55 NEW PRODUCTS: PAGE 181 • 22 PRODUCT REVIEWS: PAGE 144

MACWORLD

The Macintosh™ Magazine July 1989 $3.95 Canada $4.95

Hard Disk Alternatives

The Future of Storage

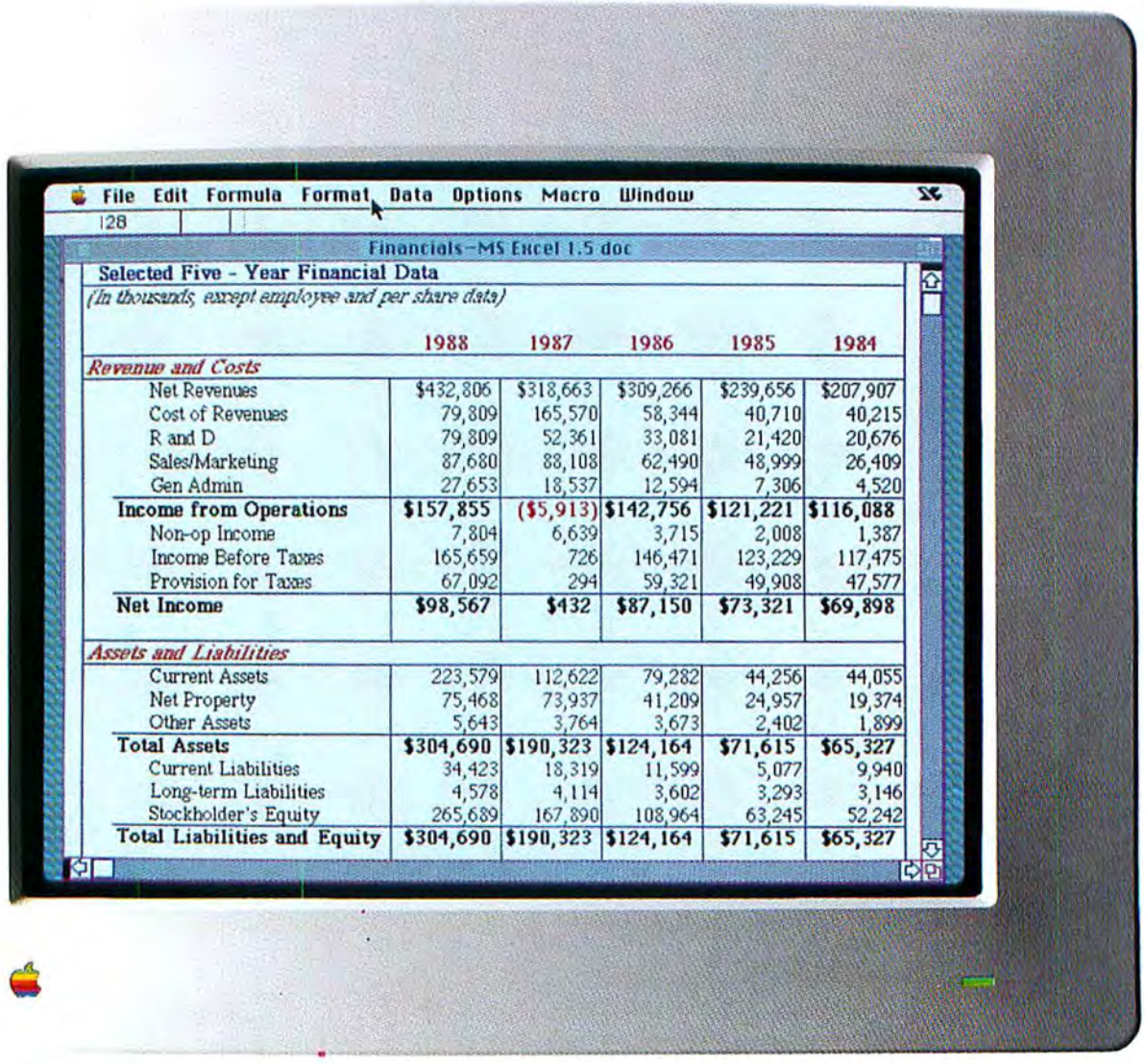
CAPTURING COLOR:
TEN SCANNERS COMPARED

9600-BAUD MODEMS:
ARE THEY READY?

90 NUBUS CARDS

SEVEN FILM RECORDERS:
WHICH ONE TO BUY?

90% of Macintosh spreadsheet users have been working on this program.



Selected Five - Year Financial Data

(In thousands, except employee and per share data)

	1988	1987	1986	1985	1984
Revenue and Costs					
Net Revenues	$432,806	$318,663	$309,266	$239,656	$207,907
Cost of Revenues	79,809	165,570	58,344	40,710	40,215
R and D	79,809	52,361	33,081	21,420	20,676
Sales/Marketing	87,680	88,108	62,490	48,999	26,409
Gen Admin	27,653	18,537	12,594	7,306	4,520
Income from Operations	**$157,855**	**($5,913)**	**$142,756**	**$121,221**	**$116,088**
Non-op Income	7,804	6,639	3,715	2,008	1,387
Income Before Taxes	165,659	726	146,471	123,229	117,475
Provision for Taxes	67,092	294	59,321	49,908	47,577
Net Income	**$98,567**	**$432**	**$87,150**	**$73,321**	**$69,898**
Assets and Liabilities					
Current Assets	223,579	112,622	79,282	44,256	44,055
Net Property	75,468	73,937	41,209	24,957	19,374
Other Assets	5,643	3,764	3,673	2,402	1,899
Total Assets	**$304,690**	**$190,323**	**$124,164**	**$71,615**	**$65,327**
Current Liabilities	34,423	18,319	11,599	5,077	9,940
Long-term Liabilities	4,578	4,114	3,602	3,293	3,146
Stockholder's Equity	265,689	167,890	108,964	63,245	52,242
Total Liabilities and Equity	**$304,690**	**$190,323**	**$124,164**	**$71,615**	**$65,327**

To learn more, call for the Microsoft Excel 2.2 brochure, (800) 541-1261, Dept. J72. Customers in Canada, call (416) 673-9811. Outside North America, call (206) 882-8661. © Copyright 1989 Microsoft Corporation. All rights reserved. Microsoft and the Microsoft logo are registered trademarks and *Making it all make sense* is a trademark of Microsoft Corporation. Macintosh and Mac are registered trademarks of Apple Computer, Inc.

So have we. Introducing Microsoft Excel 2.2.

In 1985, not long after the Macintosh® was unveiled, Microsoft® Excel became the most compelling reason to buy one.

Within minutes, it became a standard on the Macintosh. Before we knew it, a full 9 out of 10 Macintosh spreadsheet users were swearing by it. Not surprisingly, they still are.

Used to be, 1MB was enough. Now with Microsoft Excel 2.2, you can take full advantage of the 8 megs in today's most powerful Macintoshes.

But, of course, we weren't satisfied to leave well enough alone—and Microsoft Excel version 2.2 has come to the small screen. In a big way.

In mathematical terms, 2.2 is greater than 1.5. In technical terms, your spreadsheets aren't limited to 1MB of memory—version 2.2 makes the most of even 8meg machines.

Which translates into spreadsheets of outrageous proportions.

Equally outrageous: 40% faster calculations—thanks to advanced intelligent recalc.

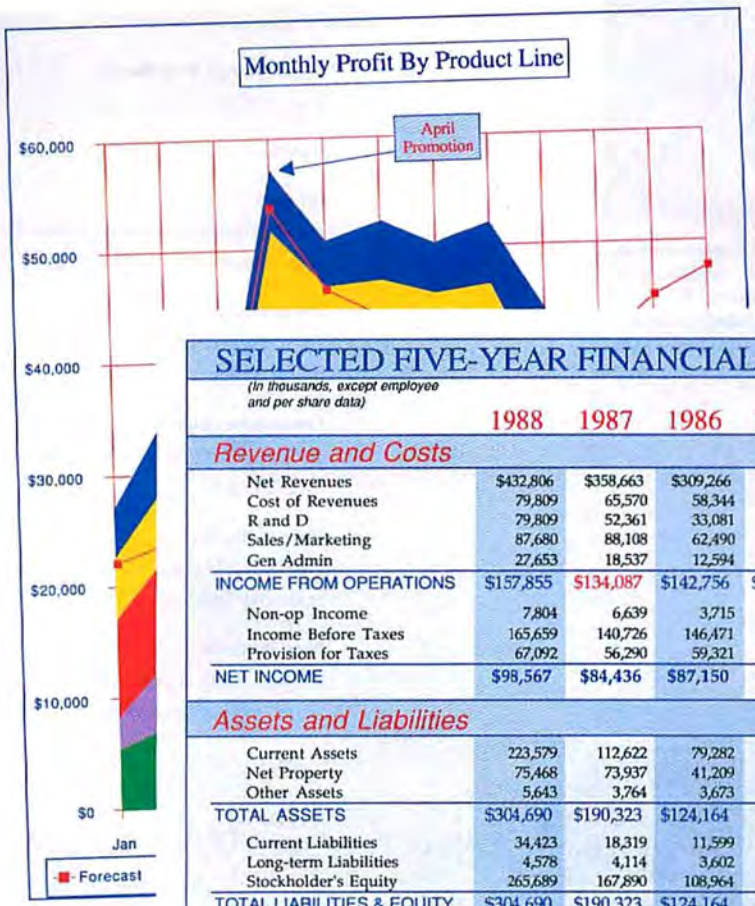
As for presentation? Version 2.2 also lets you highlight data in ways well worth highlighting: You can pick up to 256 different fonts per sheet, including up to six styles and eight colors. You can change row height. You can shade. And basically pack your documents with more visual punch than ever before.

Microsoft Excel version 2.2. Another improvement designed to make Mac® enthusiasts even more enthusiastic.

Something 90% of you are already used to. And you other 10% easily can be.

Microsoft

Making it all make sense.



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TOTAL LIABILITIES & EQUITY	$304,690	$190,323	$124,164	$71,615	$65,327
Working Capital	189,642	173,468	127,766	119,489	77,041
Number of Employees	3,456	2,727	1,681	1,390	1,086
Common Stock Data					
Net Income per Share	$1.13	$1.64	$1.94	$1.90	$2.59
Book Value per Share	$4.56	$3.56	$2.29	$1.46	$0.78
Cash and Investments	$2.65	$1.60	$0.83	$0.64	$0.48
Average Shares Out	87,535	83,258	44,956	38,634	26,984
Shares Out/Year-end	86,790	51,305	26,589	15,905	9,082
Key Ratios					
Return on Net Revenues	23%	23%	28%	31%	34%
Return on Total Assets	32%	44%	70%	102%	107%
Return on Stock Equity	37%	50%	80%	116%	134%

Now pick from 256 fonts. Change row height. Shade. Add notes. And get used to the sound of applause.

MACWORLD

The Macintosh® Magazine July 1989

With so many options available in removable storage media, is an erasable optical disk worth the price? To find out how to assess your data storage needs, see page 116. (Photo by David Bishop.)

DEPARTMENTS

How to Contact Macworld **10**
Reprints, subscriptions, *Macworld* in microform, editorial contacts.

Commentary/Jerry Borrell **19**
Looking ahead to the new system software.

Letters **27**

Art Beat **39**
By Deborah Branscum/An old-fashioned character enters the computer age.

The Iconoclast **43**
By Steven Levy/A simple soul is confused by too many Macs.

Conspicuous Consumer **57**
By Deborah Branscum/How to protect your investment.

State of the Mac **69**
By Thom Hogan/How to prolong the life of your machine.

New Products **181**
A quick look at new Macintosh hardware, software, and accessories.

HOW TO/Quick Tips **195**
By Lon Poole/Fast redrawing in Illustrator 88, RAM virus detection, check boxes in HyperCard, and more.

HOW TO/Getting Started with Desktop Presentations **209**
By Jim Heid/Learn to create slick presentation aids that get your message across.

HOW TO/Insights on AppleShare **221**
By Dave Kosiur/Making the most of Apple's versatile file server.

Updates **227**
The latest software upgrade news.

Where to Buy **231**
Contact information for products in this issue.

Best-Sellers **268**

Learning surgery with help from videodisk stacks, page 89.

NEWS

Mac Bulletin **15**
Late-breaking news.

Macworld News **83**

■ **More Colorful Publishing** PageMaker's add-on does color separations. ■ **An Engine in Every Application** HyperCard-like shop management. ■ **Not Just the Fax, Ma'am** Turn E-Mail into a fax. ■ **A Sharply Accelerated Mac II** Faster processing. ■ **A Little Learning Goes a Long Way** OCR software reads handwriting. ■ **Fractals, Anyone?** All the news that's fit to split. ■ **Texas School Network and CD ROM** Connecting over cable TV wires. ■ **Mac the Knife** HyperCard as surgery tutor. ■ **CL/1 Support Grows** Mac-to-VAX links. ■ **Your Best Stacks** Japanese landscape design. ■ **Reach Out, Reach Out and Crush Someone . . .** A novel input device for games. ■ **The Kindest Cut of All** MultiClip improves on Clipboard. ■ **Reader Survey: Apple's 90-Day Warranty** Most pan Apple's guarantee.

Are you adequately insured against computer equipment loss? Don't wait until your dog chews up your keyboard to find out. *See page 57.*

FEATURES

From Screen to Slide **108**
By Cheryl England Spencer/Is making your own slides worth the trouble and expense? Find out which of the seven film recorders reviewed here make the grade.

Hard Disk Alternatives **116**
By Charles Seiter/If you're in the market for mass storage, a hard disk may not be your best bet.

New Life for the NuBus **123**
By Brita Meng/Thanks to the NuBus, a host of add-in boards can enhance the Mac II's performance.

Communicating at Speed **128**
By Dave Kosiur/The pluses and pitfalls of high-speed communication. While 9600-bps modems are built for speed, you may get bogged down in a morass of communications protocols.

Capturing Color **134**
By Steve Roth/The brave new world of color scanners: what they're good for (and what they're not), how they work, and what to look for when you buy.

Communicating at 9600 bps—do high-speed modems really outdistance their sluggish competitors? *See page 128.*

REVIEWS

Macintosh IIx **144**
Modular six-slot 68030/68882 Mac.

SmartForm Designer **145**
Forms creation and fill-out program.

LetraStudio 1.0 ..... **146**
Display-type customization program.

CalComp Drawing Board with MacMaster Templates 1.0 ..... **148**
Digitizing tablet with templates.

Just Enough Pascal 1.0 ..... **152**
Interactive programming tutor.

ComputerEyes 1.2.1 and MacVision 2.0 ..... **155**
Two inexpensive video digitizers.

Anatool 3.0 ..... **157**
CASE software.

MetCom Modula-2 1.02 ..... **159**
Application development environment.

Colleague 1.1 and The HyperWorks Organizer 1.0 ..... **161**
Business organization tools.

Milo 1.0 ..... **164**
Symbolic math program.

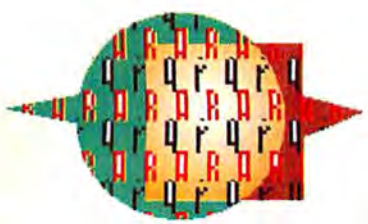
ArchiText 1.03 and Guide 2.0 ..... **166**
Hypertext authoring and viewing software.

Memorybank SS400/MAC761EA **168**
Hard disk/tape backup.

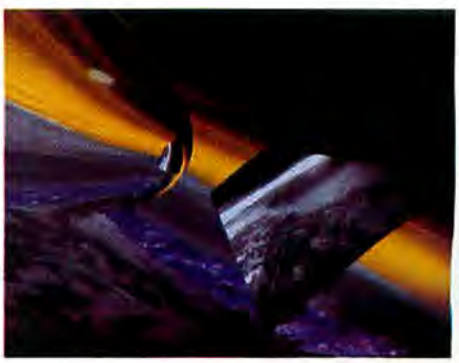
BigThesaurus 1.0 ..... **173**
Thesaurus DA.

Open It 1.0 ..... **175**
Scrapbook alternative.

Window Shopping **177**
Family Care, Casino Master, Mail Dex, and Directory.



Considering a 24-bit color scanner? Discover the advantages and the pitfalls, *page 134.*



How To Break The Font, DA, F-Key And Sound Barriers With Your Mac

If you're a power user, there are a couple of indispensible utilities designed to quicken your pulse and take you further and faster than ever before. Both are from ALSoft, the leader in resource optimization software design.

The first utility of its kind was Font/DA Juggler Plus. With it, you'll gain unlimited access to all your resources. Way beyond the ordinary font, desk accessory (DA), FKey and sound barriers of your Mac. It's 100% Multifinder compatible, too. Plus, these resources don't need to be physically installed in your System File. What's more, with Juggler Plus, all your downloadable PostScript™ font, screen font, DA, FKey and sound files can now be accessed and shared by every member of your network. Just the resources you need are now available at the click of your mouse. To save an average of 40% of your disk space, you can even compress memory intensive sounds and fonts. When you call for them, Juggler Plus will automatically decompress them on the fly. Resource Resolver is another powerful feature which will effectively resolve both sound and font ID numbering conflicts, eliminating any potential confusion. But that's just for starters.

Font/DA Juggler™ *Plus*
RESOURCE OPTIMIZER
$59.95

MASTERJUGGLER DOES EVEN MORE.

MasterJuggler is the new generation, supercharged sports model of resource optimization utilities. With all the powerful features of Juggler Plus and many more, enabling you to do much more, too. Like opening multiple applications or documents from within any application. Switching between open applications from a convenient pop-up menu. Or hiding the current application's windows before selecting another application. MasterJuggler gives you unprecedented power and flexibility. Now you can instantly see or print any name or number conflicts among the resources you are using. Plus, you can assign an interesting variety of sounds to 7 different Mac operations or you can build your own sound library by converting digitized sound files into Macintosh and HyperCard sound resources.

MasterJuggler™
RESOURCE OPTIMIZER
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Whether you're in a large network or you're one person with a Mac and a mouse, Font/DA Juggler Plus and MasterJuggler will make a big difference. All for a very small price. Call now for orders or the Bonsu dealer nearest you, 713/353-4090.

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ALSoft

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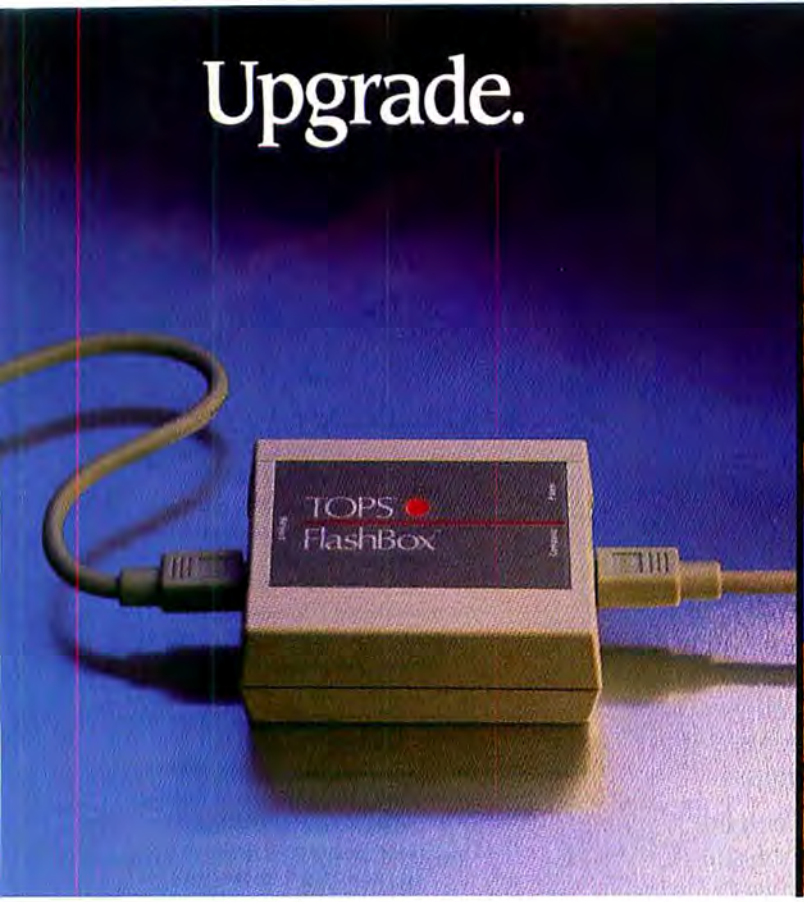
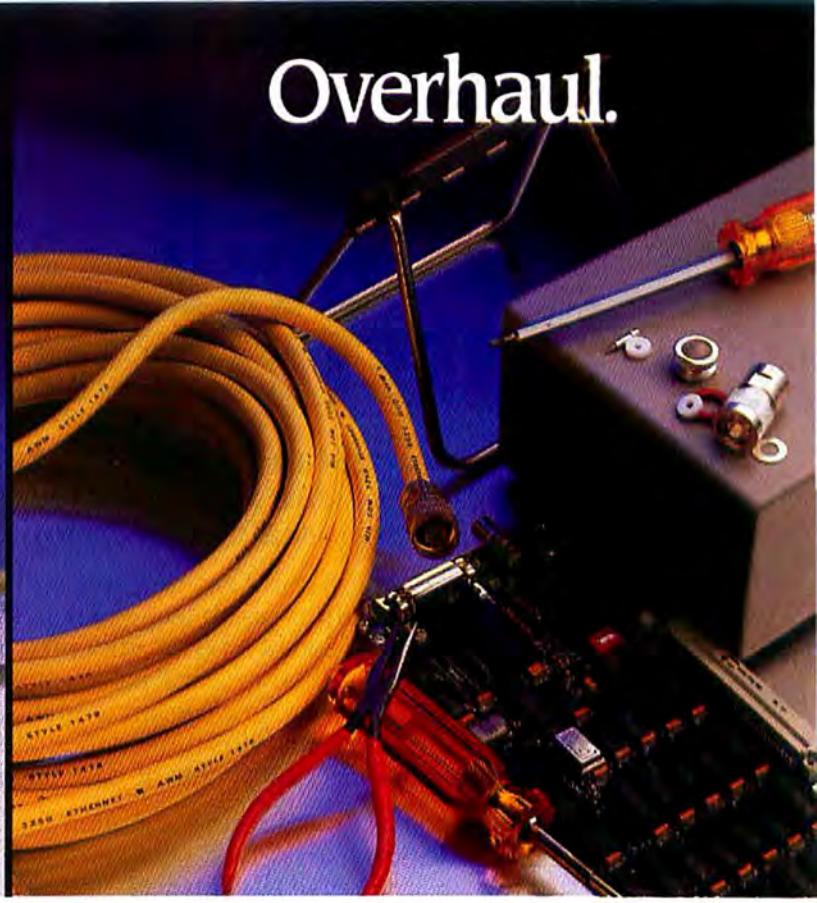
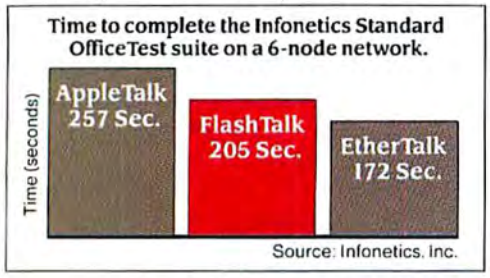
Publisher's statement can be found on page 10.





How to give Ethernet a run for the money.

Some people may think the way to rev up a LocalTalk network is to rip the whole thing out, lay some heavy cable, and send your computers out for an Ethernet implant. Spending big bucks in the process.



TOPS suggests a less traumatic alternative: FlashBox, the fast and easy LocalTalk *upgrade.*

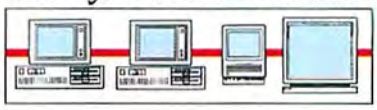
For just $189 per node, FlashBox delivers fully 80% of Ethernet performance for just 20% of the cost. How? By turning your LocalTalk network into a high-speed freeway moving data at FlashTalk rates of 770 Kbps.

Installation won't slow you down either. FlashBox plugs right into the back of your Mac and runs over your existing twisted-pair wire. It's 100% compatible with your current applications. It communicates at FlashTalk rates with PCs using TOPS FlashCard. And, unlike Ethernet, it lets you continue printing to your LaserWriter® without buying a costly gateway.

Best of all, FlashBox is available now. So stop by your nearest TOPS dealer and find out how to rev up your network without overhauling your budget. Or call the TOPS Division of Sun Microsystems at 1-800-445-TOPS, extension 107 (from outside the U.S. and Canada, call 1-415-769-8700, ext. 107).

TOPS®

When you need connections.



Actual performance of your network may vary depending on the quality and length of network cable, network size and configuration. To achieve best performance, you should connect a FlashBox to each Macintosh. Using FlashBox with bridges, gateways, or other AppleTalk-only devices may require network reconfiguration or the addition of repeating devices.

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sun microsystems

ROLL OVER BEETHOVEN.

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Our new product roll-out is worth a little arm waving. That's because LightningScan lets you scan images up to four inches wide from books, mounted artwork, or anywhere else. You get switchable resolution up to 400 DPI. Software conversion to gray scale. A setting for text and line art. Plus three dither patterns that put limitless special effects right at your fingertips.

LightningScan comes with the application that helped make ThunderScan famous. Along with desk accessory software that works in concert with any Macintosh program. And to end this ad on an upbeat note, LightningScan can be yours for just $549 suggested retail. So get rolling to your dealer and pick one up today.

Thunderware

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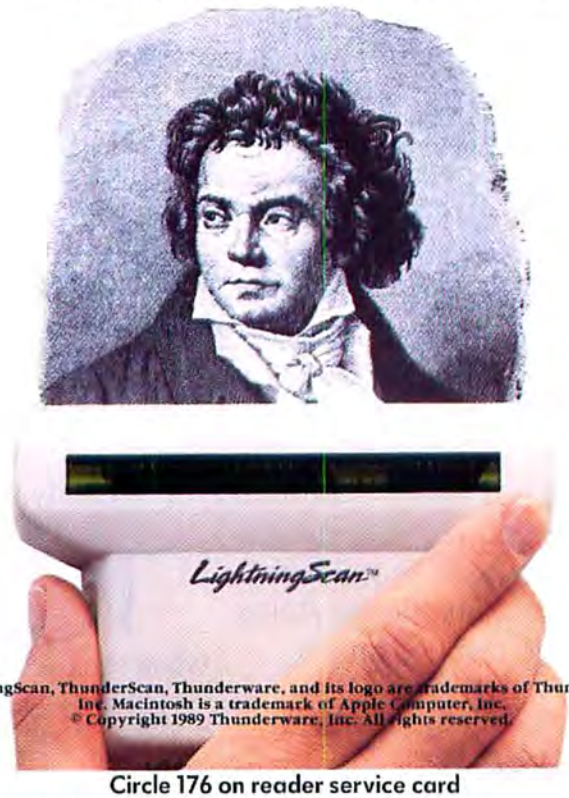

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Smart Mac users who want complete, yet effortless protection for their hard disk data should follow Steven Bobker's advice and "Get SUM." Today.

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So before you buy your Macintosh II anywhere else, call 1-800-527-1950 ext. 84 for a brochure and the name of your nearest Radius Authorized Dealer.

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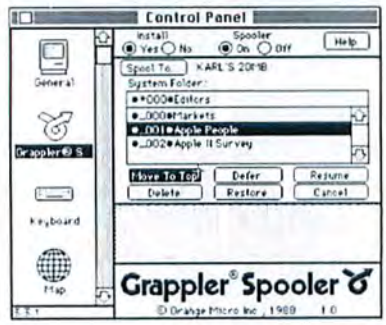
Grappler® Spooler

PRINTING DOESN'T HAVE TO MEAN WAITING

Simply stated, a "spooler" allows you to simultaneously use your Mac while your printer is printing. No more waiting. You get more done, faster! Whether you have an ImageWriter II, ImageWriter LQ, or you're using any dot matrix printer with the Grappler C/Mac/GS, the new Grappler Spooler lets your Mac do two jobs at once.

The Grappler Spooler loads into your Mac's control panel for easy access. You can queue up to as many print files as your disk will hold, and manage that queue with commands like Move To Top, Defer, Delete, Cancel and more. The Grappler Spooler even works in MultiFinder.



Suggested Retail: $79

Requires Mac Plus, SE, II or IIx with minimum 1MB of RAM. A hard disk is recommended. System 4.2 and Finder 6.0 or later is required.
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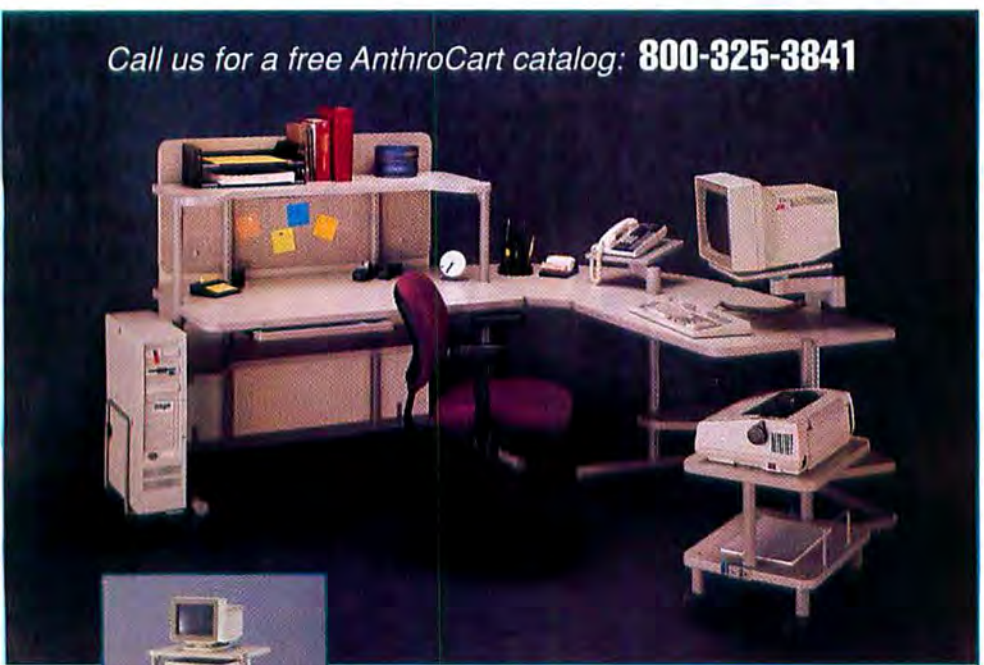

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Circle 11 on reader service card

GET A NETW

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Namely, DaynaNET.™ The first real network at a realistic price.

Here are the facts.

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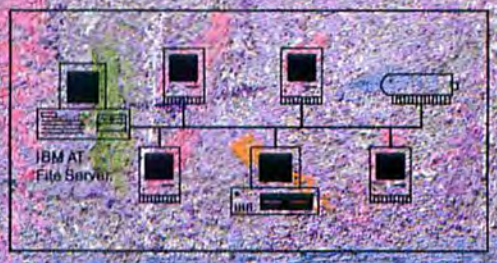

DaynaNET allows high-performance networking in either large or small Macintosh and PC workgroups.

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Dayna NET

Local Area Network for
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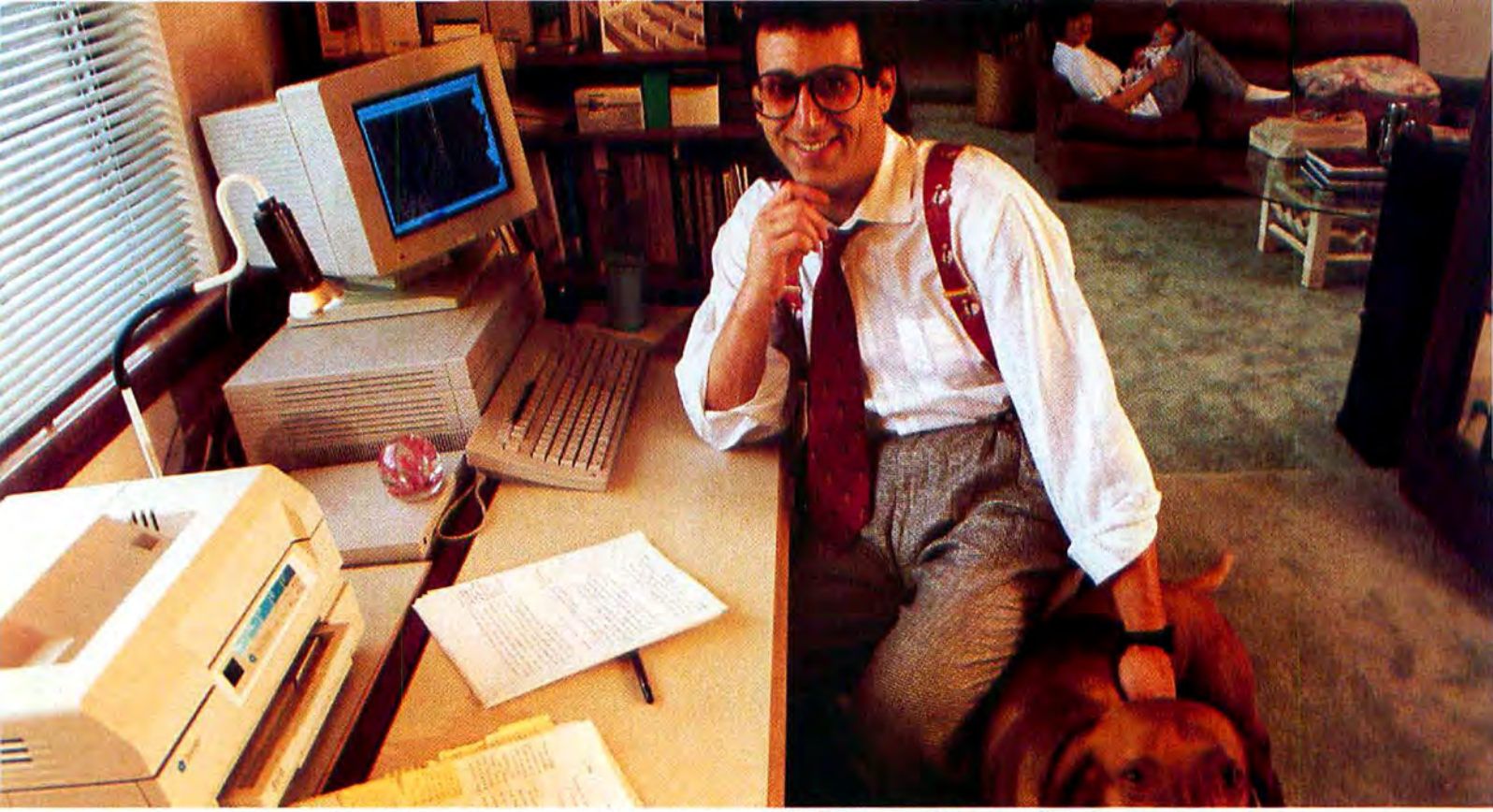
For LocalTalk



Bob LeVitus, former editor of MACazine; author of Dr. Macintosh: Tips, Techniques, and Advice for Mastering Your Macintosh.

"The Jasmine DirectPrint is not as good as a laser printer. It's better."

"Ever since the day they came out, I've been using PostScript® laser printers. I edited a magazine that was desktop-published from cover to cover, so I lived and died by laser printers daily. Over the last three years, I've had experience with at least 15 or 20 different models. And the Jasmine DirectPrint™ is better than any of them.

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"I've been using this printer for proofing all of the drafts of my new book. I've thrown some pretty complex PostScript graphics at it, using programs like FreeHand™ and Illustrator88,™ and nothing I've created has slowed it down in the least. There's no question in my mind that the DirectPrint is as fast or faster than even Apple's® fastest laser printer.

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MAC BULLETIN

INDUSTRY NOTES

Apple's Profits Fall Less Than Expected...

Apple reported that its profits for the quarter ending March 31 were down from a year ago; however, the 29 percent drop was less than predicted. Sales for the quarter increased by 44 percent. The company is still blaming its reduced profits on miscalculations made during 1988 in its purchases of DRAM chips.

And Sculley Hauls Down the Bucks

Apple chairman John Sculley had the highest salary in the computer industry for the second year in a row, according to an annual salary and stock survey in Computer Reseller News. Sculley earned $2,479,000 in 1988, far outdistancing IBM chairman John Akers, who earned $1,525,500. Microsoft chairman Bill Gates was the executive with the most valuable stock holdings, worth $1,023,807,451.

TOPS: It's Broke but We're Fixing It

TOPS has confirmed reports of very large, multiuser databases being corrupted while running TOPS under version 2.1 in high-transaction situations. The problem affects databases built in applications (such as Omnis and 4th Dimension) that use a procedural language. Version 2.2 will be delayed while Blyth, Acius, and other developers consult with TOPS to fix the problem. Users with data-integrity problems should call TOPS at 415/769-8711.

AST Sells Mac Division to Orange Micro

Orange Micro has purchased AST Research's entire Macintosh product line. AST cited its desire to focus on its industry-standard architecture (ISA) line of products as the reason for the sale. Mac products changing hands include the NuView video board—featured in John Sculley's speech at Macworld Expo in January—and two MS-DOS coprocessor boards, Mac86 and Mac286.

Apple Takes Anticlone Measures

Apple is trying to thwart the threat posed by Mac clones by incorporating a new clause in authorized Mac dealer contracts sent out in April. The clause prohibits dealers from **using Apple replacement parts for purposes other than servicing Apple products.** In recent months, two companies, Powder Blue of Salt Lake City and Akkord Technology in Taiwan, have displayed Mac clones that employ Mac 128K ROM chips to emulate the Mac.

Cricket Announces Illustration, Color Paint Packages

Cricket Software announced a new PostScript-based drawing package to be called Cricket DrawMaster. Early specifications suggest that the application will compete with Deneba's Canvas. Cricket DrawMaster **will support 8-bit color and Apple's 32-bit QuickDraw standard.** The program will allow mixing the familiar Macintosh object-oriented drawing primitives with bezier curve-controlled objects, and converting object primitives into beziers. It will also incorporate a full-featured text processor. Special features include the star-burst, grate, and polygon tools found in the original Cricket Draw, and improved access to Cricket Draw's special PostScript features such as fountains and shading. Cricket DrawMaster is slated to ship by the end of June. It will list for $295, and Cricket Draw owners will be able to upgrade for $99.95.

After surprising Mac fans last winter with the release of its black-and-white bitmapped Cricket Paint, Cricket ran its true flag up the pole recently when it shipped a color version of the program, called (of course) Cricket ColorPaint. Cricket ColorPaint lists for $295. For more information, contact Cricket Software at 215/251-0678.

Ashton-Tate Upgrades for FullWrite and Full Impact Ship

Version 1.1 of Ashton-Tate's sophisticated word processor FullWrite Professional eliminates some pesky bugs that plagued the first release, and version 1.1 of the company's Full Impact spreadsheet adds a powerful new macro feature. FullWrite Professional 1.1 is more robust and **should be able to produce large documents without crashing,** according to the company. The program no longer has a ceiling on the number of notes in a document, and Ashton-Tate is preparing foreign language dictionaries for FullWrite.

Full Impact 1.1's new XMacro feature lets you call routines that are written in standard programming environments from within the spreadsheet's FullTalk macro-scripting language. For information on upgrading, call Ashton-Tate at 213/329-9989. For other information, call Ashton-Tate's Macintosh division at 408/268-2300.

Fujitsu Jumps into Mac Fray

Fujitsu America has introduced **its first products for the Macintosh**—an 800K floppy drive and a Mac-compatible laser printer. Called the Fujitsu America 800K External Disk Drive, the 3½-inch external floppy drive lists for $265 and is compatible with both the Mac Plus and the SE. The RX7100PS laser printer comes with 2MB or 4MB of RAM and includes 35 resident fonts, dual paper trays, and built-in AppleTalk, RS-232, RS-422, and parallel ports. Prices for the printer start at $4495. For more information, contact Fujitsu at 800/626-4686.

Apple Drops High-End IIx Price

Apple has **lowered the price of its high-end IIx configuration**—which comes with an 80MB internal hard drive and 4MB of RAM—by $200 to $7669. Apple gave no reason for the price drop. In

(continues)

INDUSTRY NOTES

Oracle and Banyan Become Partners

Oracle Corporation and Banyan Systems are joining forces to integrate the Oracle database-management system with Banyan's VINES network operating system. The Oracle Server for VINES, based on Oracle version 6.0, will support MS-DOS, Mac, and UNIX-based client applications. According to the two companies, it will be available in May.

Full Impact All Ashton-Tate's

A federal court ruling in favor of Ashton-Tate has settled a dispute with Bravo Technologies over ownership of Full Impact. Bravo claimed that Ashton-Tate misappropriated trade secrets when an independent software developer, who had worked with Bravo on a similar project, was hired by Ashton-Tate to work on Full Impact.

MacPeak Systems Closes Down...

MacPeak Systems ceased operations in March. At the same time, former employees of MacPeak Systems formed a research and development company, MacPeak Research, and granted worldwide marketing rights for its products to Irwin Magnetics Systems. Irwin currently sells several MacPeak-designed accelerator boards under the Excelerator brand name.

And Rodime Is in Trouble

After sustaining an operating loss of $2.4 million last year, hard disk manufacturer Rodime PLC is looking for help—from either an outside financier or a willing buyer. The company also lost its chairman and managing director in March. Rodime PLC is the parent company of Rodime, Inc., which has supplied hard disks to Apple and Jasmine, and directly to users.

Dest Goes Chapter 11

To protect itself from creditors, Dest Corporation has filed under Chapter 11 of the U.S. Bankruptcy Code. The manufacturer of scanners and optical character recognition software claimed to have $18 million in assets and a burden of $16.8 million in debt. Dest will continue operations while reorganizing and looking for a possible buyer for its technology.

April, Apple also announced price reductions for the Mac Plus, Mac SE, and Mac SE/HD20 to schools participating in its Higher Education Purchasing Program.

More Math for the Mac

MathSoft has introduced a Mac version of its mathematical software MathCAD. MathCAD **allows users to define variables and to input formulas and text;** the program formats equations as they are typed, and calculates and displays results. Computations supported include integrals and derivatives, Fourier transforms, matrix arithmetic, linear and log plots, and three-dimensional surface plots. MathCAD costs $495 and runs on the Mac Plus, SE, or II with 1MB of RAM. For more information call MathSoft at 617/577-1017 or at 800/628-4223.

Film Recorders to Accept PostScript Images

Agfa Matrix has introduced a $17,900 stand-alone PostScript raster image processor (RIP) that makes Agfa Matrix film recorders **the first to be able to render PostScript images from programs such as Aldus FreeHand, Adobe Illustrator, and desktop publishing applications.** The RIP, which is scheduled to be available in September, works with the company's entire line of film recorders for both the Mac and IBM PCs. The company also announced MacHarmony ($1995), a device that lets Mac users run the Agfa Matrix film recorders designed for IBM PCs. For details, contact Agfa Matrix at 914/365-0190.

Iomega Gets Bernoulli-Happy

Iomega Corporation **has doubled the storage capacity** of its Bernoulli Box removable disk drive with a new drive, the Bernoulli Box II 44. The $1799 drive provides 44.5MB of formatted storage capacity on each disk cartridge. At the same time, Iomega and Aldus Corporation signed an agreement that gives Iomega permission to sell PageMaker 3.0, additional fonts, clip art, and templates on its Bernoulli disk cartridge series. For more information, call Iomega at 801/778-1000.

Generation X Announces SE/30 Monitor Boards

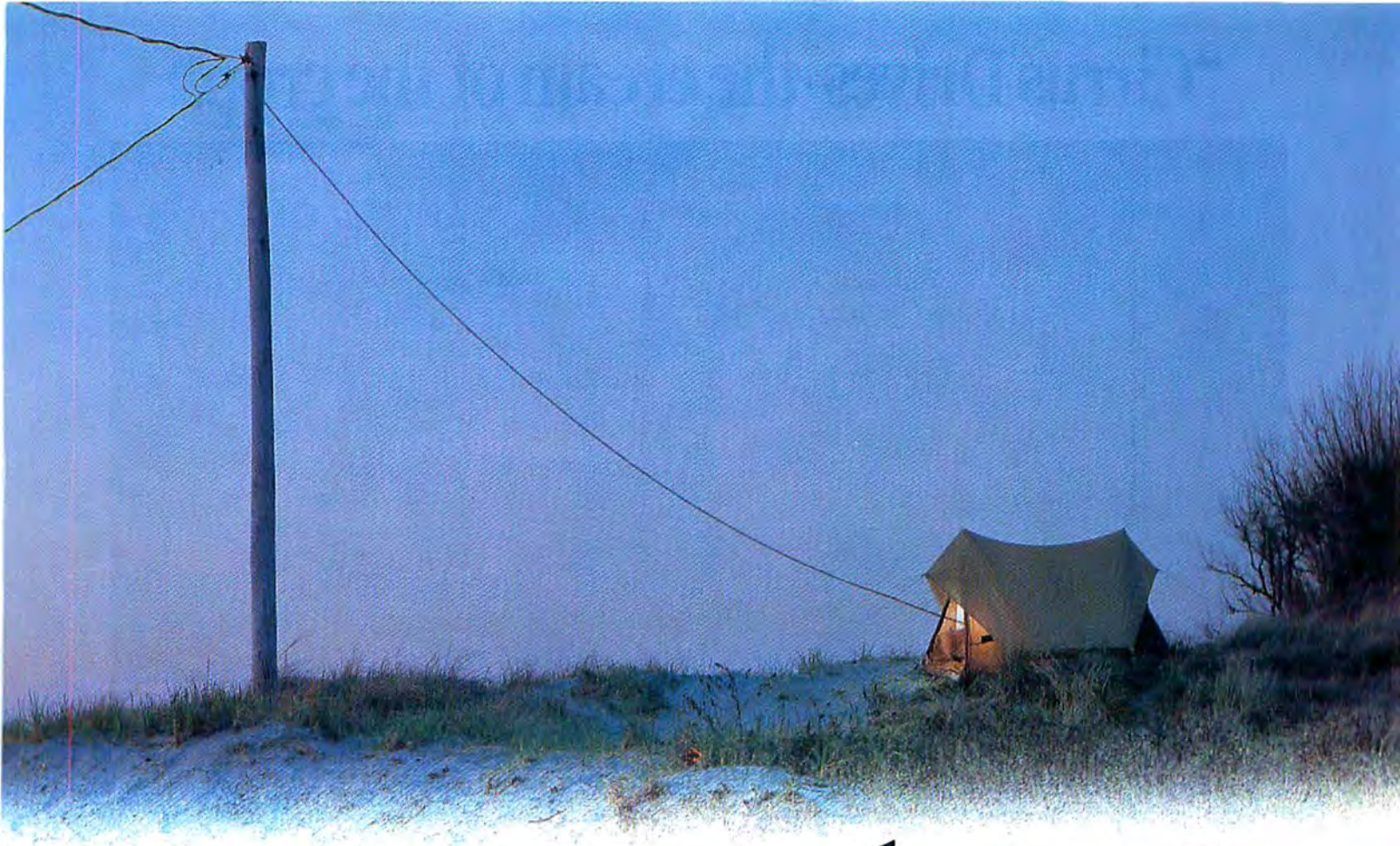
Generation X Technologies has announced **boards that drive Apple's monitors from the SE/30's Direct Slot.** The Publisher '030, a 78Hz board, is compatible with Apple's 15-inch and 21-inch monochrome monitors, as well as Generation X's HRM-19, a $1395 19-inch monitor. The Publisher '030 lists for $525, and it and the HRM-19 are available now. The Vision '030A is an 8-bit, 640-by-480-pixel color board with 72 dpi resolution that is compatible with Apple's standard 13-inch RGB monitor. It lists for $995 and comes with special software for creating and managing a virtual desktop. Finally, the Vision '030X is a 1024-by-768-pixel 8-bit color board that refreshes at 74Hz and comes with virtual-desktop software. It lists for $1795. The '030A and the '030X should be available by the time you read this. For more information, contact Generation X at 408/739-4570.

Buffer/Spooler Adds Memory

Fifth Generation Systems has bumped up the memory in its Logical Connection print buffer/spooler to 1MB from 512K. The Logical Connection is a stand-alone device that **enables Macs, PCs, and minicomputers to share peripherals without a local area network.** The device has four serial and four parallel ports, and you can hook as many as 45 units together. New configuration software provides a desk accessory for switching between ports. The Logical Connection's list price is $1095. For more information, contact Fifth Generation Systems at 504/291-7221 or 800/873-4384.

Adobe Updates Illustrator 88

Adobe Systems is sending registered users a free update of Adobe Illustrator 88 that **fixes incompatibilities with 68030-based Macintoshes**—the SE/30, IIx, and IIcx. Version 1.83 adds two new features. Split Path automatically examines and cuts the length of paths in illustrations, eliminating some errors with high-resolution printers; also included is the ability to show EPS files while in artwork mode. M



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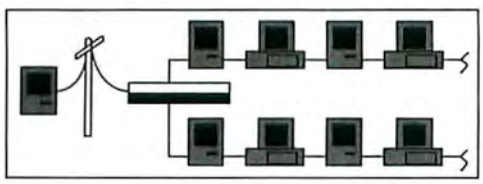

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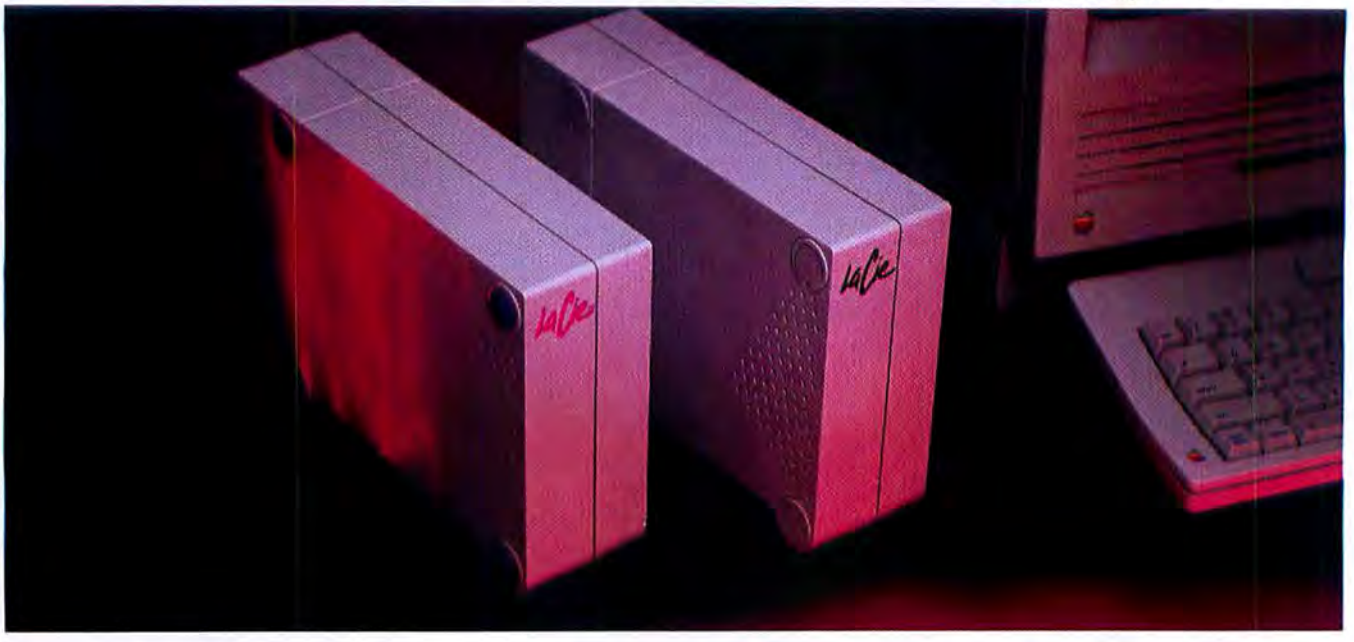
"Cirrus Drives-the cream of the crop."

Macworld, May 1989



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Macworld, May 1989.

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Macworld, May 1989.

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84	15	999
111	15	1,199
142	15	1,499
177	15	1,799
613	15	3,199

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Circle 145 on reader service card

Classic Mac

Another vintage year for Macintosh products

by Jerry Borrell

In May Apple announced a host of fundamental changes to its operating system—ranging from software architecture for printing, to changes in the interface. Significant as these changes are, by the time the new software is released through Apple dealers (this fall?), still more features will have been added.

PRINTING STRATEGY

The most ballyhooed change is in printing technology. Over the last several years Apple has made known its concern with Adobe Systems and PostScript: the high level of royalty payments to Adobe; Apple's lack of control over the destiny of its own printing technology; and user demands for more third-party suppliers of high-quality fonts. Although there continue to be admirers of both Adobe and PostScript at Apple, Adobe's push to have Apple adopt Display PostScript as a replacement for QuickDraw seems to have been the final straw. Indeed, had Apple implemented Display PostScript, it would today find itself in close competition with Next and a soon-to-be-announced family of IBM workstations.

Instead, Apple has announced a new font strategy based upon QuickDraw and an "open" (that is, publicly available) font format. This strategy is predicated on the concerns mentioned above, as well as Adobe's long-standing (and understandable) reticence to share the font-encryption techniques that enable raster imaging devices (namely PostScript printers) to produce the best fonts available. So-called PostScript clones attempt to do this, but just how effective they can be in printing graphics, gray scale, color, special effects, and text remains questionable. In fact, Adobe's success in licensing its RIP (raster image processing) technology so widely has, ironically, been an impetus for clones.

LUIS DELGADO

From left to right, the Apple system software team: Gifford Calenda, Jim Davis, Charlie Oppenheimer, and Mike Potel.

Although the use of PostScript technology in many of today's printers prevented an IBM PC–like cacophony of competing standards, Adobe's small staff of 150 people became a bottleneck for many printer manufacturers who had to wait in line for an Adobe-licensed RIP.

Similarly, URW, ITC, and other type vendors chafed at the need to produce PostScript fonts, particularly as Adobe was most firmly allied with Linotype (formerly Merganthaler). And with new PostScript typefaces coming into the market so slowly, users of type were also frustrated. (Adobe is addressing this issue by designing and selling systems that will allow others to produce PostScript typefaces.) Buyers of printers were frustrated as well—thanks to the relatively high price of PostScript printers as compared to DOS printers (due, in large part, to the cost of a PostScript RIP).

By adopting an open method of rasterizing type on laser printers Apple believes it will bring a large number of printer and type manufacturers into the market. And that it, a company not known for consorting with the likes of Steve Jobs or IBM, will have control over the future of that market. Having said all of that, the next question to ask is: What about the installed base of PostScript printers and PostScript typefaces at publishing businesses? What of Apple's next generation of printers: will they be PostScript or QuickDraw, or a combination? And the inevitable question: Will Apple's QuickDraw printing be as good, and as fast (yes fast, PostScript and the LaserWriter driver have improved quite a bit over the last year), as today's PostScript printers? Finally, what role will Adobe play?

The answers: Today's PostScript printers will work with the new QuickDraw fonts and new applications, but some necessary PostScript interpretation will result in PostScript working less efficiently. I believe that Apple has designed its last PostScript-only printer, but Apple will not

(continues)

abandon PostScript. Those of us with large investments in PostScript font libraries are safe for the time being. And the service bureaus with Linotronics should remain viable for quite a while. But, longer term, we will be tempted to move to QuickDraw printers and libraries of type based on the new format. There will also be many problems in application software until developers learn what will make the new fonts break. Perhaps most oddly, Apple will adopt a position that erodes a widely accepted standard—PostScript—that it helped to promulgate.

As for Adobe, it will continue to derive royalties from the sale and licensing of PostScript fonts and from licensing PostScript RIP technology and font-encryption techniques (although Apple will no longer be one of the licensees). Adobe will design and sell fonts in Apple's new open font format. Adobe has the opportunity to be a strong Macintosh developer with a lineup that includes a new prepress application called PhotoShop, a forms-production package acquired from Spectrum Digital, and, of course, Illustrator. But in spite of all this, Adobe's overall share of the Apple market will decline.

While Apple QuickDraw printing and display technologies are not perfectly analogous to PostScript as a unified approach to display and printing, Apple has effectively ended any speculation that it may consider PostScript as an alternative to QuickDraw. And few applications developers relish the thought of supporting yet another programming environment, let alone one that competes with Apple's own approach. The question of whether Apple will attempt to market Display PostScript for the Macintosh has been answered: it will not.

INTERFACE CHANGES

Next on the list are changes to the Finder. So often have I moaned about the need to evolve the interface that it would be hypocritical of me not to recognize these proposed changes now. Apple is, in short, retaking the high ground in the fight for the best user interface. While there are changes to the interface itself, the most important changes have to do with the underlying functionality of the interface. The best example is what happened to the Font DA/Mover mechanism. Basically, it is gone. Ed Birss, vice president of engineering at Apple, says that Apple's goal is to simultaneously simplify how users interact with the computer while increasing the power they have available. To install fonts, for example, you will merely drag them into the System Folder. No more dialog box routine or trying to remember how Font/DA Mover works since you only use it once every three months.

APPLEMAIL

Apple staffers have long mentioned that they see mail functions as being within the realm of system software. The prospects are tantalizing. When you boot-up your system, little "in" and "out" boxes appear. You open one to check your messages, you open the other to send messages. Will Apple spend the time to develop the kind of network dialog boxes and underlying services already provided by electronic mail developers? Apple's discussions about mail functions in its new system software bring an incredible array of reactions. Many in the developer community are again looking over their shoulder, trying to determine whether Apple might covet their turf.

Apple makes a valid point in saying that the underlying functionality—that is, file formats and translations, the techniques through which data is passed between machines; network functions; and the interaction of applications and system software—must be defined by *Apple*. Microsoft, CE Software, and TOPS (they own InBox, remember?) also rightfully ask whether Apple will content itself with providing underlying functionality—or does it intend to get into the electronic mail business? They want to know what portion of the market will be willing to purchase additional mail functions, beyond those provided in system software. Certainly, third parties will always be able to provide a richer set of features. But will the number of users who demand something beyond the basic messaging Apple provides be a sufficient economic base to encourage third parties to incur development costs?

Closely related to messaging are issues also fundamental to multitasking. Interprocess communications (IPC), interprocess messaging (IPM), and interprocess applications communications (IAC) are the approaches that underlie multitasking. IPM is necessary if mail functions are to reside in system software—since computers must be able to detect when target machines on the network are available to receive messages, or know that when a machine becomes available messages can be sent to it.

Next, those of you who curse when Microsoft Mail crashes your application by interrupting with a "message arrived" dialog box will appreciate the need for crash-free interaction with busy machines on the network (IPC). By discussing IAC and IPC functions with its developers, Apple is laying the groundwork for the multitasking world. IAC, describing how communications can be exchanged between running applications (not merely from computer to computer), appears to be further away. Nevertheless, even it is being discussed.

VIRTUAL MEMORY

Another long-sought addition, virtual memory, is crucial to Apple's commitment to retain a low-cost CPU that will run with only 1MB of main memory. With system software and applications both requiring more memory than ever before, the only way to accomplish this is by introducing virtual memory, which would allow the CPU to switch the operating system of applications in and out of system memory from the disk as needed—squeezing more out of the same amount of memory. Apple's virtual memory scheme will be integrated into system software beginning with release 7.0. It will allow all 68020- and 68030-based CPUs to take advantage of virtual memory, as long as they have a PMMU chip. While there are trade-offs to be made between disk-swapping of data and high-cost RAM, now we will have a choice. Unfortunately, models based on the 68000 chip (the SE and below) will not be able to take advantage of this feature. But if Apple's preannounced "low-cost" Mac is, as predicted, based on a 68020, then future users will have access to virtual memory. ■

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TABLE OF CONTENTS

ıancial Highlights 1
:tter from the President 2
lessage from the Employee Committee. 3
Discussion of Operations. 4
Operations by Division 5
5.1. Sales 5
5.2. Marketing. 5
5.3. Manufacturing 5
5.4. Financial Services Group. 5
5.5. Capital Corp. / Holding Company. . . . 5
. Financial Statements. 6
. Footnotes. 7
3. Charts 8
9. Design Highlights 9

QUARTERLY REPORT
ARTICULATE DESIGNS

• Second Quarter • 1990 •

Q

The Second Quarter of 1990 saw Articulate Designs strengthening its position as the leader in marketing communications in the Bay Area. The most significant event was the completion of negotiations with the Oakland Rebels,[tl] a new football franchise, that will have Articulate Designs create the complete team image for the club—logo, uniform, tickets, and marketing materials. The $5 million deal calls for the consulting and design work into the mid-1990's.

The company posted profits of $.1 per share this quarter, on $244,568 revenue, marking the third quarter in a row that profits have been increased. acquisition of PeachTree Printing in the Fourth Quarter 1989 to pay dividends, as th in-house production ting costs in

Product Comparison Chart

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Text Wrapping	√	No	No
Outlining	√	No	No
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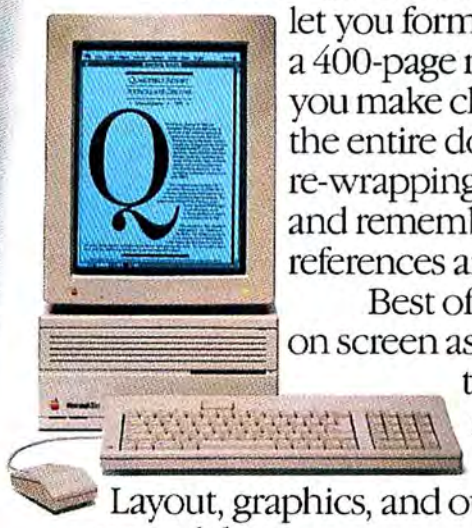

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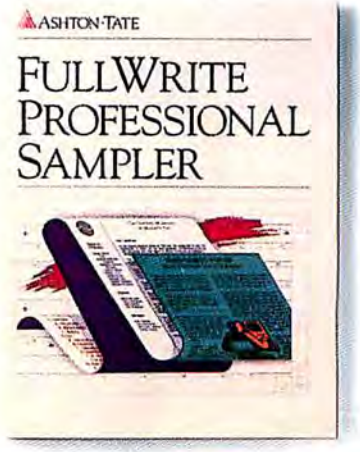

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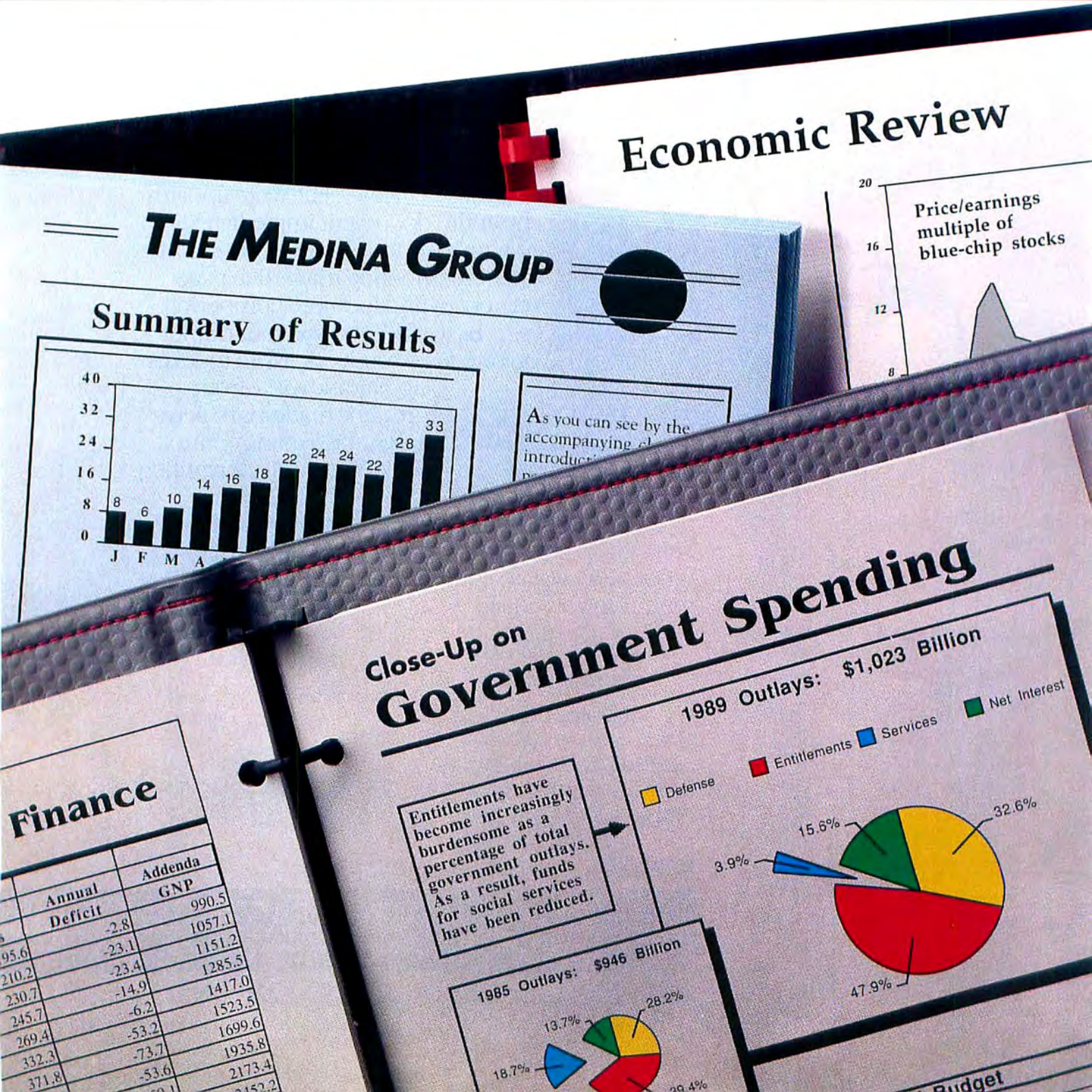

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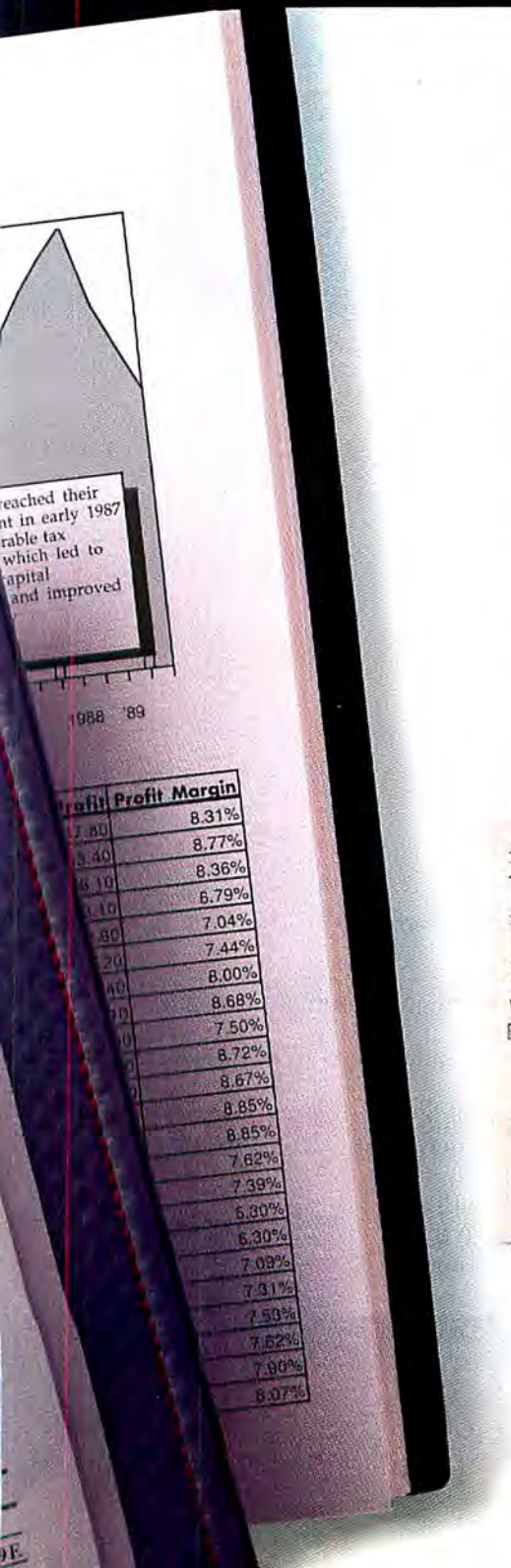

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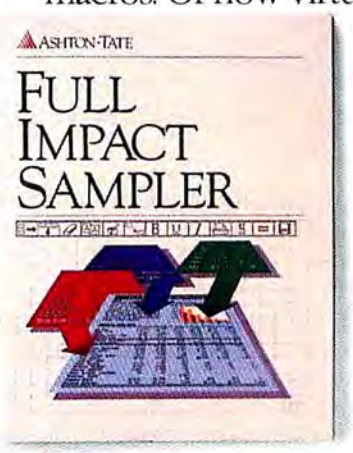

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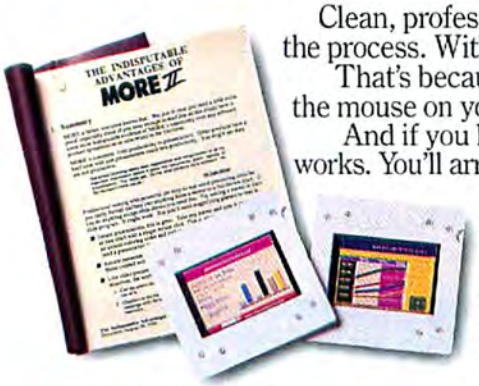

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LETTERS

A Forum for Macworld Readers

Responsibility First

David Bunnell's recent editorial, "Safety Last?" (March 1989), left me with a very uneasy feeling. Despite Bunnell's contention that Robert Morris is not to be regarded as a folk hero (à la D. B. Cooper), his essay seems quite pointedly aimed at painting that very picture. Bunnell claims that Morris "never intended his virus to cause massive havoc" and is "apparently remorseful." He has every reason to be. As to whether he intended his prodigious creation to travel so far and wide, or to wreak the havoc it did, I really don't care.

As Bunnell admits, Morris is an extremely bright fellow. The power to program that he possesses is far beyond what most computer users can understand. But power begets responsibility. Robert Morris knew exactly what he was writing, and he knew exactly what it could (and would) do. Morris is guilty of breaking and entering, and despite his massive intelligence, he must bear the responsibility for the crimes he has committed. Rather than congratulate him for showing me how defenseless I really am, I say please protect me from common criminals like Robert Morris.

Seth D. Madell
Springfield, Pennsylvania

MICK WIGGINS

More Than a Tweak

In his discussion of Robert Morris's worm, David Bunnell made several errors.

First, the correct term for Morris's program is indeed *worm*. A worm is a program that may replicate and appropriate large amounts of memory and CPU cycles. The key difference between a worm and a virus is that a worm will not infect other programs.

Second, Bunnell's assessment that a virus "is intended to be more of a nose tweak than a punch to the solar plexus" is a naive appraisal of the depravity of some computer users. The Trojan horses (programs that appear to be one type of program when they are actually another, possibly harmful) that have been propagated over bulletin boards have been extremely destructive, and those unfortunate people who were "hit" certainly felt as if more than their noses were tweaked.

Finally, there are many programmers with more than enough skill to create an even more subtle, sophisticated virus that would not necessarily have been found so readily. This problem will not go away but may indeed become worse. Computer users must take steps to protect themselves and their software.

Dean J. Miller
Canton, Massachusetts

Virus Protection

In the November 1988 issue of *Macworld* you listed a number of freeware programs that protect your Mac from the virus threat ("Mad Macs"). How can I obtain these programs?

N. Calvin Han
Los Angeles, California

Most major BBSs and user group libraries carry antiviral freeware and shareware. For a disk containing several of these products along with information on viruses, send $6 plus $1.50 for shipping and handling to The Shenandoah Macintosh Users' Group, c/o Fred Showker, 15 Southgate, Harrisonburg, VA 22801. For $2 plus $2 shipping and handling, a similar disk is available from MacPack/RR Software Resources, 1706

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Corrections

Computerized Classic Bookkeeping by Absolute Solutions Inc. (Macworld News, *May 1989) is available in three versions: Client WriteUp $695, Small and Medium-size Business Solution Package $995, and General Ledger, A/R, A/P, Inventory Control $1295. Outside California, call 800/633-7666; in California call 800/458-3399.*

	Excel	Full Impact	Wingz
Mac SE			
Open	39	5	5
Recalc	8	10	7
Save	56	5	5

These are the correct times for opening, recalculating, and saving files on a Mac SE as they should have appeared in the "Wingz Benchmarks" table (Reviews, June 1989).

Delaford, Carrolltown, TX 75007.

Two commercial products promise to offer updates as new viruses emerge. Virex by Robert Woodhead, the author of Interferon, is available from HJC Software, P.O. Box 51816, Durham, NC 27717 ($99.95; updates $15 each). AntiToxin ($99.95) is distributed by Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301.—Ed.

SANE or Insane?

In response to Thom Hogan's "Pondering Performance" (*State of the Mac*, March 1989): numerical enthusiasts within Apple conceived of SANE, the Standard Apple Numerics Environment, almost ten years ago to ensure numerical compatibility across Apple's entire line of computers.

Is this all not so sanely designed, as Hogan suggests? He claims that SANE "uses much higher precision than that specified by the Institute of Electrical and Electronics Engineers (IEEE) standard used by most other personal computers." This simply isn't true. There is just one binary floating-point standard and SANE adheres to it scrupulously.

Hogan says "SANE doesn't always call the numeric coprocessor to do the work, even when the 68881 chip is present and could handle the task." This is an apparent reference to elementary functions. We stuck with the original SANE algorithms so that an application making SANE package calls would produce identical results on all Macs. The faster but less accurate 68881 functions are available to developers compiling directly to coprocessor instructions. Hogan says that the 68881 numerical coprocessor in the Mac II seems to give only a marginal (under 25 percent) improvement in system speed. His findings are neither in conflict with Apple's nor surprising. Tasks that spend only 50 percent of their time doing floating-point operations—not unreasonable for "typical" Mac applications—can be speeded up at most two times, while compute-intensive tasks will reflect whatever speedup is achieved for floating point.

Hogan and others would like us to pursue raw performance at all costs, but this trade-off has failed too often in the past to be reasonable on personal computers. We'd prefer not to subject our users and developers to the caprices of ad hoc arithmetics designed for each short-term circumstance.

Jerome Coonen, Jim Thomas
Apple Computer
Cupertino, California

Bad Timing

Due to disastrous timing, "The Big Match: Illustrator 88 vs. FreeHand" (February 1989) is essentially an irrelevant comparison. By comparing Illustrator 88 to FreeHand 1.0 rather than 2.0, *Macworld* has done a disservice to those interested in finding out which is the best package available today.

In addition, the article incorrectly states that Illustrator 88 has the ability to place TIFF images. In fact, it is possible to place TIFF images only if they are saved as EPS files. This is certainly different from placing them directly, and in any case, FreeHand 1.0 can do precisely the same thing.

The article goes on to say that "many people find Illustrator's single-pen tool easier to master and more intuitive to draw with than FreeHand's four basic drawing tools." FreeHand's combination tool does everything Illustrator's pen does

(continues)

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The G330-70 color thermal transfer printer produces a full-color 8½" x 11" page or transparency in about 80 seconds.

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Design. Surprisingly, with all its unparalleled power, MicroPhone II is simple to use. Menus, dialog boxes and on-screen controls are well organized and pleasant to look at. Its "outstanding" manual is easy to read, clearly laid out and contains a thorough index.

Speed. Routinely clocked at 18,000 bits per second over ordinary telephone lines, MicroPhone II is the fastest telecom software around. Its file transfer protocols — XMODEM, 1K XMODEM, YMODEM, YMODEM-G, Kermit and ZMODEM — are all optimized to make your files fly across the country or around the world. The intelligent ZMODEM negotiates the most treacherous channels of a packet-switched network and resumes broken transfers with no loss of data.

Color options. MicroPhone II lets you assign color icons to your scripts, thus turning the *icon bar,* shown here, into your control panel. The icon bar can be scrolled, resized and placed vertically or horizontally anywhere on the screen, awaiting your next click. Choose icons from the large collection provided with the software, or create your own.

Cruise control. Flexible scripting means that MicroPhone II can run on *automatic* while you're taking care of other important business. Whether collecting your electronic mail in the background, or calling Paris at midnight to transmit the daily sales report in French, the program is always at your service, saving you time and money.

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"... stunning. Fast, slick; it does everything except slice bread."

SOFTWARE VENTURES

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and then some. Illustrator's blend tool and pattern fills are mentioned, but FreeHand's graduated and radial fills are not. This is unfortunate because anyone who needs to do a simple graduated or radial fill will discover that it's vastly easier to do in FreeHand.

The section on color strongly recommends Illustrator 88. To get the correct colors in Illustrator 88, David Smith consulted his Pantone color-sample book, found matches for the original colors, and typed the numeric values into his document. For FreeHand, Simon Tuckett consulted his printer's color chart and keyed in the percentages of cyan, magenta, yellow, and black. To me there isn't a whole lot of difference between typing in Pantone numbers and typing in process colors. The article also fails to mention FreeHand's three color models (RGB, HLS, and CMY) versus Illustrator's one, or FreeHand's templates with colors predefined.

Finally, the article's most extraordinary oversight was in ignoring ease of use. Every prior review has immediately mentioned how much easier FreeHand is to use than Illustrator, and what an important advantage that is.

Pete Mason
Altsys Corporation
Plano, Texas

An Easy TKO for FreeHand

Having just read your comparison of Illustrator and FreeHand, I felt compelled to write. A reader with the funds to purchase only one of these programs would be far better off with FreeHand.

As a professional designer I rarely use Illustrator except for the stroking capability when working with letter-forms. Illustrator uses gobs of memory—even with 2.5MB, I constantly get "out of memory" and "unable to print" messages. I can't preview anything but a simple illustration in a second window.

Having to create gradations using the blend tool is ridiculous. Furthermore, Illustrator users had better make sure they've created a sufficient number of blend steps prior to sending their files to a typesetter or their output is going to have banding.

Autotrace? You have to spend so much time cleaning up the result that you might as well do it by hand; that is, if you even have enough memory to complete the trace in the first place.

I could go on about FreeHand's multiple layers, alignment functions, clipping paths, and text handling. And it does all this using far less memory. With FreeHand 2.0 this contest would have been a second-round knockout—I'll grant the superiority of Illustrator's freehand drawing tool. As it is, FreeHand 1.0 still beats Illustrator 88 in an easy TKO.

C. Thomas Tyler
Pacific Grove, California

More on Word

It might be worth warning any of your readers who are considering buying More II that it is not compatible with Microsoft Word because More II's dictionary has the same name as Word's.

James Long
Sunnyvale, California

According to Symantec product manager John Leddy, if you put the More II main dictionary in

(continues)

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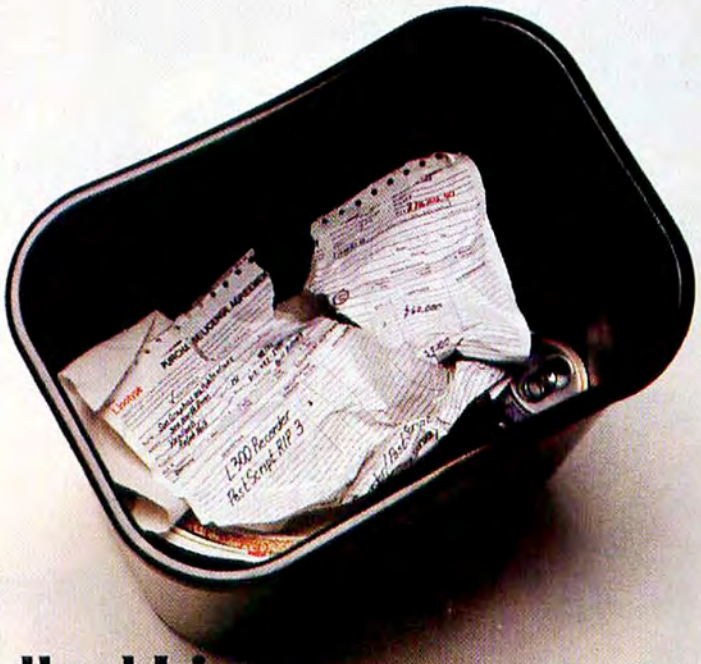

Why Ralph Volk cancelled Linotype for a Varityper® PostScript® Imagesetter

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"My advice to anyone looking for a high quality PostScript imagesetter: Do yourself a favor. Consider Varityper and make your own comparisons."

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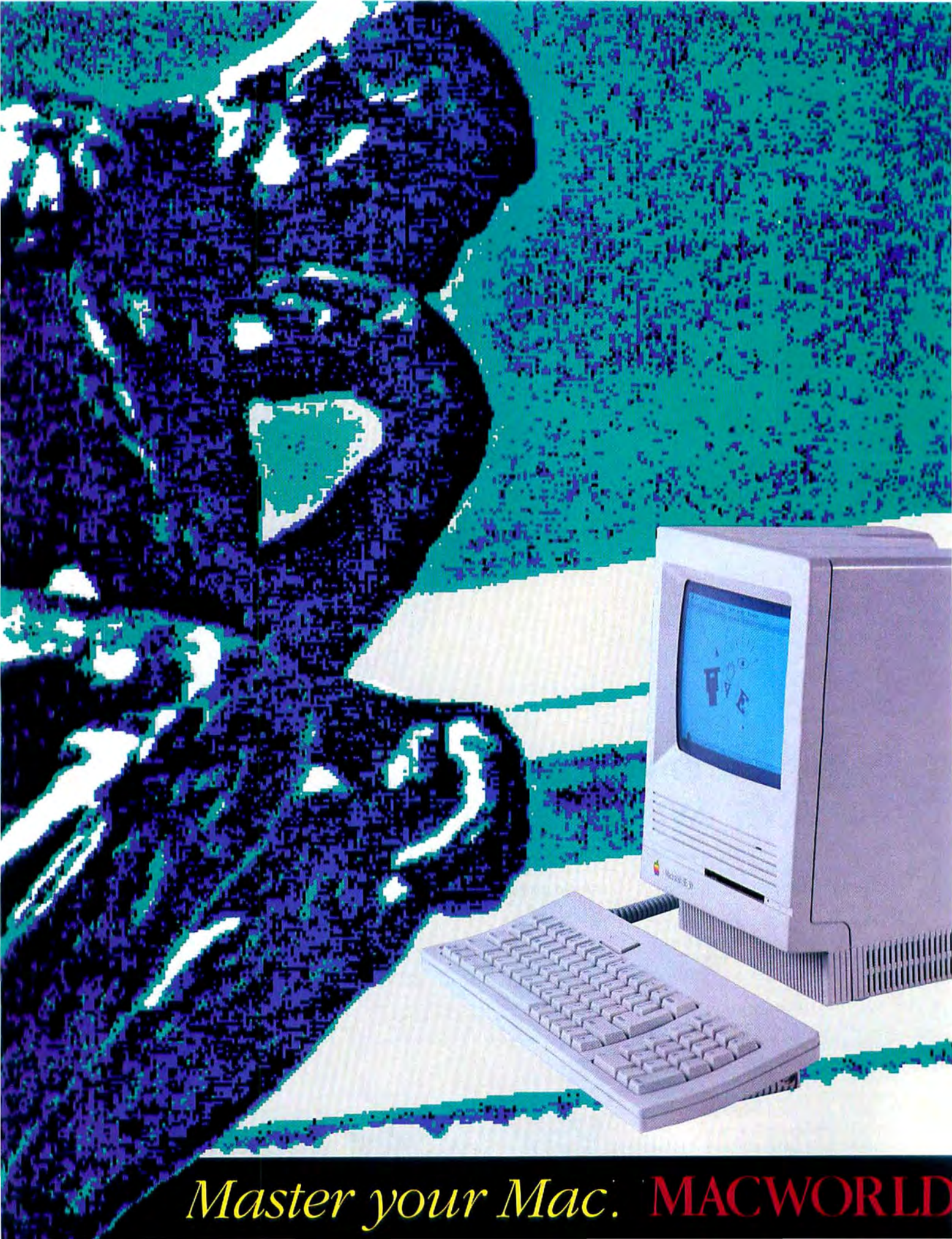
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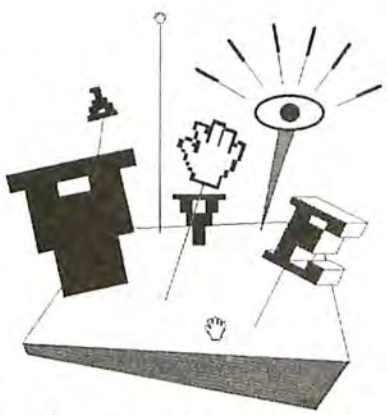

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Slides and Service Bureaus

Franklin Tessler's article, "Step-by-Step Slides," in the December 1988 issue, was concise, informative, and timely, but it failed to address a major source of confusion: the true cost of service bureau slides. Both firms mentioned in the article, Genigraphics and Autographix, charge customers (beyond the base cost of the slide) for the time they are connected to the service. Customers employing bitmaps in their files can easily add several dollars (tens of dollars, in some cases) to the cost of a slide from either service. Furthermore, it's extremely difficult to determine in advance what these costs will be. Caveat emptor.

Karl Lautman
Elmsford, New York

The High Cost of Computing in Japan

In Japan, a Mac Plus with 2.5MB costs about $3000. (In order to run KanjiTalk, the Japanese Mac operating system, 2.5MB and a hard disk are required.) An ImageWriter II costs about $692. A full 4MB of RAM will cost me $1230. The 20MB hard disk I plan to buy costs $754. For that price, I could get a 60MB hard disk in the United States.

Macs are expensive in the United States, but they're double the price here. I'm a Macintosh fan, but at these prices "the rest of us" must mean those with no children, no wife, no car, and no house—nothing except a computer and software. People in the United States should not complain. Or maybe they should complain louder to Apple—for its shoddy workmanship and high prices. Let's get some decent machines for a decent price.

Sidney K. Higa
Kumamoto, Japan

New, Improved Macworld

A few years ago, I received a phone call from your offices. The caller was conducting a survey, collecting opinions about what *Macworld* was doing right, what it was doing wrong, and how it might be improved. She must have called many others before she rang my line, and subscribers were likely letting her have it from both barrels. You deserved it.

In those days, *MacUser* was on the ascendancy. On the whole, *Macworld*'s content was thin and uninspiring. I could get through your magazine, cover to cover, in maybe 30 minutes, while *MacUser* kicked around the reading table for days. My, how things change! Now *Macworld* is doing substantial and outstanding work, with a level of maturity that *MacUser* seems to have rejected consciously (perhaps to distinguish its editorial tone from yours?). Cute and glib get old as a steady diet. In recent years, your columns have evolved into useful and interesting parts of the magazine, while *MacUser*'s columns are strangely devolving into whining and one-brave-man's-opinion pieces.

I can imagine the sustained commitment and work required to produce a fine magazine issue after issue. Congratulations on the status you have achieved. I look forward to the next issue.

Frederick A. Larson
College Station, Texas

(continues)

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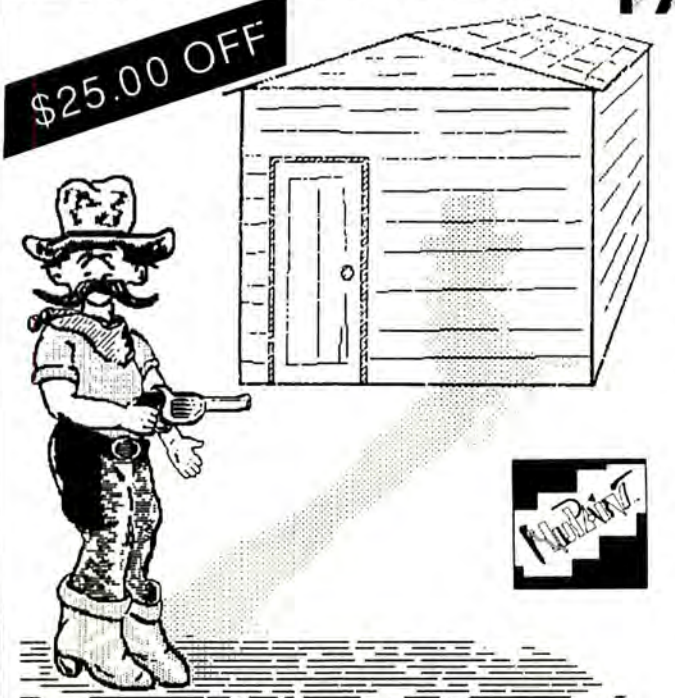

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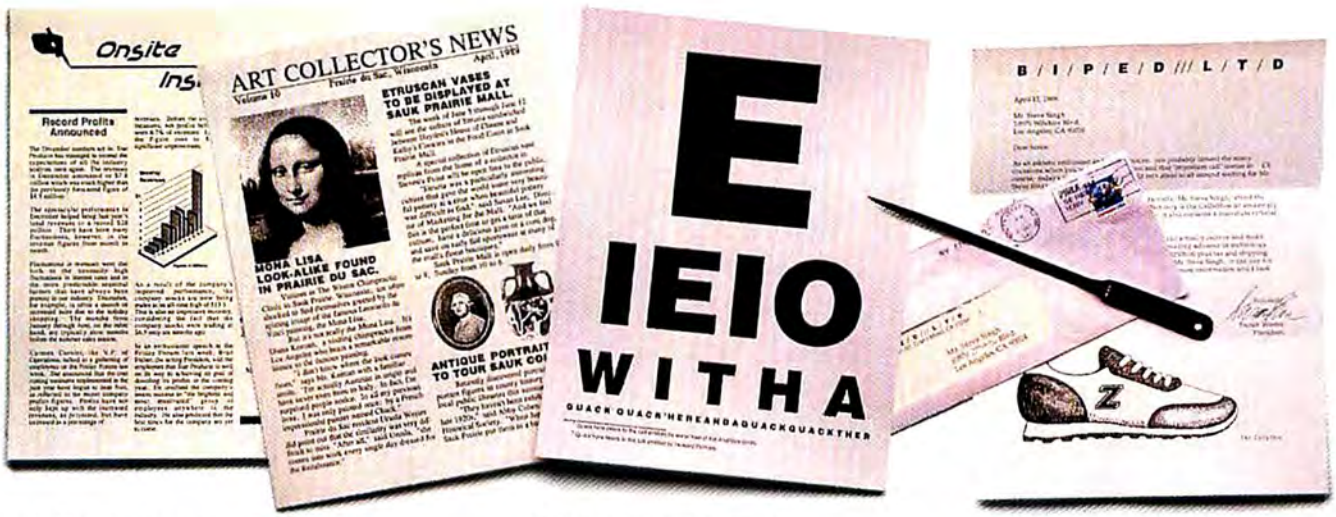

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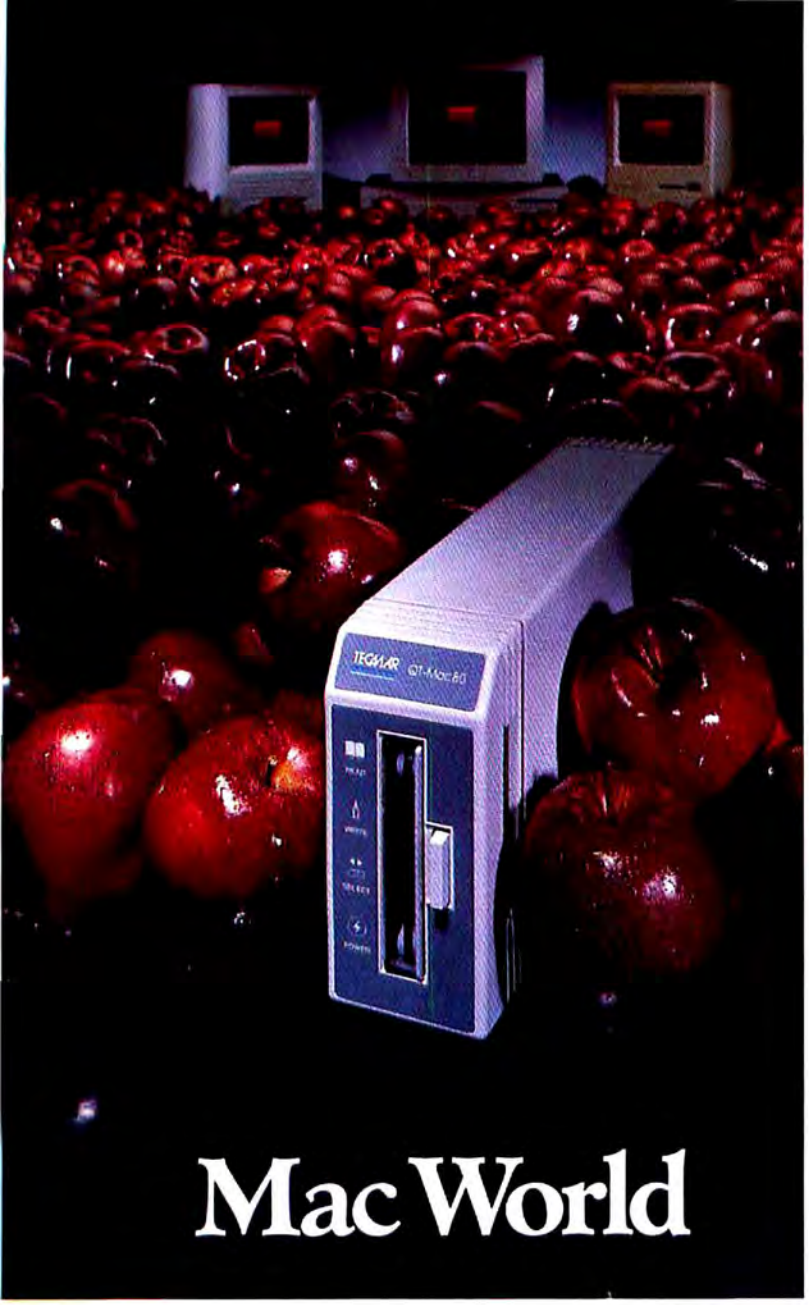

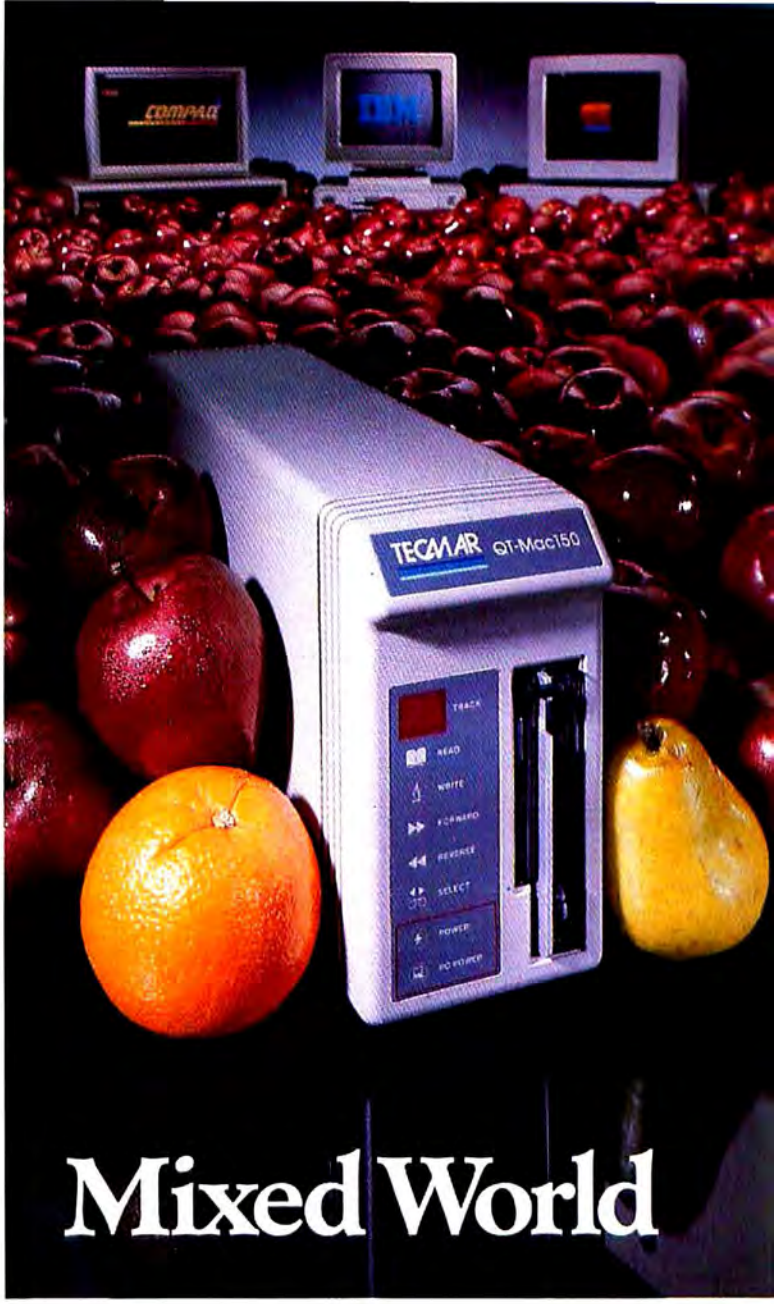

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False Advertising

Those interested in using a frame grabber to acquire images from a VCR in pause mode should be wary of advertising claims. A colleague and I each bought Data Translation's QuickCapture board for the Mac II after being assured that it had no difficulty doing this. We found out otherwise, and Data Translation's engineers have now admitted that it's a problem they are working on.

This misrepresentation is inexcusable, especially since the problem is not new. The same thing happened with PC Vision's frame grabber, and it took a year for its engineers to redesign the board so that it had that capability.

I have found that the problem with QuickCapture can often be solved by using an expensive time-base corrector or an editing processor such as the Panasonic MX 10. I have also had good luck with Sony's $350 digital video adapter, the XV-D300.

Geoffrey R. Coulter
Rochester, New York

Laser Printers Win Out

I noticed in February's *Macworld News* the results of a printer survey that I feel may need some qualification.

You claimed that 66.3 percent of those queried used ImageWriters most often at home and 26.6 percent used them most often at work, while the remainder used various types of laser printers most often. I'm sure these figures are accurate, but I found the captions assigned to them misleading. You state: "Of those who responded to our survey, 66.3 percent favored the ImageWriter I or II for home use, ... and 26.6 percent favored the ImageWriter I or II for use at work." Get real. Not many people would favor using an ImageWriter given the choice between a dot matrix and any brand of laser printer. Probably the ImageWriter is the only printer available to them.

Jan Kiefhaber
Cincinnati, Ohio

Statistics Update

Regarding your review of statistical analysis software (*Reviews,* February 1989): Mystat (the demo program included with Systat 3.2) handles up to 50 variables per analysis and as many cases as you can squeeze onto your disk; it now sells for $5.

Systat now offers Fastat, which lets users work without switching modules. It offers summary statistics, tables, regression, nonparametric tests, forecasting, plotting, MacDraw-like tools, and online help.

Lucy Saunders
Sytstat
Evanston, Illinois

News on LightningScan

The suggested retail price of LightningScan (*Macworld News,* March 1989) is now $549. Also, the scanner will capture a 4.1-inch rather than a 4.5-inch strip.

Ann D. Rascher
Thunderware
Orinda, California

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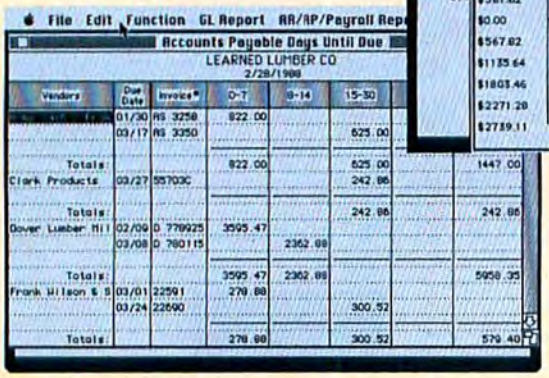

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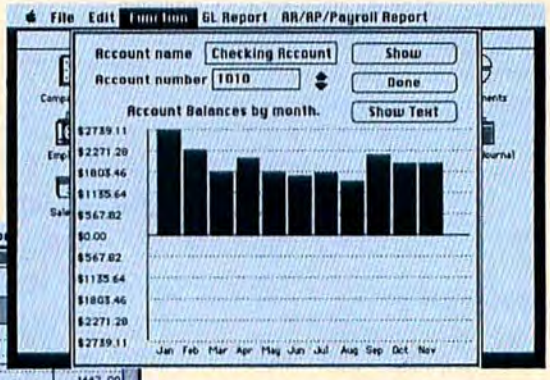

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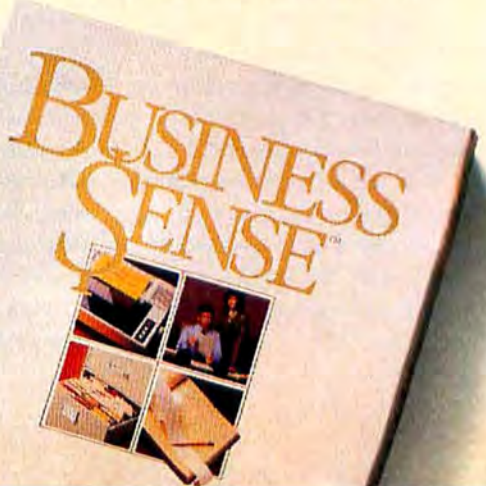

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ART BEAT

by Deborah Branscum

This column examines the tools and the talent behind Macworld's graphics and the techniques that make them possible.

Artist: Award-winning illustrator John Craig lives on a sheep farm in Wisconsin. In his studio in the upper half of a remodeled barn he concentrates on collage.

Tools: Mac II, ThunderScan scanner, and PixelPaint.

How It Was Done: "Sometimes I think doing collage is an excuse to collect," says Craig, who hoards engravings found in old books and catalogs. He needed an old-fashioned character to illustrate this month's *Iconoclast* column, which is based on an 1853 short story. As it turned out, there was a likely candidate on the illustrator's hard disk as a paint file, scanned in earlier with ThunderScan.

Craig wanted a swirling ring of letters, representing the confusing number of Macintosh models, to surround the character. He started by using PixelPaint to draw a circle from the center point, then filled the circle using the fill effect in the Sunburst mode. Once the circle was filled with repeating waves of color, he used the Trace Edges feature to create the effect of color rings. Craig experimented with several palettes.

The artist used a gray grid as a backdrop for tracing and designing the lettering. After coloring the letters, he copied them and used the shrinking effect to reduce some letters to a third of their original size. Then he used PixelPaint's Flop and Rotate commands to change the direction of selected letters. Once satisfied with the lettering, Craig imported the figure paint file into PixelPaint. He duplicated the man, used the Trace Edges command to outline the image, then colored the outline with a light tint by using the paint bucket. Craig placed the original over the copy with traced edges to make the man look cut out (a process he also followed for the lettering).

Once he had the figure and the lettering positioned correctly, Craig colorized the man using a custom palette. The artist uses Pantone colors for overlays in his more traditional illustrations, so he looks forward to the Pantone color matching system included in the latest version of PixelPaint. M

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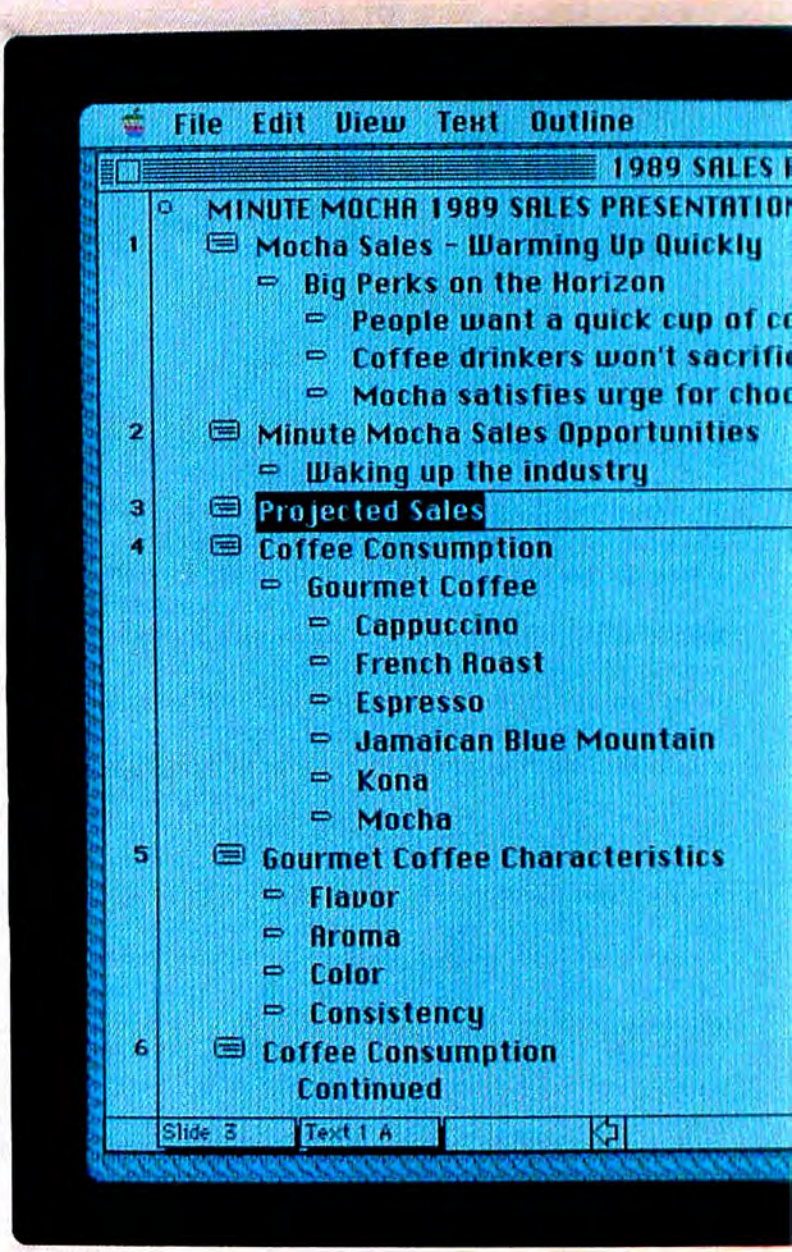

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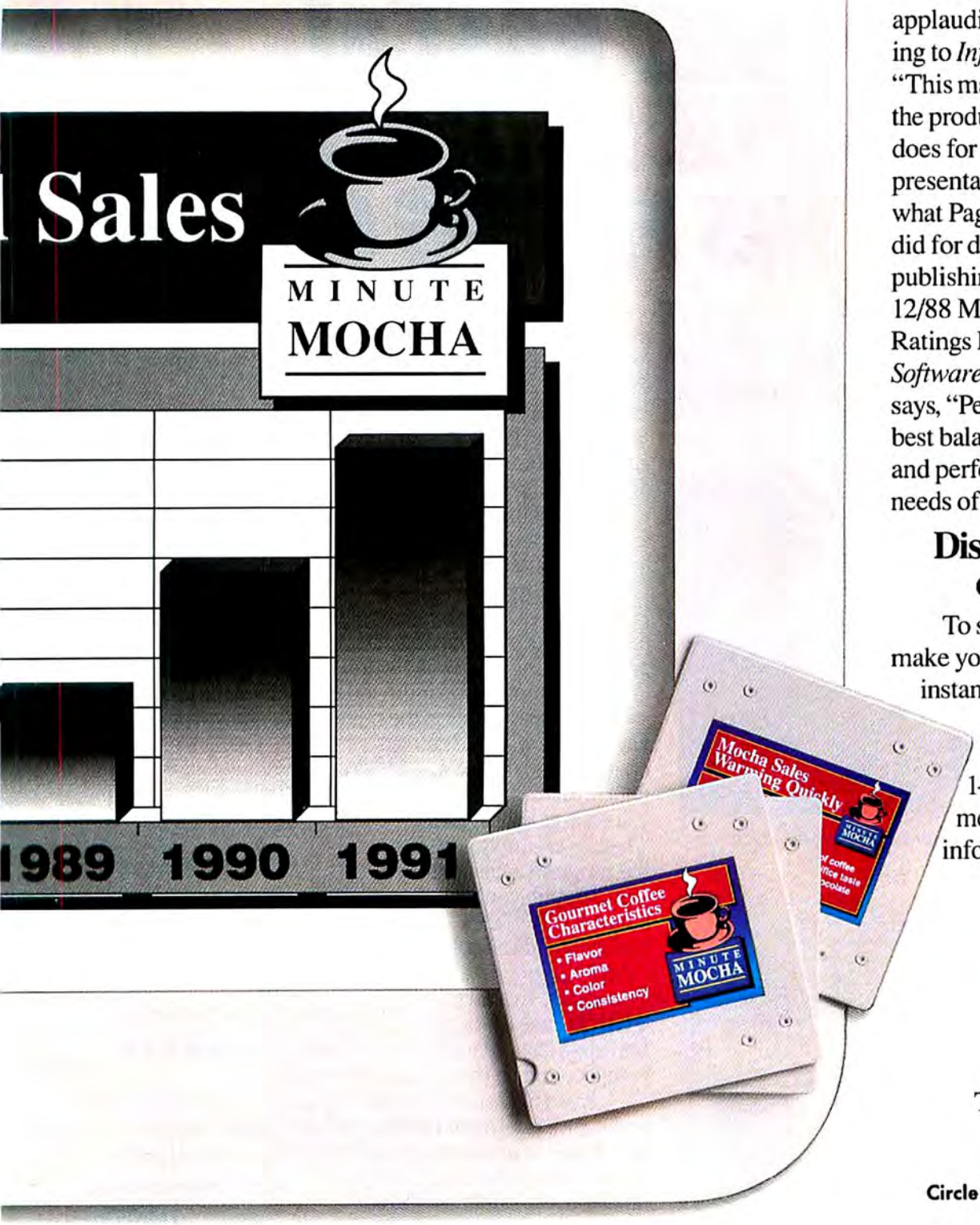

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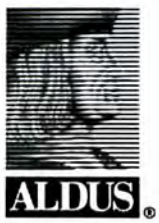

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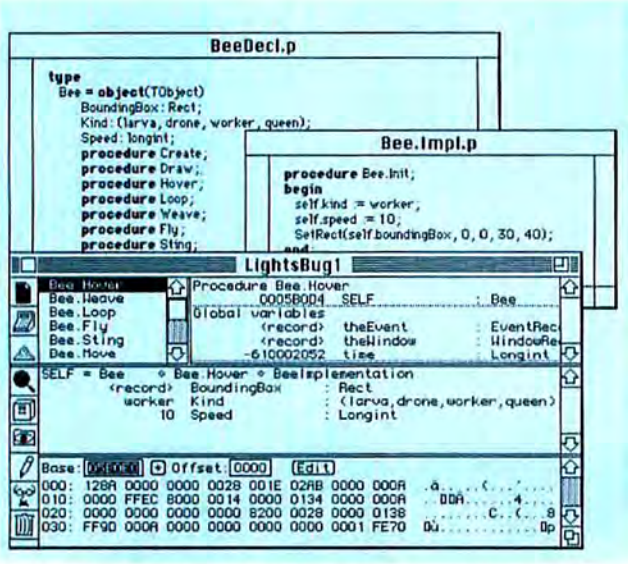

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Too Many Macintoshes

Is choosing a Mac an invitation to confusion?

by Steven Levy

I may not answer all my mail, but I do read it. Every so often, among the press releases, gripes from aggrieved subjects of former columns, and requests for names of technicians who still upgrade 128K Macintoshes, I receive something truly startling. Such was the case with a plain brown envelope that arrived at my electronic cottage. It just so happened that it came the day after the announcement of the Macintosh IIcx.

At this point I had lost count of how many different Macintoshes Apple had offered to the public. (I vowed one day to use Mathematica to help calculate the number.) Though, of course, I was thrilled at another major milestone in this "Year of the CPU," I admit that the introduction of yet another Mac spurred a dark thought to scamper across my mind: had we finally reached the point where we have too many Macintoshes?

So you could see why the following letter, extraordinary in its own right, demanded my attention. I immediately contacted its author and requested permission to print it in its entirety.

Dear Mr. Levy:

I am a consultant to potential buyers of computers. It is not an arduous task, and it is pleasantly remunerative. It does require extensive knowledge of those myriad varieties of microcomputer available to the general purchaser, and in that matter my labors have grown complex indeed. Yet by virtue of subscription to your magazine and frequent correspondence with those who make it their business to maintain familiarity with the various forms of computers, Macintoshes in particular, I have been able to justify my claim to competence.

The nature of my avocation frequently brings me into contact with what would seem a singular sort of human, seldom written about; men and women who, if I revealed their diverse histories, would evoke smiles from good-natured gentlemen and tears of pity from sentimental souls. Yet none struck me as deeply as a bedraggled fellow who lumbered into my suite on Wall Street on a blustery winter's day.

He announced himself as a scrivener requiring a computer for his copying work, as well as for drafting tasks, and possibly desktop publishing. His name, he announced in a mild, firm voice, was Bartleby.

ROMANCING THE SCRIVENER

"Well, Bartleby," I began, ushering him into my sanctum, "there are many computers from which to choose, and I shall explain them to you. May I assume that you are interested in a Macintosh?"

Bartleby said nothing, and I took his silence as assent.

"Well, then, I must inform you that your choice will not be as simple as it once was. You should know that the original designers of this marvelous machine intended that there be only one Macintosh. Those wishing to acquire it would need only to intone the single word. Everyone owning a Macintosh would own the same Macintosh, and there would be no question, when acquiring software or peripherals to attach to the device, whether or not these appurtenances would fit with this particular Macintosh. They would. Do you understand what I say to you?"

No answer. I continued.

"You should know that the original Macintosh, the 128K, and its successor, the professed Fat Mac, are no longer sold. Hapless owners of those machines are forced to upgrade, which costs them dearly, or stumble by. They cannot even hope to use the current system software. However, if you are extremely low of funds, these sometimes become available. Peruse the classified ads, brokerage services, or cybernetic flea markets."

(continues)

His silence signified that he was wisely refusing this option.

"So, we shall examine the new machines," I said. "There is the Mac Plus, which I consider a bargain at $1799. Marketeers often part with the computer for $1300 or a like price. It has 1 megabyte of memory. It has the hardy, yet increasingly overmatched, 68000 processor. It will run your standard software, but you may notice that some newer software, requiring a more estimable processor, runs slowly, almost to the point of distraction. And it has no slot. Many people require none but are extremely uncomfortable at the notion of having none. Moreover, Apple Computer seems eager to divest itself of this machine, as if the spectacle of customers spending under $2000 for one of its products is some sort of discredit to the company. Yet you might still consider it if your purse is thin."

Circle 109 on reader service card.

Bartleby shifted in his chair and said nothing.

SURVEYING THE SE

"Shrewd, Mr. Bartleby, very shrewd," I continued. "You prefer not to consider a computer whose doom is imminent. Then I should say that you would also be wise to avoid the standard models of the Macintosh II. I am referring to the Macintosh II in its many configurations; in short, any Mac II with the orphaned 68020 processor. These lack the estimable 'Superdrive,' which stores more scrivenings on a floppy disk and can read scrivenings from other systems as well. When introduced, the Mac II was proclaimed the inheritor of Apple's future, and indeed it had such potential; but Apple, in its haste to bury the market in editions of the Macintosh, soon deemed the superior 68030 processor as its standard, and those who purchased the Macintosh II have been, in effect, snookered."

Bartleby squirmed in his chair. Such was his discomfort that I wondered whether he or a relative had owned one of the godforsaken machines, and I had thus offended him.

"It is not so dire," I assured him. "Apple has announced an upgrade path for those poor souls. But the cost is unconscionably high."

That said, I proceeded to describe the standard Macintosh SE to poor Bartleby, whose visage was beginning to assume a severe melancholy. I informed him that among the virtues of the SE was its compact form, its single slot that accepts boards for communications and accelerators, and the fact that, unlike the Mac Plus, it can be upgraded to more powerful versions. It is available in various configurations—poor Bartleby, faced with yet another decision!—but most prefer it with a single floppy drive and a 20-megabyte hard disk. I suspected that this might be ideal for Bartleby and suggested as much.

But my proposition was met with only silence.

MORE AND MORE MACS

So I continued; there were yet *more* Macintoshes to ponder. Perhaps the scriv-

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ener might prefer the SE's more powerful cousin, the oafishly named SE/30. The SE/30 has the advantage of the powerful 68030 processor and the Superdrive. Its speed is quite pleasing. Yet its price is daunting. Depending on the memory, it could well cost $5000. No wonder Bartleby responded with a glazed look.

"Well, my good man, if you are immune to the charms of the SE/30, I am sure you will not approve of my next suggestion, the top-of-the-line Macintosh IIx. This resembles the Macintosh II, but includes the powerful processor and the Superdrive. But with the ducats it takes to purchase one, you may well be able to buy a Honda Accord. In other words, though its performance is no better than some other models, its cost is higher."

It was no surprise that Bartleby withheld comment.

"Well, Bartleby, I have only one more Macintosh to offer you, the newly unveiled Macintosh IIcx. Its name is unsightly, but I assure you that this is perhaps the neatest of all the Macintosh computers. It allows one a choice of monitor, and its three slots are quite sufficient for most uses. It is as powerful as any of the Macintoshes. It has the desirable Superdrive. Yet it requires little space on your desk. And as Apple's newest model, it has many wonderful little features, some of which will never be available at any price on the other kinds of Macintoshes. Its price is between the Macintosh SE/30's and the Mac IIx's—that is, it's overpriced. But its obsolescence will be slow in coming. It is the computer that I would prefer myself, if I but had the dollars."

THE FINE PRINT

I had hoped that this testimonial would bring Bartleby to a decision. But confronting him with the relative virtues and blemishes of each one of the six different kinds of Macintosh had only put him in a tizzy. And I had not even begun to explain some of the finer distinctions. How future versions of system software will give certain users powers forever denied to others. Or why certain programs promise that they run on some of the lower-cost Macintoshes, but do so at a speed so tardy one

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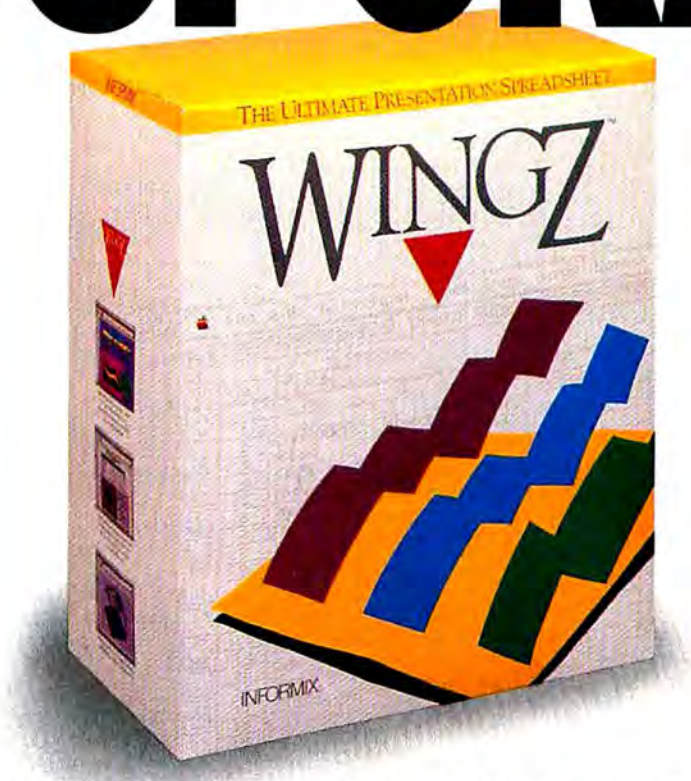

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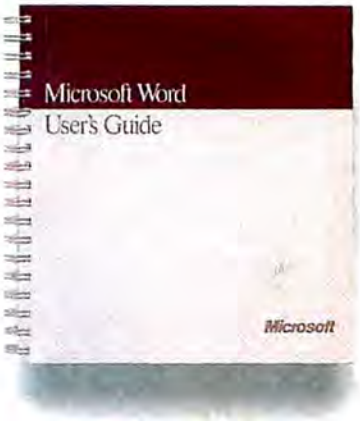

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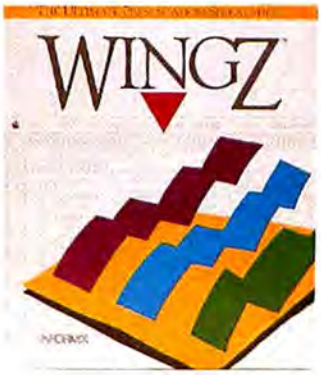

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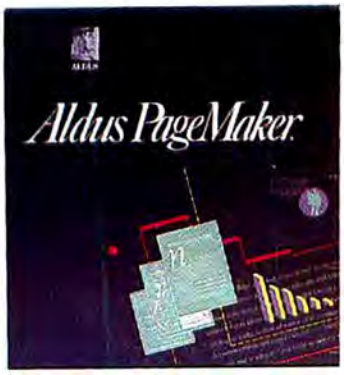

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Microsoft
Flight Simulator 1.02 ..... 32.

Miles Computing
Fool's Errand ..... 31.
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Mindscape
Aussie Joker Poker, Balance Of Power 1990, Colony, Crossword Magic, Deja Vu, Deja Vu II, Shadowgate, Trust & Betrayal, Uninvited ..... each 29.

PBI Software
NetTrek, Strategic Conquest + ... ea. 34.

PCAI
Lunar Rescue ..... 33.
Mac Racquetball ..... 36.
MacCourses ..... 28.
MacGolf ..... 34.
MacGolf Classic ..... 53.
Road Racer ..... 39.

Silicon Beach Software
Apache Strike, Beyond Dark Castle, Dark Castle ..... CALL

Sir Tech
Wizardry ..... 35.

Software Toolworks
Hunt For Red October ..... 28.

Sphere
Falcon 2.0 ..... 31.
Gato 1.4, Orbiter, PT-109 ..... ea. 26.
Solitaire Royale ..... 19.
Tetris (Color) ..... 24.
Tetris (Black & White) ..... 20.

Spinnaker
Sargon IV ..... 28.

Three Sixty
Warlock ..... 29.

Education

Bible Research Systems
The Word (KJV, NIV, NKJV, RSV) . 164.

Borland
Eureka: The Solver ..... 128.

Bright Star Technology
Alphabet Blocks (Req. 1mb) ..... 30.
Talking Tiles (Req. 1mb) ..... 63.

Broderbund
Calculus, Geometry, Physics ..... ea. 58.
Type! ..... 19.

Davidson & Associates
Math Blaster ..... 26.

Great Wave Software
Kidstime or Number Maze ..... ea. 26.

Learning Company
Reader Rabbit ..... 32.

Mindscape
S.A.T./ Perfect Score ..... 45.

Nordic
Alphabetizer, Bodyworks, Clockworks, Coinworks, Earthworks, Flashworks, Lemonade Stand, Naval Battle, Preschool Disk 1, Preschool Disk 2, Turbo Math Facts, Word Search . ea. 27.

Simon & Schuster
Typing Tutor IV ..... 34.

Spinnaker
Typing Made Easy ..... 25.

True Basic
Algebra, Arithmetic, Calculus, Discrete Mathematics, Pre-Calculus/ Trigonometry, Probability Theory, Truestat ..... each 33.

Music

Ars Nova
Practica Musica 2.07 ..... 74.

Bogas Productions
Studio Session ..... 48.
Super Studio Session ..... 74.
Brass, Country, Heavy Metal, Sound Effects, String Quartet ..... each 14.

Broderbund
Jam Session ..... 28.

Coda
Finale ..... 845.
MacDrums ..... 32.
Perceive ..... 52.

Electronic Arts
Deluxe Music Construction Set ..... 84.

Farallon
MacRecorder ..... 134.

Great Wave Software
ConcertWare Plus ..... 38.
ConcertWare Plus MIDI ..... 78.

Mark Of The Unicorn
Professional Composer ..... 395.
Professional Performer ..... 325.

Passport Designs
MasterTracks Pro 3.0 ..... 258.
Notewriter ..... 168.
Passport MIDI Interface ..... 97.
Passport MIDI Transport ..... 340.

Resonate
Listen 2.1 ..... 69.

Accessories

Addison Wesley - Inside Macintosh
Vol. 1, 2, 3, 4 (Soft Back) ..... 21.
Vol. 5 (Soft Back) ..... 23.
Inside Macintosh Cross Reference .. 15.

American Power Conversion
UPS 110SE - Uninterruptable Power Supply ..... 325.

Asher Engineering
Turbo Trackball (for any Mac) ..... 69.

Bantam Books
Illustrator 88: Official Des. Handbook ..... 19.
Mastering WingZ ..... 21.
Complete HyperCard Handbook ..... 22.

DataDesk
Mac 101 Keyboard (any Mac) ..... 144.

Datashield
MacDirector ..... 119.

Golden Ribbons
ImageWriter II Ribbon - Multi Colored ..... 8.
ImageWriter Ribbon - Black ..... 4.

Kalmar Designs - Disk File
Teakwood (Holds 45 Disks) ..... 14.
Teakwood (Holds 90 Disks) ..... 21.

Kensington Microware
System Saver Fan ..... 64.
Turbo Mouse (for any Mac) ..... 109.

Kraft
Quickstick (for any Mac) ..... 49.

Mac Packs - Gray, Navy or Wine
ImageWriter Bag ..... 45.
Mac Plus/SE Bag ..... 55.
Mac SE Bag XI (Extended Keyboard) ..... 69.

Mac Zone
7 Outlet Noise & Surge Protector .... 24.
800k Disk Drive (Platinum) ..... 155.
Mouse Pad - Black, Blue, Gray, Red ..... 6.
Mac Tool Kit w/Grounding Strap ..... 15.

MSC Technologies
A+ Mouse ..... 65.
A+ Mouse ADB ..... 85.

Orange Micro
Grappler C/Mac/GS ..... 78.
Grappler Mac LQ ..... 92.
Grappler Mac LS ..... 91.
Grappler Spooler ..... 39.

ScanCo
Mac Table W/Cabinet (w/ Shipping) ... 445.

Sony Disks
Double Sided - 10 Pack ..... 14.
Double Sided - Bulk (Min. 50) ... ea. 1.29
High Density - 10 Pack (1.44 Meg) ..... 36.
High Density - Bulk (Min. 50) ... ea. 3.35

Williams & Macias
Labels, 216 (ImageWriter) ..... 16.
Labels, 216 (LaserWriter) ..... 20.
myDiskLabeler (ImageWriter) ..... 30.
myDiskLabeler (LaserWriter) ..... 33.
Sticky Business ..... 95.

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Flipper 44 ..... 1075.

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Targus Bags
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Bootware Software
ResuméWriter gives the tools & experience to help create professional quality custom resumés in a variety of formats.
ResuméWriter ..... 60.

TOPS
If connectivity is the name of the game, these are the All-Stars. Networking software and hardware for Macintosh and IBM.
TOPS ..... See Listing

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Mac Golf Classic ..... 53.

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Will Maker Ver. 3.0 ..... 33.

Odesta
DataDesk Professional 2.0 ..... 288.
Double Helix Release 2 ..... 337.
GeoQuery 1.0 ..... 198.

Olduvai Software
MultiClip ..... CALL
Read-It! 2.0 ..... 249.
Read-It! Personal ..... 105.

Paragon Courseware
Nisus ..... 295.
QUED-M ..... 105.

Peripherals Computers & Supplies
KaleidaGraph V1.1 ..... 118.
Versa Term Pro 2.20 ..... 189.
Versa Term V3.20 ..... 64.

Preferred Publishers
DAtabase ..... 72.
Vantage ..... 55.

Quark
QuarkStyle ..... 175.
XPress 2.1 ..... 495.

Shana Enterprises
Fast Forms Construction Kit ..... 98.

Silicon Beach Software
Digital Darkroom ..... 249.
Super 3D ..... 195.
Super 3D (Enhanced) ..... 297.
Super Paint 2.0 ..... 128.

Smethersbarnes
Prototyper 2.0 ..... 145.

Software Ventures
Microphone 1.5 ..... 109.
Microphone II 3.0 ..... 221.

Solutions
backFax ..... 126.
SmartScrap & The Clipper 2.0 ..... 45.
Super Glue ..... 49.
The Curator ..... 74.

SuperMac Software
Disk Fit 1.5 ..... 53.
Network Disk Fit ..... 198.
PixelPaint 2.0 ..... 198.
Sentinel ..... 148.
SuperLaserSpool - Multi User (1-5) ..... 198.
SuperLaserSpool 2.0 - Single User ..... 78.
SuperSpool 5.0 ..... 53.

Survivor Software
MacMoney 3.02 ..... 60.

Symantec
Lightspeed C 3.01 ..... 148.
Lightspeed Pascal 2.0 ..... 92.
Just Enough Pascal ..... 48.
MacSQZ! 1.5 ..... 49.
More II ..... 249.
S.U.M. (Symantec Utilities • Macintosh) ..... 64.

Symmetry
Acta Advantage ..... 64.
HyperDA ..... 34.

T/Maker
EPS Illustrations ..... 74.
WriteNow 2.0 ..... 109.

TML Systems
TML Pascal II V3.0 ..... 58.
TML Pascal II V3.0 (w/MPW v3.0) ..... 114.
TML Source Code Library II V1.1 ..... 39.

TOPS
InBox Personal Connection ..... 73.
InBox V2.2 Starter Kit ..... 195.
TOPS (Dos Version) ..... 117.
TOPS (Mac Version) ..... 145.

Traveling Software
Lap-Link Mac 2.0 ..... 82.

True Basic
True Basic Version 2.0 ..... 57.
True Basic Graphic Toolkits
3-D, Business, Scientific ..... 47.

U.S. Micro Labs
FontSizer ..... 65.

WordPerfect Corp.
WordPerfect ..... 185.

Xerox
Acculext ..... 795.

Zedcor Inc.
DeskPaint/DeskDraw 2.0 ..... 65.
ZBasic 5.0 ..... 98.

Hardware

3M
40 Mb Dc-2000 Tape Cartridge ..... 23.

Best Data
Smart One 2400 Baud Modem 165

CMS
60 Mb Backup Tape (CT-600H) ..... 22.
TapeStack 60 (SCSI Tape Backup) ..... 725.
MacStack 30 (Ext. SCSI Hard Disk) ..... 605.
MacStack 43 (Ext. SCSI Hard Disk) ..... 779.
MacStack 60 (Ext. SCSI Hard Disk) ..... 799.
Platinum 170 (II & IIx Internal) ..... 1598.

Connor - Internal Hard Disk
Zone 100 (SE, II, IIx, & IIcx) ..... 995.

Daystar Digital
16MHz 030 Accelerator SE ..... 975.
25MHz 030 Accelerator SE ..... 1595.
33MHz 030 Accelerator SE ..... 2395.
Daystar 33/030 Accelerator II ..... 4680.
Lt 200 MC LocalTalk Board ..... 279.
Lt 200 PC LocalTalk Board ..... 179.
Novy Mac20MX - 68020 Accelerator
16MHz (Plus, 512kE & SE) ..... 699.
25MHz (Plus, 512kE & SE) ..... 1280.

Dolphin
Flipper 44 Mb Removable ..... 1075.

Dove
MacSnap Upgrade Kits
2SE (1Mb to 2Mb - Mac SE) ..... 375.
524 (512k to 1Mb) ..... 192.
524e (512kE to 1Mb) ..... 284.
524s (512kE to 1Mb W/SCSI) ..... 240.
548 (512k to 2Mb) ..... 432.
548e (512kE to 2Mb) ..... 419.
548s (512kE to 2Mb W/SCSI) ..... 479.
Plus 2 (1Mb to 2Mb - Mac Plus) ..... 299.
SCSI Port Adapter ..... 109.
Marathon Accelerators
MSE1 (Mac SE Accelerator) ..... 584.
MSE2 (...w/1 Mb) ..... 720.
MSE3 (...w/Math Co-Processor) ..... 774.
MSE4 (...w/Math Co-Proc. & 1 Mb) ..... 899.
Marathon 030 - Mac II Accelerator ..... 975.

Everex
EMAC-20D ..... 515.
EMAC-60/60DTL Deluxe ..... 1895.
EMAC-60T (Tape Backup) ..... 845.
EMAC-MD2400 Baud Modem ..... 225.

Fortis
Dm1310 Dot Matrix Printer ..... 295.
Dp600p PostScript Laser Printer ..... 3395.

Incomm
Midget Internal 2400 - Mac II ..... 199.
Turbo 2400 Baud Modem ..... 199.
Turbo 2400 EC Baud Modem ..... 274.
Turbo 4800 EC Baud Modem ..... 329.
Turbo 9600 V.32 Baud Modem ..... 635.

Irwin
Excelerator XI 25 MHz ..... 1280.

Macintosh
2 One Mb SIMMs (100 Ns) Surface Mount ..... CALL
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Magnavox
Color Monitor 14" Analog ..... 545.

MegaGraphics - MegaScreen
19" Black & White Display ..... 1098.
Mac 512/Plus Kit ..... 475.
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Mac II, IIx & IIcx Kit ..... 545.
19" Color Display ..... 3198.
8 Bit Col. Card (II,IIx & IIcx) ..... 1249.
8 Bit Col. Card (SE/30) ..... 1298.

Mobius
Fanny Mac (Platinum or Beige) ..... 59.

Motorola - Math Co-processors
68881 - 16MHz ..... 235.
68881 - 25MHz ..... 395.
68882 - 16MHz ..... 293.
68882 - 25MHz ..... 425.
68882 - 33MHz ..... 695.

Nuvotech
Turbo Bridge ..... 345.
Turbo Net ST ..... CALL
Turbo Net ..... CALL

Orchid Technology
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Osicom Technologies
MacBest 20EXT ..... 485.
MacBest 30EXT ..... 525.
MacBest 45EXT ..... 635.
MacBest 60EXT ..... 745.
MacBest 80EXT ..... 885.
MacBest 90EXT ..... 998.
MacBest 150 External ..... 1598.
MacBest 300 External ..... 2275.
MacBest 30ISE ..... 425.
MacBest 45ISE ..... 495.
MacBest 60 Internal Mac II ..... 595.
MacBest 80 Internal Mac II ..... 750.
MacBest 90 Internal Mac II ..... 895.
MacBest 150 Internal Mac II ..... 1398.
MacBest 300 Internal Mac II ..... 1975.

PLI (Peripheral Land, Inc.)
Infinity 10 Turbo Removable ..... 798.
Infinity 40 Turbo Removable ..... 1235.
TurboFloppy 1.4 ..... 339.

Quantum
Quantum 40 (SE II, IIx, & IIcx) ..... 439.
Quantum 80 (SE II, IIx, & IIcx) ..... 790.
Quantum 40 External ..... 745.
Quantum 80 External ..... 998.

Rasterops
Colorboard 108+ ..... 1249.
Colorboard 108+/SE30 ..... 1439.
Rasterops/Trinitron 19" Monitor ..... 3398.

Seagate - Internal Hard Disks
Zone 30 (SE, II, IIx, & IIcx) ..... 425.
Zone 45 (SE, II, IIx, & IIcx) ..... 475.
Zone 60 (II & IIx) ..... 550.
Zone 81 (II & IIx) ..... 790.

Sharp
JX 450 Color Scanner ..... 5995.

Shiva Corporation
Net Serial ..... 308.
NetBridge ..... 279.
NetModem V2400 ..... 459.

Summagraphics
Bit Pad Plus (12 X 12 Tablet - ADB) ..... 324.

Supra Corp.
Supra Modem 2400 Baud ..... 145.

Syquest
Infinity 44 Cartridges ..... 115.

Telebit
T-1000 9600 Bps Modem ..... 749.
T-2000 19,200 Bps Modem ..... 1399.
Trailblazer + 18,000 Bps Modem ..... 1228.

Thunderware
Lightning Scan ..... 405.
ThunderScan 5.0 ..... 188.

U.S. Robotics
2400 Baud Modem ..... 340.
9600 Hst Baud Modem ..... 625.

Xerox (Scanner)
Datacopy 730gs (Gray Scale) ..... 1595.

Entertainment

Access Software
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Accolade
4th & Inches, Hardball, Mean 18 ..... CALL

Broderbund
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Autoduel, Moebius, or Shufflepuck Cafe ..... each 23.
Sim City ..... 27.
Where In The World Is Carmen Sandiego? ..... 27.

Casady & Greene
Crystal Quest ..... 25.
Crystal Quest (w/Critter Editor) ..... 41.

Data East
Super HangOn ..... 26.

Discovery Software
Arkanoid 26

Electronic Arts
Chessmaster 2100 ..... 28.
Chuck Yeager's Advanced Flight Trainer ..... 31.
Patton Vs Rommel ..... 14.
Scrabble ..... 25.

Epyx
Sub Battle (also available for Mac II) ..... 29.

Infinity
Go or Grand Slam Tennis ..... ea. 26.

Mediagenic
Manhole ..... 30.
Might & Magic ..... 35.
Quarterstaff ..... 29.
Shanghai ..... 23.
Universal Military Simulator ..... 29.

Microprose
Pirates! ..... 32.

might as well not even bother.

Nor did I bedevil him with the situation regarding the add-on cards that enhance the various Macs. What good would it have done to inform him that a card that works on the SE will not work on the SE/30 nor on the various Mac IIs. In fact, no card that works on one will work on the others.

And I certainly did not confront him with the impending announcement of yet another family of Macintosh products, which purportedly will sit on one's lap, if one's lap is accustomed to luxury.

In short, if the designers of Macintosh ever hoped to simplify the task of computing by offering one sort of computer, their goal in that respect has been unmet. True, many of these difficulties have been confronted while wooing dame Progress. Yet difficulties they are, and the situation is lamentable.

Finally, in order to help Bartleby decide, I laid out a poster presented to me by Apple, a fine document that pictured the various Macintoshes and detailed the features of each. Bartleby gazed at one, then another, for what seemed an interminable interval. Then, finally, inexorably, he spoke.

"I prefer not to," he said, and left my domain immediately.

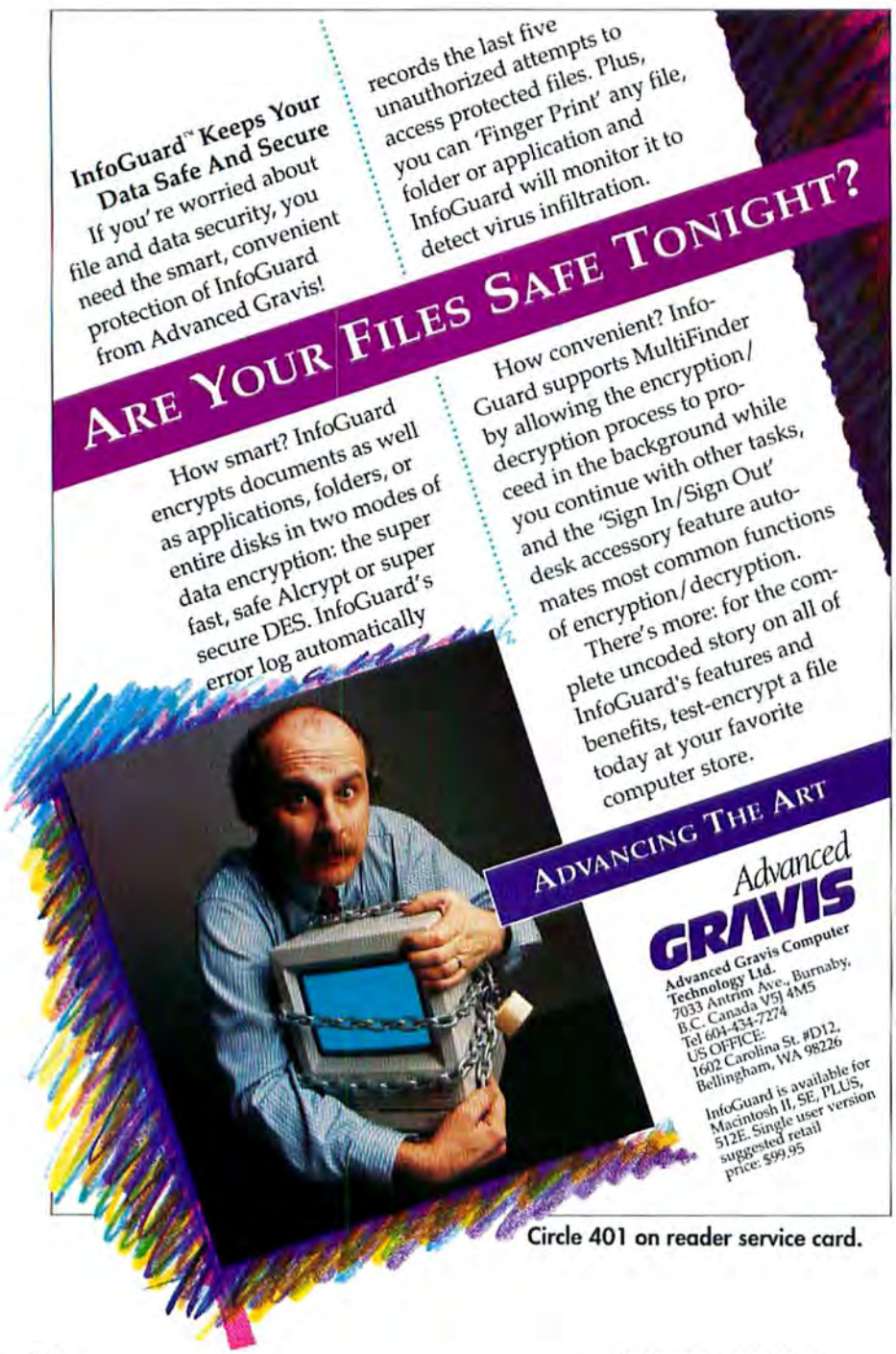
AH, BARTLEBY! AH, SCULLEY!

Of course, I was stunned, but not a little intrigued. Perhaps the sheer gravity of the decision was the reason for his refusal. Certainly any of the Macintoshes I described would have helped him in his work. So I vowed to make inquiries into the fate of poor Bartleby to see if he eventually solved his problem. Alas, I was unable to gain any verifiable information. The only rumor of any kind I heard was from the mouth of an unreliable sort who had purportedly spotted Bartleby shambling near the World Trade Center, an inexpensive Toshiba portable in his hand.

If this were true, I lament it. I truly believe the Macintosh to be the finest computer available. But I fail to understand the need for so many of them. Perhaps one day good Mr. Sculley will deign to make sense of the alarming proliferation of computers in his company so that this humble consultant will be better able to serve scriveners and any others who wander into his office.

That's the letter. The author told me to withhold his name and warned me that if I printed his missive, many of my readers would think I had totally lost my mind, especially if they weren't familiar with the famous Herman Melville short story entitled "Bartleby the Scrivener," written in 1853. But I disagreed, insisting that my readers were sufficiently literate to get the reference, and that if they somehow missed it, they would rush to the library to read the story. M

Steven Levy is a Macworld *columnist and the author of* The Unicorn's Secret: Murder in the Age of Aquarius *(Prentice-Hall, 1988).*



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Macintosh owners have a reputation for being fanatical about their Macs. And rightfully so, when you consider the elegance of the Macintosh user interface.

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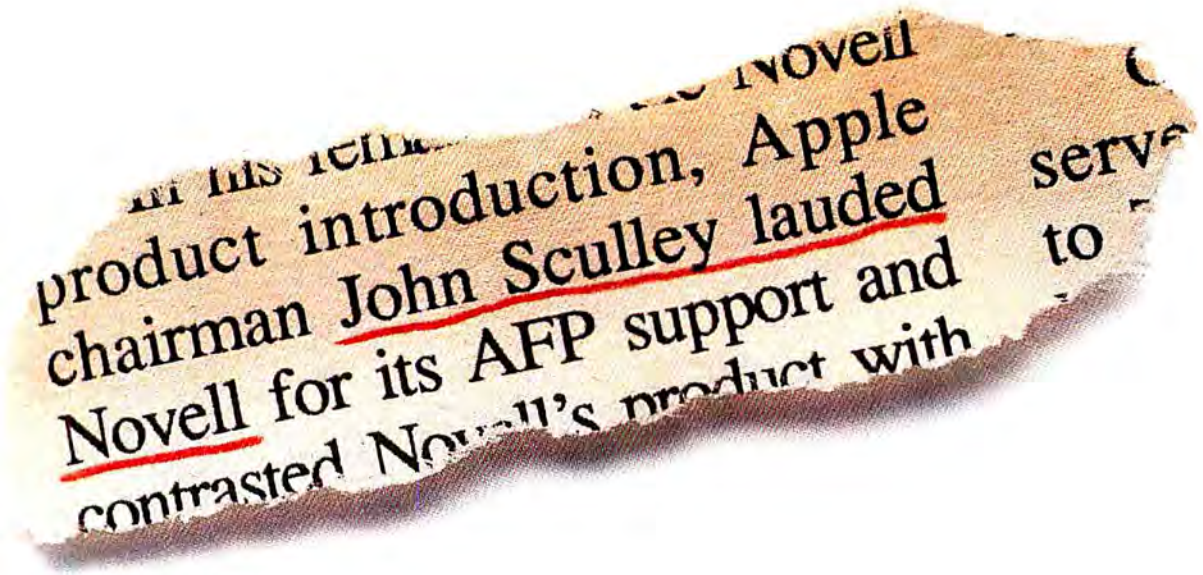

InfoWorld, June 20, 1988

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Protecting Your Investment

Advice and information for the Macintosh owner

by Deborah Branscum

Last weekend several Macintoshes were stolen from an architectural firm two floors up. It was a powerful reminder that ownership isn't necessarily forever. A dog may drool on your keyboard. A power surge may fry your electronics. Or a thief may break into your apartment. But such sob stories don't have to end in heartbreak. Smart souls protect their investments with insurance.

Most homeowner and renter policies include computer equipment coverage, but it's often inadequate. Allstate offers only $5000 basic coverage, for example. So carefully add up the value of all your hardware and software and make allowances for future purchases when deciding how much coverage you need.

One important question to always ask is whether the policy covers damage from power surges. Hartford says yes, State Farm says no. People who bring work home or who free-lance may run into a business-use clause. Farmers' basic policy doesn't allow you to use your computer for business. Allstate's, however, does. There are plenty of other issues to consider as well. What's the deductible? Does the policy cover full replacement cost or depreciated value? Is your equipment covered if you use it while away from home?

DAN ESCOBAR

If playing consumer detective doesn't sound appealing, you can always turn to a computer insurance specialist. Safeware (800/848-3469 or 614/262-0559 in Ohio) and Data Security Insurance (800/822-0901 or 303/442-0900 in Colorado) have policies that cover such real-life hazards as virus damage and animal mayhem. Dave Johnston, Safeware founder and CEO, offers the story of a couple who moved to Pasadena from the Midwest. They packed all their software into a box for the move, and once there the cat mistook it for a litter box. Safeware paid up.

Both companies offer comprehensive coverage. Safeware's basic policy doesn't cover normal wear and tear, nuclear radiation (perhaps understandably, though who would be left to pay up if they did?), or theft from an unattended vehicle, which is covered by Data Security. Data Security also covers the loss of custom programs and the loss of data, such as accounting files. However, insuring your machine through one of these companies is more expensive than adding to an existing policy. Beefing up Allstate's policy to $10,000 coverage will set you back an additional $10 a year; that same coverage will cost you $100 from Data Security and more from Safeware.

Half of Safeware's claims are for power surges. "That number is going up, even though people have surge protectors, because people are leaving their computers on all the time and using modems," Johnston says. "If you have a modem, that's another line that can take surges into the computer." Theft accounts for roughly a quarter of the claims.

Data Security's claims shake out a little differently. Most claims are for theft, with data loss running second because many people don't back up properly, according to Arrone Appel, an executive vice president with the company. Appel says Data Security gets very few claims for power surges. With the number of claims for viruses still few but increasing, virus protection may be withdrawn in the future.

As a good Californian, I hate insurance companies and can't vouch for any of them. But I was struck by the fact that Safeware doesn't require itemized serial numbers for equipment it insures. Johnston, a former computer professional, doesn't seem to think they're necessary because "computer owners are pretty good folks—much brighter and more detail oriented than other people."

(continues)

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SERVICE HEROES

Frank Kofsky of Benicia, California, has kind words about Working Software. When he reported problems with Lookup, a spelling checker, the company called Kofsky to discuss the problems (a first for him) and then sent two floppies. "One contained a new copy of Lookup; the second contained a copy of Working Software's Expanded Dictionary—a reward (I was told) for locating a defect in the former application." Kofsky was stunned. "Working Software is evidently so eager to improve its merchandise that instead of greeting customer complaints with defensiveness, it presents them with a bonus when they find a shortcoming in a program."

George S. Lewbel of Santa Cruz, California, was impressed by the support he received from Ehman Engineering, which makes both Ehman and Cutting Edge drives. Lewbel was having problems with several programs, so he called the company late one afternoon to find out if his hard drive might be defective. Senior production technician Johan Mekel "patiently walked me through several diagnostic and initialization procedures and then asked me to hold the receiver up to the drive while I turned it off and on. He determined that the drive was on the edge of mechanical failure." After Lewbel explained he was working against a deadline, Mekel said he would assemble a replacement drive because none were on hand. "Sure enough, I had the new drive in my hands the next morning at 10 a.m., reloaded it from my DiskFit backup floppies, and was back in business by noon. No one could possibly ask for better service."

Consider a security system if you live in a dorm or keep dubious company. Several companies make them for less than $50, including Secure-It (800/451-7592) and Mac Products (714/595-4838). They sell kits with hardware, cabling, and a lock for securing your computer and peripherals to a desk or table. Doss Industries (415/861-2223) and FMJ Security Systems (800/322-3365) offer sturdier (and more expensive) metal pad systems. FMJ's limited three-year warranty covers your equipment for up to $5000 per machine if the equipment is stolen "due to a compromise" in the security system.

(Thanks to Wendy Monroe for her research assistance.)

CALL TO ACTION

Recently we asked selected readers what they thought about Apple's 90-day product warranty (see *Macworld News*, in this issue). More than 90 percent of the respondents said Apple should extend its warranty. But Apple's not impressed with the survey. Mike Torgersen, manager of customer service, says Apple's warranty meets customer needs. Here's why. First, "Apple is committed to building quality products." Second, Apple argues that a longer warranty would force consumers to use authorized dealers for service when they might want to go elsewhere. "Some customers rely on resellers, some do their own service, and some prefer to work with third parties," says Torgersen.

AppleSpeak may be one reason why 1989 is like *1984*. A one-year warranty does not suggest shoddy goods but quite the opposite. And a note to the confused: yes, this is the same company that tells us to call our dealer whenever we have a problem.

Macintosh buyers outside the United States get a full year of protection, and U.S. consumers deserve no less. In a recent interview in *The Exchange*, the APX newsletter, John Sculley defends this double standard. Apple products are sold at higher prices in Europe, he says, and "we build in a lot of things for free for the users that you don't get from other computer vendors." Sculley adds that "we think our products are designed from the beginning to have very high reliability [and] there is not enough broad demand for us to raise the prices of our products for

(continues)

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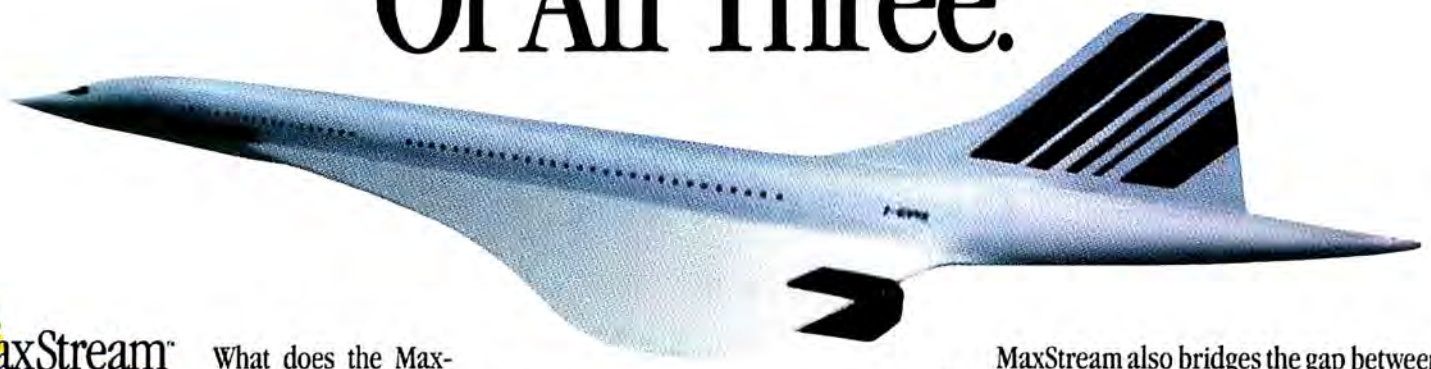

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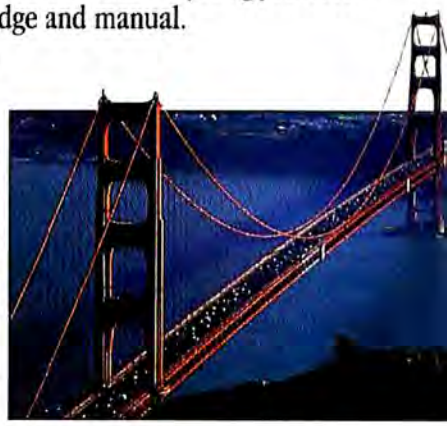
And of course, MaxStream works with every popular network. It's the one drive you can trust for backing up all the valuable data on a server.

LAN administrators will also appreciate MaxStream's software. It lets you back up an entire network at pre-programmed times, instead of having to rely on users to back up their data individually.

Even if you're not on a network you'll like our full array of backup and restore features as well as scripting, which allows for automatic, unattended backups. You can run an entire backup at night, or while you're at lunch.

MaxStream also bridges the gap between Macs and IBM PCs® by letting you use the same DC600 cartridge with both systems. With Archive's Universal Tape Format,™ a tape from one of Archive's tape subsystems can be read and used by the other and vice versa.

MaxStream works with the Mac Plus, SE, II and IIx®. It plugs into the standard SCSI port, and comes with everything you need – cables, software, DC600 cartridge and manual.



Just as important, when you go with MaxStream, you're getting backup and support from the company that pioneered streaming tape technology back in 1980. Today, there are over one-million Archive tape drives in use throughout the world.

If you're looking for backup that combines speed, capacity and connectivity, it's time to look into MaxStream. For complete information call **1-800-237-4929.** Or write Archive Corporation, Data Storage Division, 1650 Sunflower Ave., Costa Mesa, California 92626.

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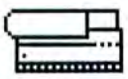

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everybody in order to reach those people who would like to have an extended warranty."

In fact, a one-year warranty is not an extended warranty—it's the industry standard. Apple now offers a truncated warranty, a puny version of the norm. It's overdue for Apple to demonstrate that the quality of its products can live up to a one-year warranty, but users shouldn't have to pay extra to get a standard policy. If you agree, fill out the form above and send it to me. I'll deliver the coupons to Sculley and ask for his response. This issue of *Macworld* should be in your hands the first week of June, so please mail in your coupon no later than June 23. E-mail junkies can, of course, send in their votes electronically. Please include your name, address, and telephone number—no anonymous votes will be accepted.

COMPLAINT CORNER

Recently *Macworld* heard from Greg ArBuckle of Cedar Rapids, Iowa, about problems he was having with Jasmine.

"November 9, 1988. I ordered my Jasmine DirectDrive 70. The salesperson on the phone said they were in stock and gave me an order number. I was told I would receive the drive in about three

(continues)

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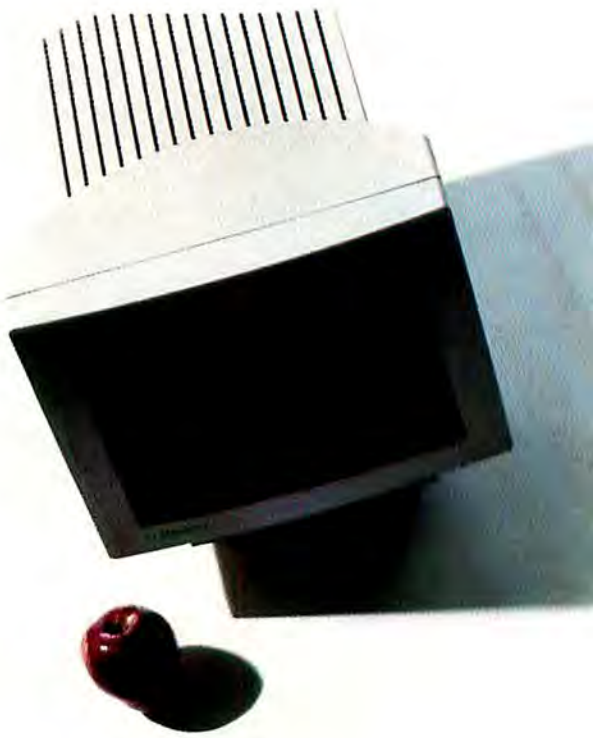

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working days. . . . December 5: I finally got my DirectDrive 70. It worked great for 12 days and then stopped mounting correctly at boot-up. . . . December 19: Called Customer Support to exercise my 30-day love-it-or-leave-it option. . . . January 18, 1989: Called Customer Support to find out why I hadn't received my refund."

ArBuckle's letter was forwarded to Jasmine, which promptly sent a letter of apology, a refund for the drive, and reimbursement for shipping and telephone costs.

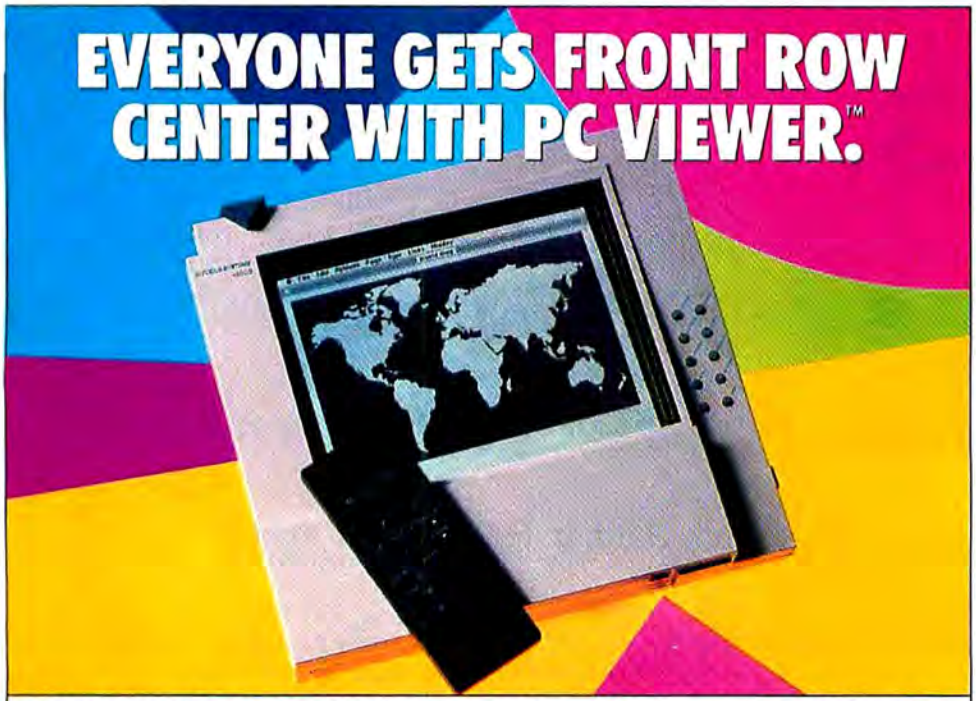
Scott Steward, customer service supervisor, says that Jasmine usually ships its products on time but sometimes experiences delays because of parts shortages. "This was the case with DirectDrive 70s in November," he wrote in a letter to ArBuckle. "This delay was sudden and the salesperson assumed we would continue to be in stock. Normally this would be a safe assumption, but unfortunately in this case it was not. Jasmine should have informed you of the delay."

Jasmine's Scott Gaidano told me that 25 percent of Jasmine's staff (not including secretaries) is devoted to tech support and customer service. There may be some dissatisfied customers, he says, but the vast majority are very well taken care of. Jasmine's repeat business shows that "unhappy customers are the exception, not the norm."

DEVELOPERS HEAD DOWNTOWN

Seattle's Macintosh Downtown Business Users Group is hosting its annual Local Developer Night on July 12. All Macintosh developers in the Northwest are invited to this informal event, where they will have the opportunity to exhibit and demonstrate their wares. Just pop by the Seattle Center at 6:30 p.m. to attend; there is no admission charge. (Call 206/624-9329 for more info.)

I love happy endings. Send your nominees for sainthood to Service Heroes, Macworld, 501 Second St., San Francisco, CA 94107 or via AppleLink (Macworld1) or MacNet (Branscum). Conversely, drop me a line if a company is ignoring you. I will help solve your problem, if I can. If your user group is sponsoring an event, please get in touch. Attention Mac-only dealers: I'm compiling a list, so let me know that you're out there.



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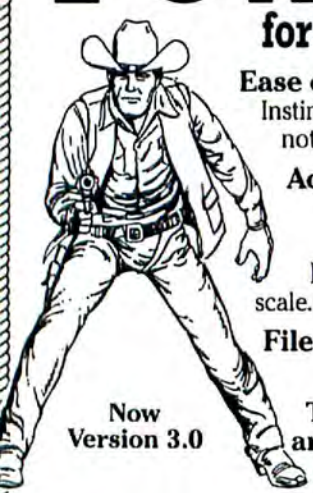

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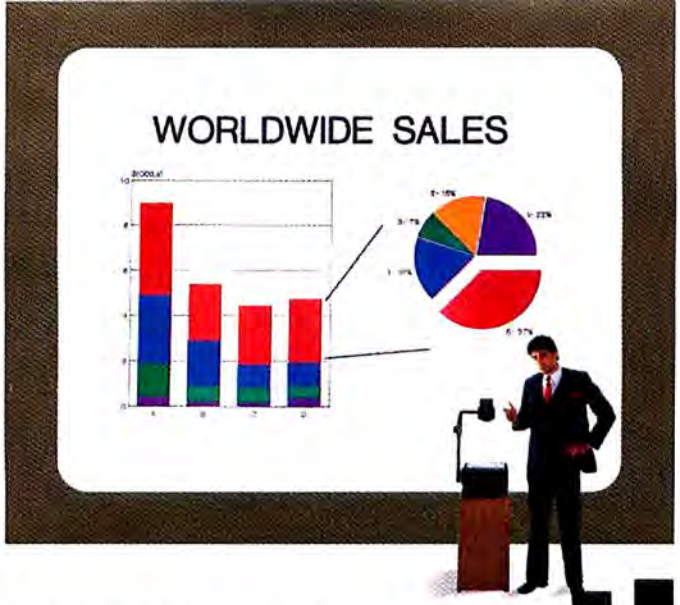

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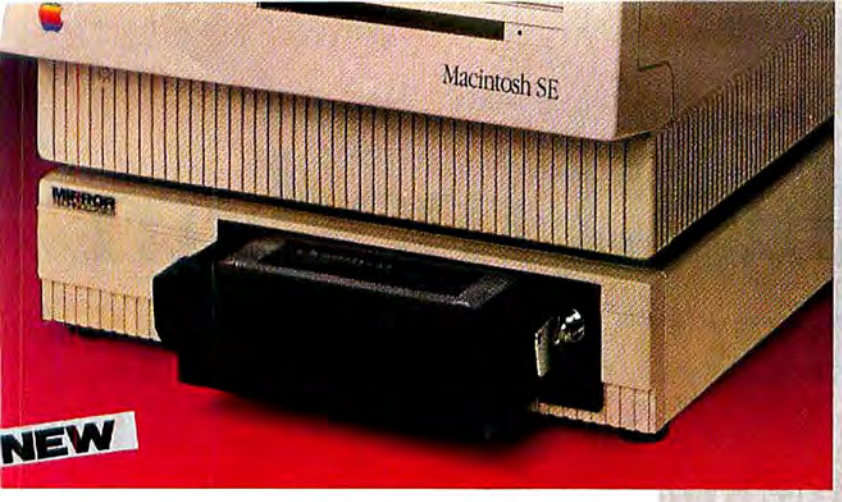

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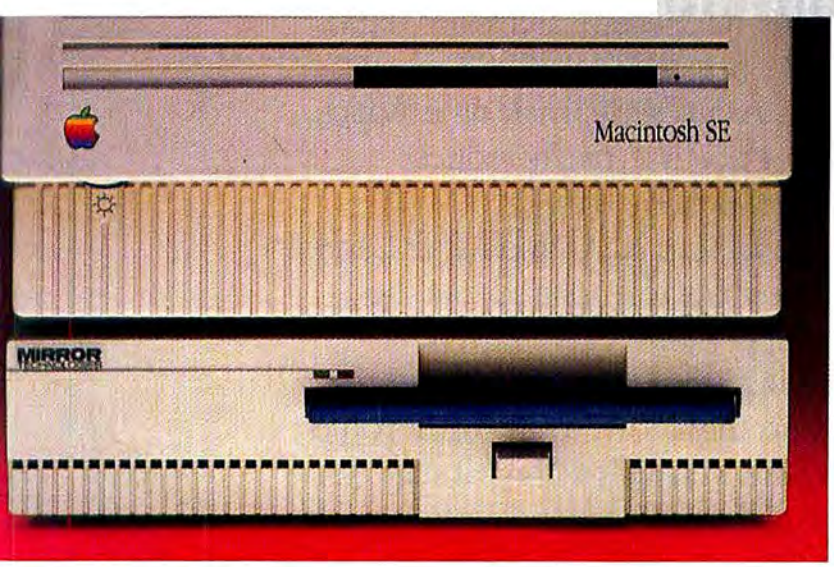

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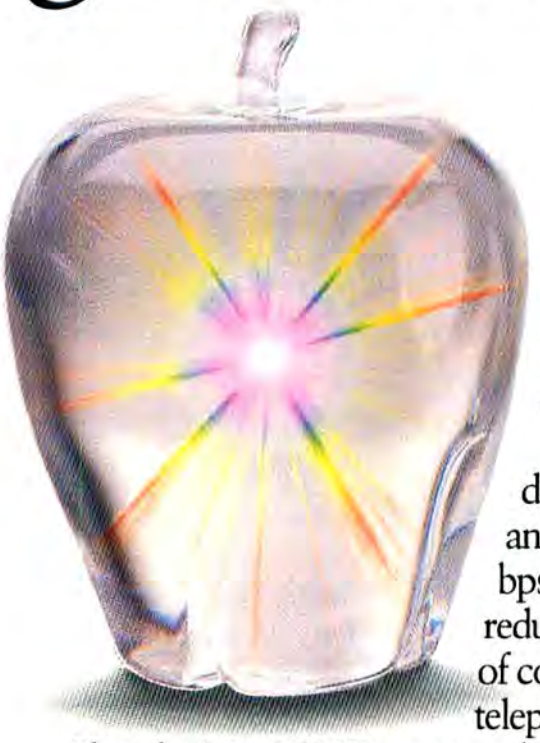

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Circle 469 on reader service card

Keep Your Mac Healthy

Bad habits erode the life of your machine

by Thom Hogan

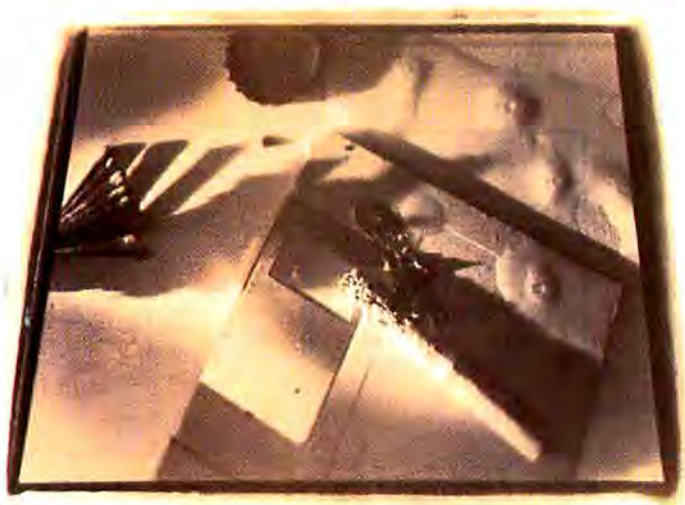
The Macintosh, despite proclamations to the contrary, is not an appliance. You don't just plug it in and use it as you do a toaster. You need to take care of your machine, do a little preventive maintenance, and know what to do when it starts to break.

You might drool appropriately as I describe faster-than-the-speed-of-light disk drives, but it doesn't make any sense for me to write about the latest state-of-the-art, technowonder hardware if you aren't prepared to deal with what you've already got. Therefore, dear readers, today's topic is maintenance.

SMOKE GETS IN YOUR DRIVES

Let's get the nontechnical issue out of the way first: just what kind of environment have you put your Macintosh into? There are any number of environmental factors the Mac is eventually going to complain about, but the big ones are smoke, dust, temperature extremes, humidity extremes, power problems, and bad habits. The more sophisticated your equipment, the more likely it will fall prey to one of these factors.

Certain peripherals, such as removable hard disks, are especially vulnerable. Smoke and dust tend to settle over a hard



JEFFERY NEWBURY

disk's surface evenly and build up in layers, not rocky mounds. The real danger is that those layers build up over time. Eventually, the layers get so thick that the distance between the heads and the magnetic signal is no longer within the range the electronics can resolve. (Signal

intensity relates inversely with the square of the distance, so even a small increase in head-to-media distance can lead to a large decrease in signal strength.) The disk will become first unreliable, then unusable over time.

Environmental problems are likely to show up as disk errors. On floppy and removable media, you might get the "This disk is unreadable" message. Or maybe you'll start getting the "Sorry, a system error occurred" message (ID numbers 36, 52, 57, or between 59 and 80 almost certainly indicate a disk media problem).

If you let your disks get to this stage you have only one course of action: back up everything you still can and use a disk-recovery product like Symantec Utilities for Macintosh or 1stAid Software's 1stAid Kit to attempt to resurrect the bad file or sector. Failing that, try reformatting the disk. (You can't recover data if you reformat the disk. There's a good chance you can recover data if you don't.) If you've really abused your disk, even this last step won't solve your problem, and your only choice is to buy another disk and take better care of it. And one other thing: *never* automatically click on the Reformat button unless you're absolutely sure that the disk you inserted is blank or you're willing to lose the data it contains.

To keep the damage to a minimum:

1. Make sure all your floppy (and removable) disks are stored in a dry, cool place that is not open to the air. Dry and cool is better than hot and moist because the media will retain its natural barriers against absorbing and collecting particles. Removable hard disks, like those used by drives from Mass Micro and PLI, should *always* be in airtight containers when not in use. The corollary: don't leave disks lying about.

2. Leave hard disks on as much as possible. A spinning platter (especially one spinning at 600 revolutions per second) is not a likely place for dust or smoke particles to land. The spinning creates an

(continues)

air wave that repels falling particles.

3. If your drive has a filter over its fan (the better ones do), clean it periodically. If the filter gets clogged or overloaded with dust, it will stop working or, worse still, simply discharge dust into the drive.

4. I don't recommend vacuuming or dusting your equipment yourself (except for the keyboard), since it's easy to get careless and cause other damage while zealously cleaning. If you think your machine needs a good cleaning (you can see a layer of dust on the internal components, for example), take it to a reputable dealer or repair shop. While the machine is in the shop being cleaned, ask the dealer to run the Apple diagnostics overnight—you'd be surprised how often this will spot a problem about to happen. Expect to pay $50 to $100 for a routine cleaning and checkup.

5. For heaven's sake, back up your disks regularly! Even with proper maintenance, hard disks don't last forever. (I know, I've had three die of natural causes during the past eight years.)

BE KIND TO ELECTRONICS

You can divide the Mac's hardware devices into two basic types: electronic (or passive) and mechanical (or active). The system board, for example, is electronic. The ImageWriter II printer has some electronics but is highly mechanical. The rule of thumb here is that electronic components, if treated correctly, can be ignored virtually forever. Mechanical things eventually wear out or need adjustment.

First, let's make sure you know the things to avoid if you want to ignore the electronics: (1) keep them out of the heat (don't disconnect your fan); (2) keep them away from liquids, especially liquids that conduct electricity (which include water, coffee, sodas, and so forth); and (3) give them good, stable power (buy a surge protector at the least, a power-line conditioner if you live in a known problem area, like Indianapolis, and a static guard if static electricity is a common event, as it is in Las Vegas, Nevada, in the winter). If you follow these simple rules, it's likely the electronic portion of your computer will last many years longer than you will.

Hot, humid climates are often a problem for electronic devices. None of the Macintosh equipment is rated to be operated at more than 90°F. Moreover, hot, humid climes tend to be the site of afternoon thundershowers. The heat is bad for the electronics, the combination of heat and humidity makes disks vulnerable to damage, and the thunderstorms often send harmful voltage spikes down electrical lines.

I thought I was being careful when I unplugged all my computer equipment from the wall sockets during electrical storms until one day a lightning bolt hit the cable TV hookup, sizzled its way down the cable into the house, jumped from the TV cable to a printer cable, and fried my computer. To add insult to injury, I was sitting next to the computer at the time, so I got to see the lightning bolt, hear the thunderclap, and a fraction of a second

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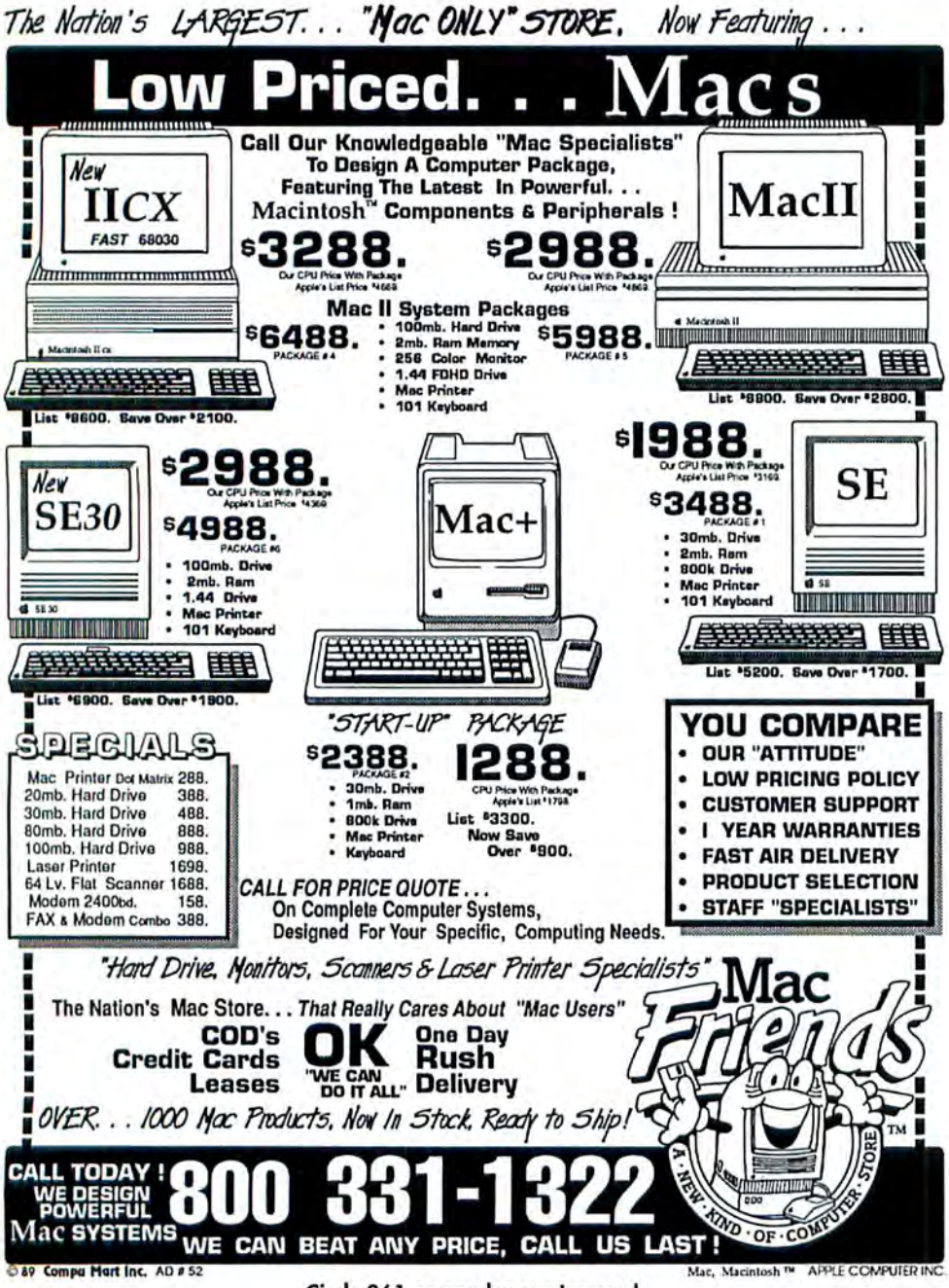

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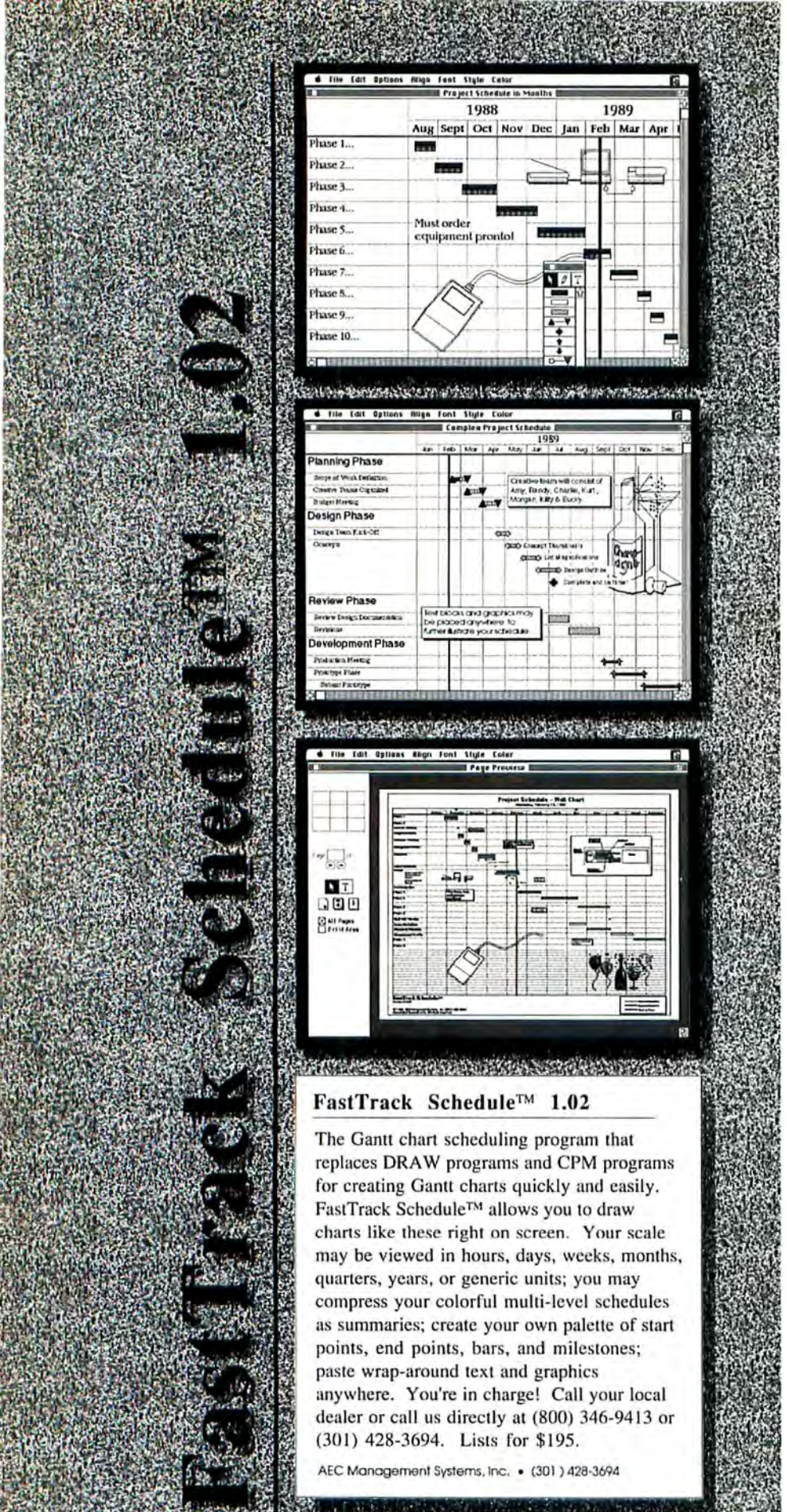
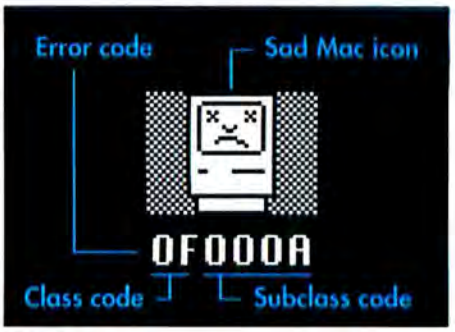


Circle 181 on reader service card.

later watch the smoke waft out of my machine.

So how do you know you've had an electronic component failure? Short of smoke billowing out of the casing, normally you'll get a Sad Mac Icon on start-up (see "Bad News"). The first two digits



Bad News
A Sad Mac Icon on start-up means problems. A class code of 0F indicates a software-related error. Perhaps the ROM chips are no longer valid or some add-in equipment is installed incorrectly.

underneath the icon are the class code, while the last four digits are the subclass code. The most likely class codes you'll encounter are 02, 03, 04, and 05, all of which indicate a RAM problem. For these class codes, the subclass code indicates a particular memory location, but that's not really important to know, since there's no way to replace individual memory chips in the Macintosh. If you get any of these class codes, your best bet is to open up the Mac, remove the SIMMs from their sockets, rub the connection area on the SIMM with a pencil eraser, then reseat the SIMMs in the sockets. If this doesn't correct the problem, try substituting known good SIMMs one at a time to isolate the bad SIMM.

A class code of 01 indicates that the ROM test done at system power-up failed. Turn off the machine and take it to your nearest Apple repair center.

A class code of 0F indicates a software-related error. Perhaps the ROM chips are no longer valid or some add-in equipment (like large-screen displays or accelerators) has been installed incorrectly. Again, there's not much you can do except take the machine down to the shop.

Recently, a number of users have asked me about system lockups. You'll be

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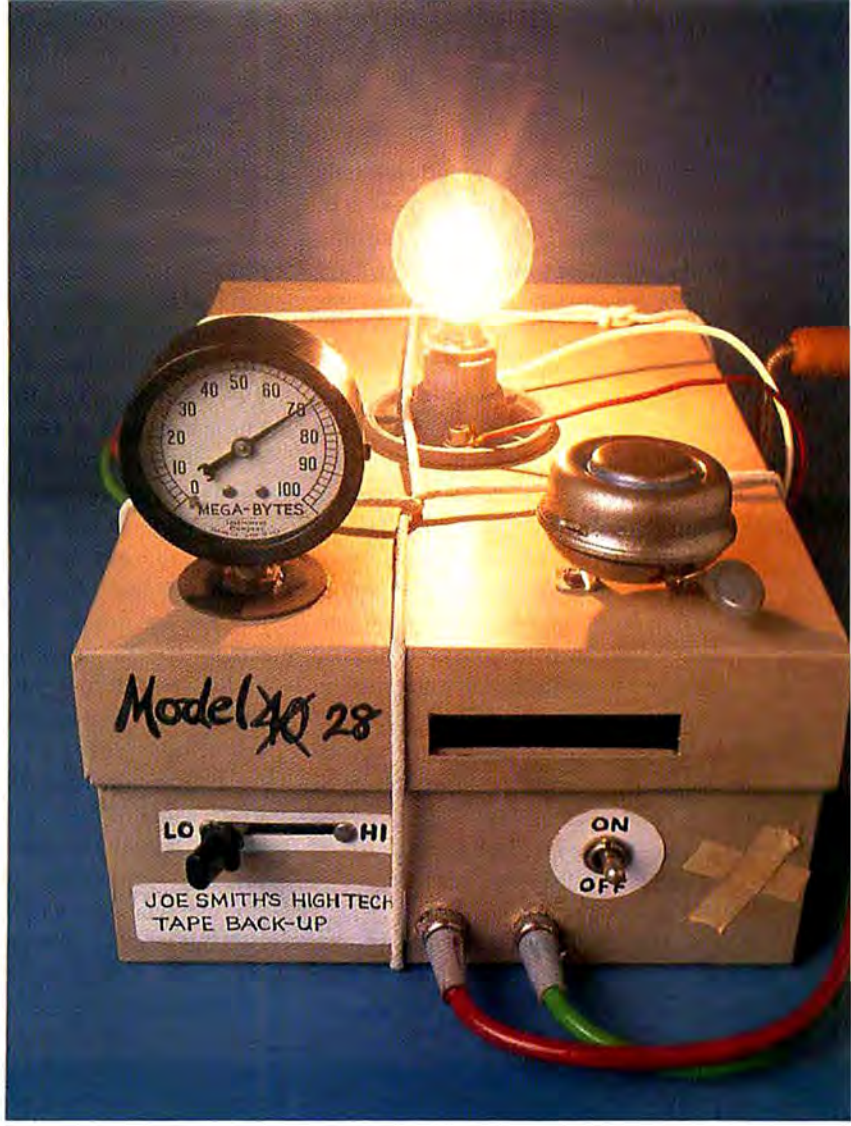
When it's time to buy a tape backup system for your Mac, you'll have a choice from roughly 15 different products, gadgets, novelties and doodads.

Or, one sure thing.



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working, with no problems, and suddenly the mouse and keyboard go dead—that is, the machine stops responding. Pushing the Reset button or turning the power off and back on usually, but not always, seems to fix the problem. I say seems because in almost every case I've heard of, one of two things really went wrong: (1) someone unplugged or turned off a SCSI device while it was still connected to the machine, which temporarily caused a termination problem the Mac didn't know how to handle; or (2) the system board was about to die, usually because someone had been plugging in ADB peripherals (keyboard and mouse) while the machine was on (a big no-no and an almost-guaranteed electronics killer at some point in your future). The first problem is easily corrected: leave all SCSI devices connected and on while the Mac is running. The second problem is going to require a new system board.

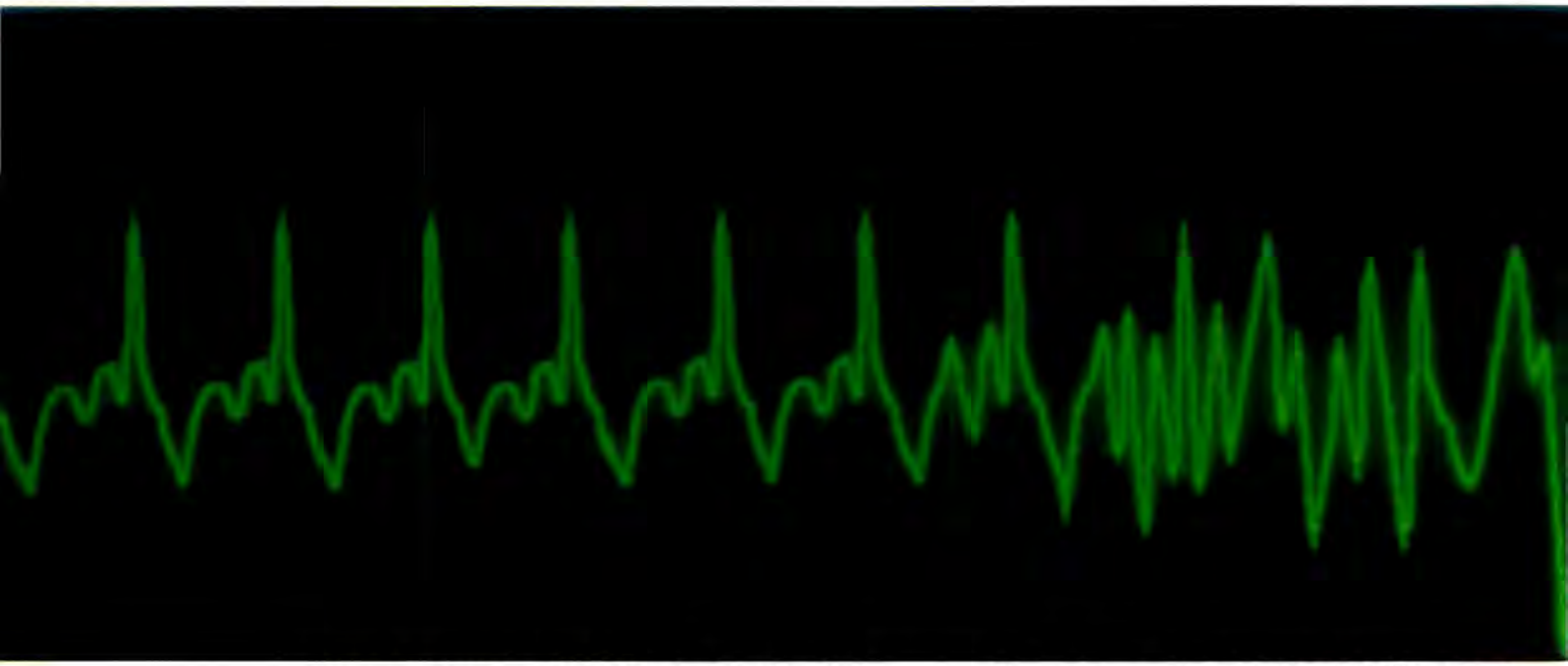
SERVICING THE MECHANICS

Now for the mechanical stuff: have your printer serviced regularly by an authorized repair center. Printers of all sorts ought to get a thorough cleaning and checkout once a year, more if you are running paper through them constantly. After 20,000 copies, two pinch rollers had to be replaced on my laser printer, and the whole thing needed a realignment. Expect the cost to be in the $100 to $200 range for this servicing, but also expect the printer to work like new after the servicing has been completed. I stopped counting pages many years ago when I found that I was printing an average of several hundred pages a week. I figure I'm a pretty tough test site for printer longevity—and not a single one of my printers ever died a sudden death on me, either. Properly maintained, a good printer will last you ten or more years.

It's just possible that you might be able to do some of the printer servicing yourself, although I caution against it if you have no experience in this area. Apple doesn't sell service manuals for its printers, but you can get the HP LaserJet service manual from virtually any authorized Hewlett-Packard dealer. The LaserJet's internal mechanism is the same as the Apple LaserWriter SC, IINT, and IINTX printers—only the electronics and plastic case are really different. The LaserJet service manual will help you clean and adjust the paper path of your LaserWriter and align the laser and print drums, if that should become necessary.

Unfortunately, no such manuals are currently available for the ImageWriters. The good news is that these printers are relatively simple to take apart and adjust. The only tricky part is the print head, which is a pain in the butt to adjust properly. If you find that one line of dots in your characters is missing or slightly out of position, you'll have to completely replace the print head. If characters are darker on the top than they are on the bottom, or vice versa, you'll need to adjust the print head. I've managed to perform both operations on my old ImageWriter I with good success.

Disk drives are also mechanical devices, but there isn't a lot that can be done with them that won't cause you more problems than you already have. For



example, let's say that your floppy drive has slowly gone out of alignment. It still reads and writes your disks okay, but it seems to have problems with disks from other machines (the classic symptom). Well, if you have the drive realigned by a dealer, the disks you wrote when it was out of alignment will now be unreadable.

If you suspect you have this problem, the only rational solution is to borrow a good external drive, connect it to your computer, copy all your floppies to the external drive, then bring your drive to a dealer for realignment. Failure to follow this whole procedure may result in a lot of lost work. I know one fellow who proudly backed up his 90MB drive to floppies (as I recall, about 100 of them), took his machine in to be serviced, got it back, and found that his reformatted hard disk couldn't read a single one of the backup floppies. Fortunately, his dealer was able to unalign the drive to restore the data and then realign it immediately afterward. My friend paid an extra $150, he lost a lot of time, but he was also extraordinarily lucky—usually it's not possible to unalign a drive correctly to recover data.

Attempting to realign your own floppy drives without the proper diagnostic tools is ill-advised. It can be done, but it's more likely that you'll botch the job. A few tools exist to realign IBM PC disk drives, but to date I haven't found any that are available directly for Macintosh users.

One thing you should do is periodically run recovery procedures to block out bad sectors on hard disks. The software that comes with 1st Aid Kit always blocks out bad sectors. By blocks out I mean it makes these sectors of the disk unavailable to the system, which basically skips over them as if they weren't there. The important thing to understand is that all hard disks eventually develop a few bad sectors. If you've been backing up regularly, encountering a bad sector won't have much effect on you. Use 1st Aid Kit to diagnose and recover the sector, if possible. Then restore the affected file (or files) from your backup.

I actually go further than this. About once every two or three months I do a full backup, then I perform a new low-level format of the drive. Afterward, I restore my files back to the disk. Not only does this get rid of any file fragmentation, but the formatting software that came with my drive has an option that lets me test for bad or nearly bad sectors overnight. This is sort of like what your dentist preaches: regular preventive maintenance keeps your equipment healthy.

Okay, those are the ground rules. There's enough extra material left over to fill a book on computer maintenance, but you've got the basics. Protect your valuable data. Avoid extremes. Have mechanical devices serviced regularly. The truth of the matter is, if you take even modest care of your equipment, in all likelihood you'll be replacing it with new goodies long before the old stuff dies. M

Thom Hogan is president of Macreations, a Macintosh software developer, and publisher of the Macintosh II Report. *His reference book,* Programmer's Macintosh Sourcebook, *was recently published by Microsoft Press.*

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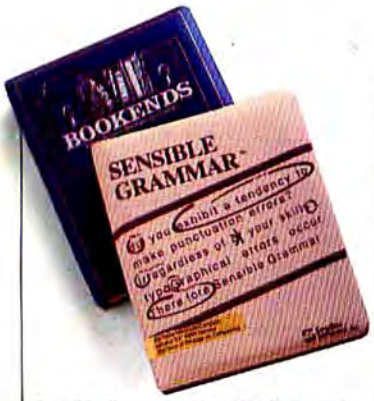

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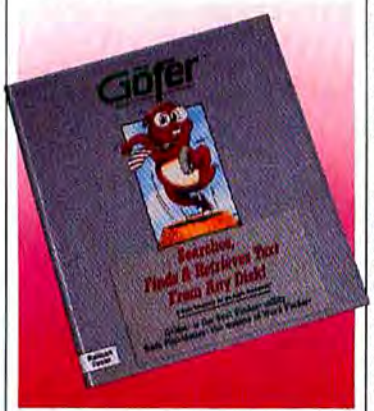

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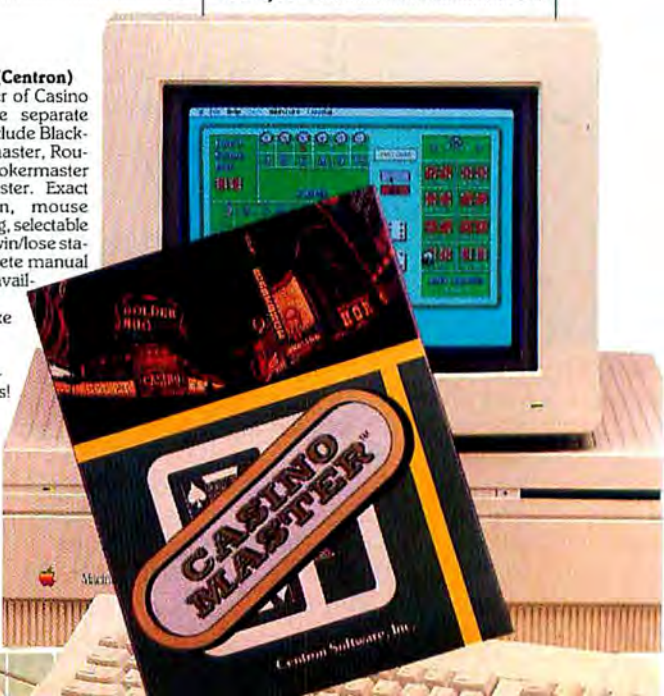

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Deskpaint 2.0 ..... 69.

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U.S. MicroLabs, Inc.
FontSizer ..... 79.

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MenuFonts 2.02 ..... 29.
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LetraStudio ..... 289.
LetraFonts *(various)* ..... ea 69.
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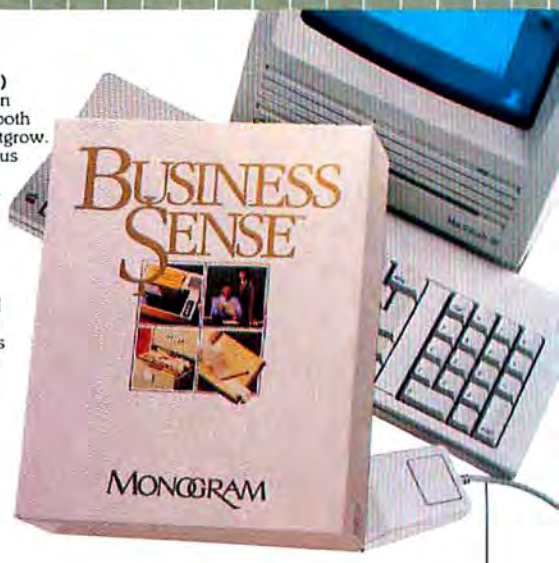

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Alphabits ..... 69.

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Dac-Easy Light ..... 42.
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Monogram
Business Sense ..... 279.
Survivor
MacMoney 3.02 ..... 61.

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Abacus Concepts
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StatView SE+Graphics ..... 229.
BrainPower
StatView 512+ *(requires 512k)* ..... 152.
D2 Software
MacSpin 2.0 ..... 189.
Odesta
Data Desk Professional ..... 289.
Paracomp
Milo ..... 159.
Select Micro Systems, Inc.
Exstatix ..... 219.
Wolfram Research
Mathematica (SE) ..... 450.

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MIDI Basic ..... 30.

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Acknowledge ..... 329.
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Microphone III ..... 225.
Solutions
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Traveling Software
Lap-Link ..... 83.

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4th Dimension ..... 389.
AEC Management Systems
AEC Information Manager ..... 115.
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dBase Mac ..... 295.
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FileMaker II ..... 229.
Fox Software
FoxBASE+/Mac 1.1 ..... 205.
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Double Helix II ..... 339.
GeoQuery ..... 199.
ProVUE
Panarama ..... 205.

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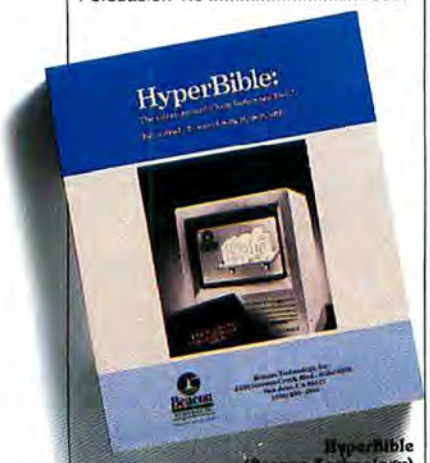
Persuasion 1.0 ..... 385.



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Cricket Presents ..... 289.
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Business 1 ..... 69.
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Broderbund
Drawing Table ..... 76.
PosterMaker Plus ..... 35.
Casady & Greene
Vivid Impressions Vol. 1 ..... 69.
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Cricket
Cricket Color Paint ..... 179.
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In case you're still not convinced *we'll give you 30 days to return your purchase with no questions asked.* In addition we back our products with a two-year limited warranty, compared to as little as 90 days for some manufacturers. Ehman drives are compatible with the Mac Plus,™ Mac SE,™ and the Mac II™ and come in a variety of sizes. Larger drives are available at equally attractive prices. So call **1-800-257-1666 today** or order by FAX at **307-789-4656** for the best value in Macintosh peripherals. Ehman calling hours are 9:00 A.M.–9:00 P.M. EST Monday–Saturday.

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Size (Mb)	Internal	External
20	$329	$399
30+	$379	$479
45+	$449	$529
65	$499*	$579
85	$599*	$679
44MB Removable Drive		$999

*Good on Macintosh II models only. SE Drives also available.
All product names mentioned are trademarks of their respective holders.
PC Tools/Mac not included with 20 MB drives.

Ehman Engineering, Inc.

Peripherals Designed for Value

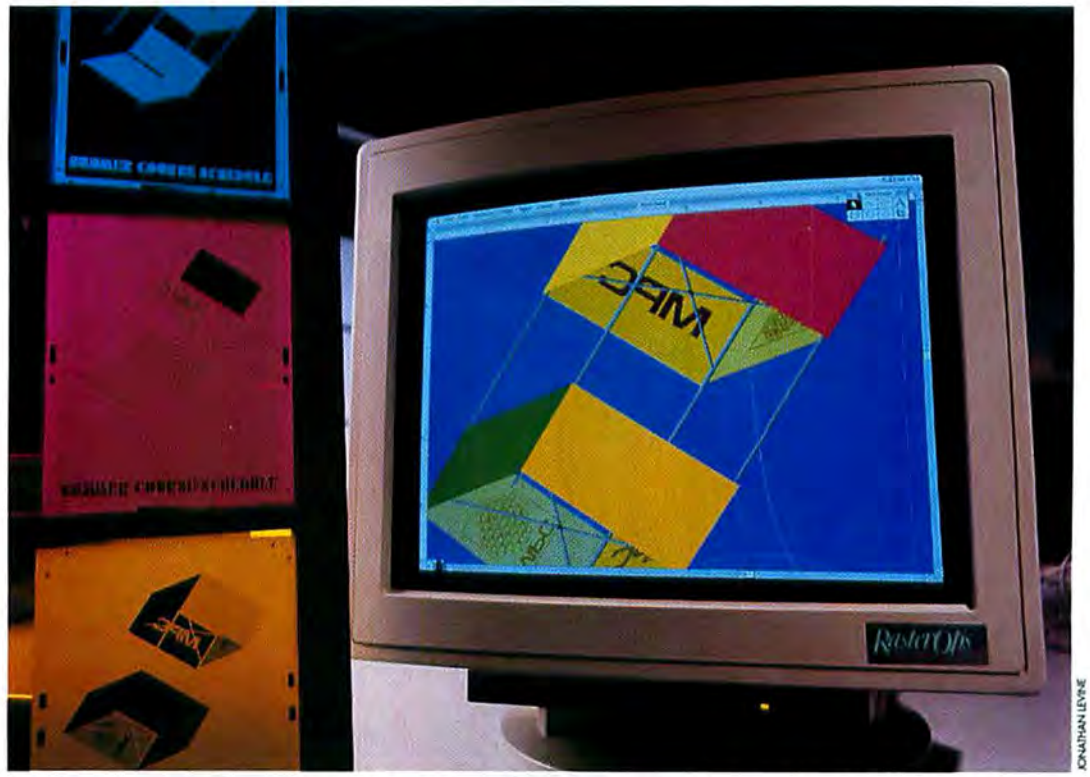
Circle 452 on reader service card

MACWORLD NEWS

by Tom Moran

More Colorful Publishing

Aldus Corporation's new Color Extension for the Macintosh makes it possible for the first time to spec four-color separations in PageMaker documents. Color Extension, a $195 add-on for PageMaker 3.0, lets users create color text and specify color for black-and-white graphics within PageMaker 3.0. Imported EPS files, which show up in black and white in PageMaker, appear in color once Color Extension is installed. With the extension, PageMaker can import 24-bit TIFF images and translate a good approximation of them onto 8-bit displays. Users will be able to specify colors using Pantone's color matching system. RGB, HLS, and CMYK color models are also supported.



JONATHAN LEVINE

Film for a four-color separation (left) was made from the onscreen image using Aldus' Color Extension.

Color Extension lets you print out full-color comps on any PostScript color printer. Color Extension Separator, a utility program that comes bundled with the new software, produces CMYK separations of color type, black-and-white graphics colored in PageMaker, and imported EPS art on image-setters such as the Linotronic 300. Color TIFF images placed in a PageMaker document can also be separated and output to image-setters using PrePress Technologies' SpectreSeps/PM.

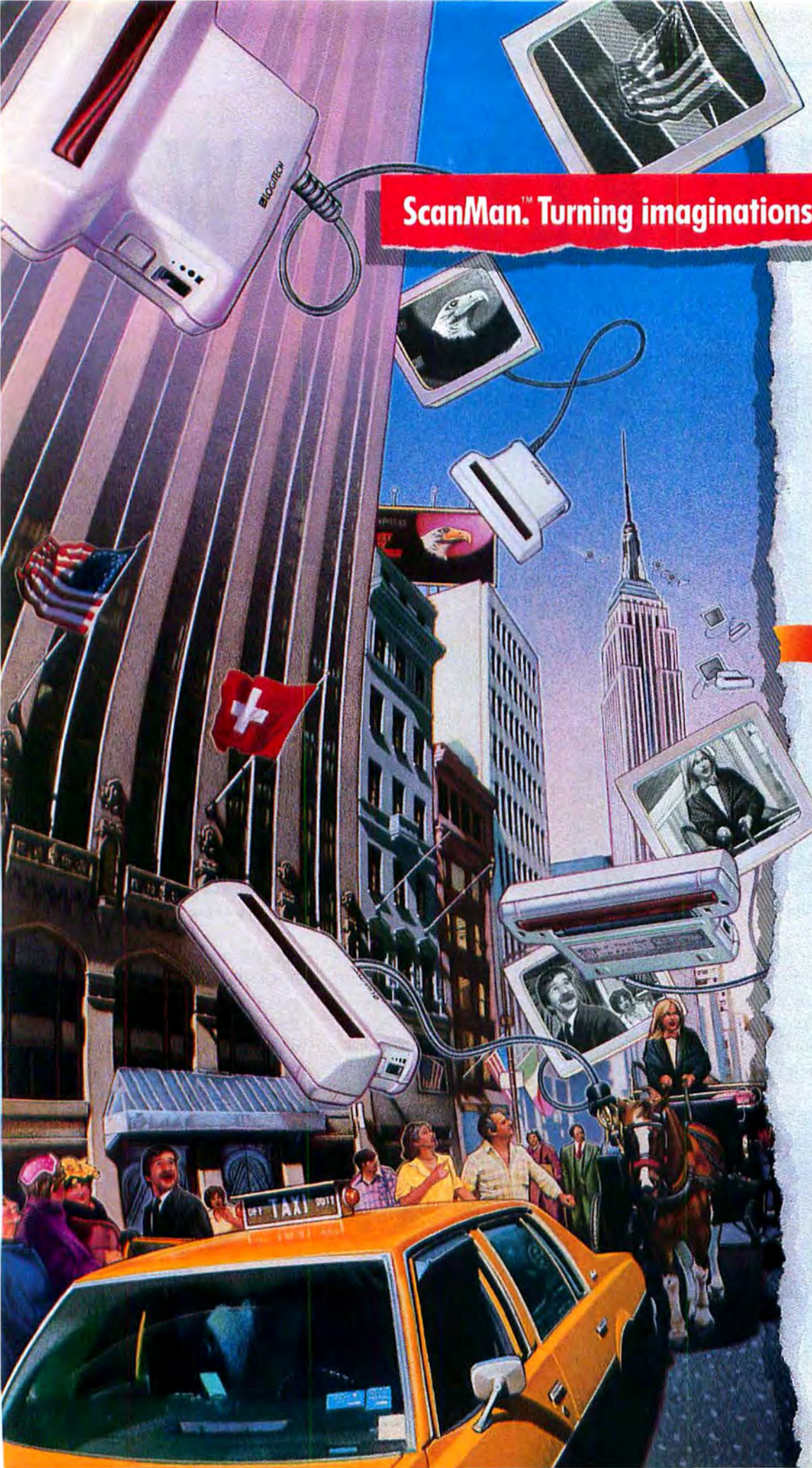
For higher-resolution color output, Aldus has announced the Open Prepress Interface (OPI), a proposed standard method for letting high-end prepress systems produce four-color separations for documents containing TIFF images. Supported by Crosfield, Diadem, Dainippon Screen (DS America) and PrePress Technologies, OPI will enable desktop publishers to send their documents on disk, along with the original TIFF files, to the high-end prepress system of their choice. Page geometry information goes to the prepress system, which positions the TIFF image correctly on the page, leaving design control in the hands of the desktop publisher while offering high-quality color output for the finished product.

(continues)

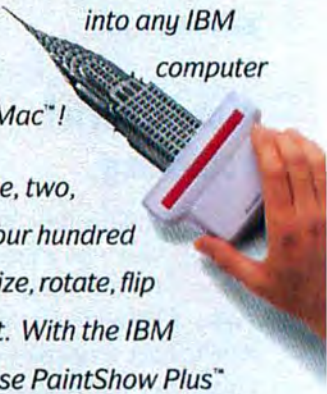
Color Extension lets you use the Pantone Matching System to specify colors on a monochrome system. When the same file is displayed on a color system, its true colors appear.

LOGITECH

ScanMan.™ Turning imaginations loose everywhere.



Pop any image up to 4" x 11" straight into any IBM personal computer or Apple Mac™!



Select one, two, three or four hundred D.P.I. Resize, rotate, flip and edit it. With the IBM version, use PaintShow Plus™ (included free) for coloring and shading, then port into any popular publishing program.

With the Mac ScanMan use the Clipboard™ to transfer the image to virtually any application — the Mac ScanMan works just like any Desk Accessory!

ScanMan for the PC	*— $309*
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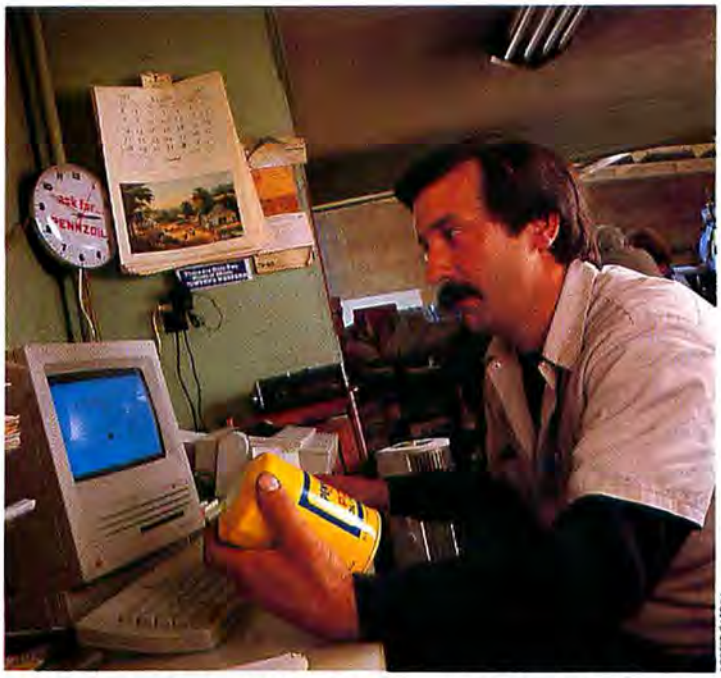
For further information, contact Aldus Corporation in Seattle, at 206/622-5500 or PrePress Technologies in Encinitas, California, at 619/753-0194.
—Liza Weiman

And an Engine in Every Application

In the course of designing auto-repair-shop software, Micron Computer added a series of HyperCard-like screens to give its TurboMac the look of a real repair shop. The screen images used are so common to auto mechanics that even those with no computer background find TurboMac easy to use.

To get stored information about a customer's preferences, for instance, the mechanic can click on the image of two customers waiting on a couch inside a repair shop's office. Similarly, by clicking on a door labeled Parts Department, a user can enter the parts room and check for an item in inventory; or to add a task to the repair order, the user can click on an image of a car's engine.



ROBERT CARDIN

John Accacian of Sheaff's Service Garage in Oakland, California, uses TurboMac to coordinate an auto repair order.

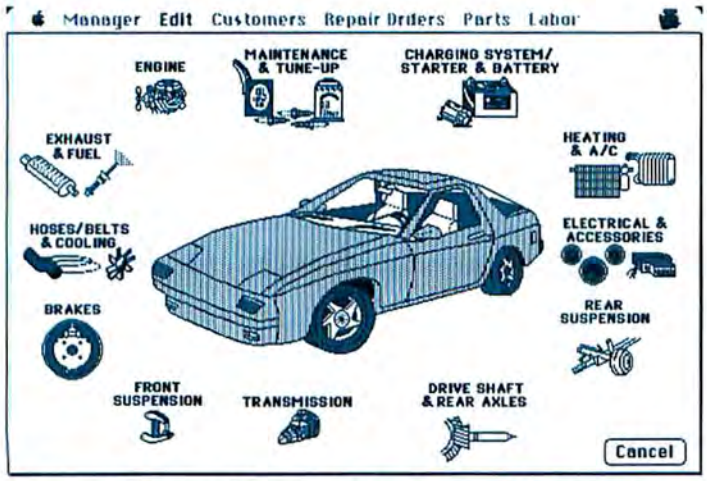
All of TurboMac's data fields are linked. Entering data in one part of the program automatically updates that information. When writing up an estimate for a tune-up, for instance, the mechanic enters the necessary number of spark plugs on the repair order and the program subtracts the same number from the parts inventory. Recognizing the repair order as the key element that ties together every aspect of the repair shop (customer, vehicle, parts, supplies, labor), Micron built TurboMac completely around this central document.

Although TurboMac is tailor-made for the automotive repair industry, its basic application engine could be used to build other retail applications. The program's HyperCard-like interface and relational database would be well suited to just about any inventory-intensive business.

But because the key ingredient is expertise in a particular business, Micron's present plans are to stick with its automotive focus. The company has not ruled out licensing the application engine to other developers, however.

An updated version of TurboMac that can access thousands of pages of information from Mitchell's Automotive Repair Guides on CD ROM in Macintosh presentation format is scheduled for release this spring.

With a Mac SE, an ImageWriter, and the latest version of the software, TurboMac sells for around $10,000. For more information, contact Micron Computer, in Camarillo, California, at 805/482-0702.
—Mary Margaret Lewis



When you click one of the repair jobs shown, TurboMac brings up an estimate form. As you fill out the form, TurboMac calculates the cost and subtracts from inventory.

Not Just the Fax, Ma'am

E-mail users will soon be able to send and receive faxes over Novell NetWare networks, thanks to PC-based products now available for the Mac. cc:Mail, which recently adapted its IBM PC E-mail software to accommodate the Mac, now integrates fax capa-bilities with E-mail through cc:Mail Faxlink.

To send or receive faxes via cc:Mail Faxlink, you need Intel's Connection Coprocessor board in a PC-based NetWare server on the network. Once cc:Mail users are linked to that server, both PC and Mac users can turn their E-mail messages into faxes, and vice versa. The Connection Coprocessor board works with cc:Mail's software to translate both the text and graphics portions of an E-mail message to facsimile format for transmission. NetWare-based Faxlink Manager software also routes incoming faxes to the right addressee on the network.

Although both text and graphics can be converted into outgoing faxes, unfortunately, cc:Mail Faxlink has no way to extract text as a file

(continues)

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Three-dimensional full color scatterplots with surface smoothing, and sophisticated dynamic graphics like scatterplot brushing and movies.

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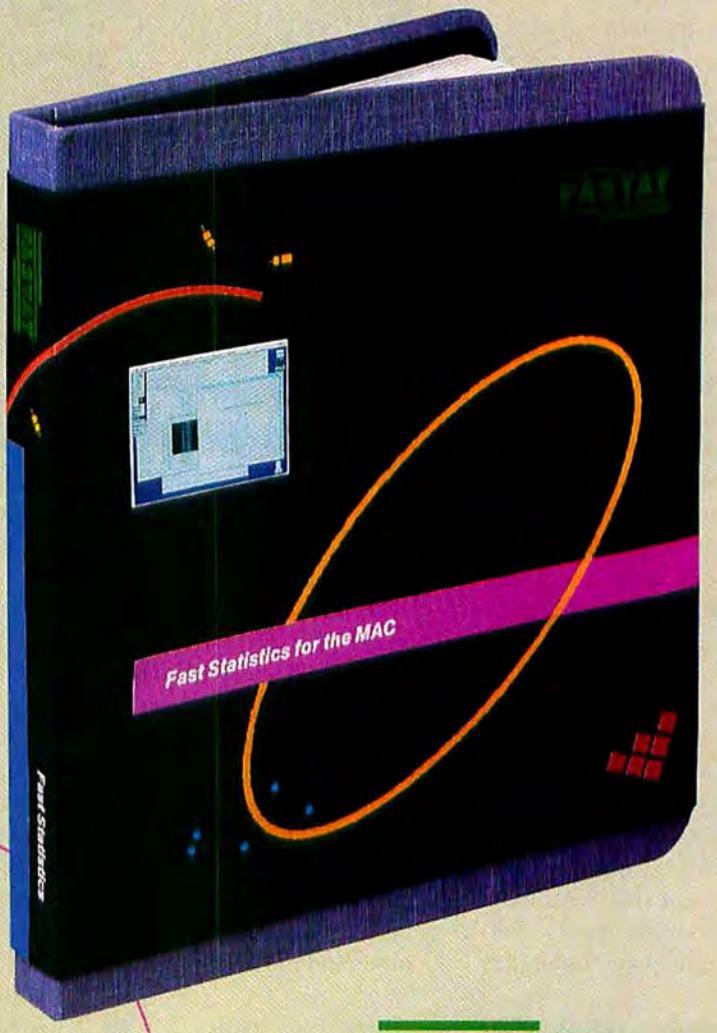
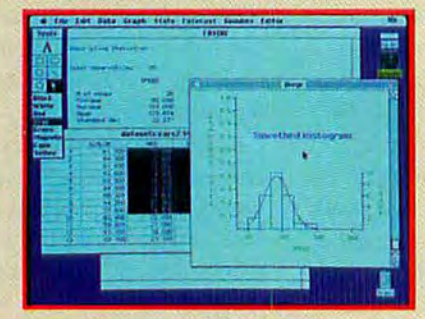
The company that brought professionals "the best statistics package on the Macintosh"* introduces the *easiest:* FASTAT.
Designed just for the Macintosh, FASTAT makes high-powered, accurate statistics easy.

You can do dependent and independent t-tests, time series analyses, factor analysis, two-way and n-way tables, correlations, nonparametric tests, regressions, analysis of variance and covariance, exploratory data analysis — even if you've never done them before.

You can also create full-featured graphics such as X-Y plots, bubble plots, line plots, histograms, box-plots, stem-and-leaf diagrams, autocorrelation and time series plots, as well as state-of-the-art displays, like scatterplot matrices.



Some of the graphs are only a click away.
Click on a variable name, and you get a histogram or a box plot of the variable. Click on a regression output or a cell in a correlation matrix, and you get a scatterplot of the variables.



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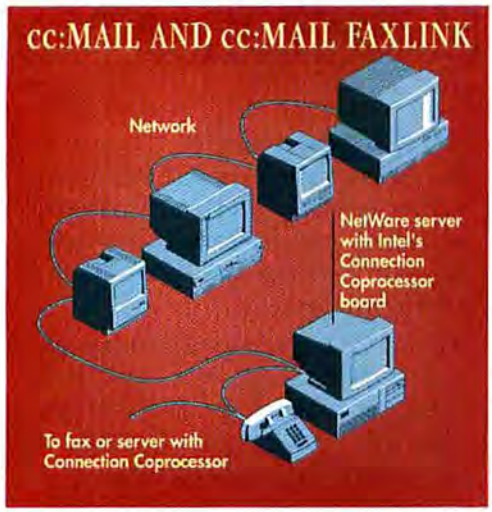
System requirements: 1 megabyte of memory and hard drive.
Mac II version available. Unlimited free technical support.

*MacWeek September 13, 1988
**Suggested Retail Price

Dealers circle 492 on reader service card
End users circle 491 on reader service card



cc:Mail's Faxlink software works with Intel's Connection Coprocessor (for the PC) to let Mac users send faxes over Novell networks.

from incoming faxes. That means both Mac and PC users of cc:Mail Faxlink will be restricted to viewing their incoming faxes as graphics files only.

cc:Mail Faxlink is scheduled for delivery this summer, and will cost $995 per LAN. For details contact cc:Mail in Palo Alto, California at 415/321-0430.

—Dave Kosiur

A Sharply Accelerated Mac II

Dash 030, a Mac II repackaged and accelerated by Sixty Eight Thousand Inc., offers about three times the processing speed of the original. The main reason for Dash 030's higher performance is its custom version of DayStar's 33 accelerator board. However, it's the inclusion of a Golden Triangle Pronto SCSI accelerator board that increases SCSI transfer speeds to 2.6MB per second, compared to just under 1MB for the Mac II and IIx. A 180MB hard drive with an average access time of under 15 milliseconds also helps pep things up, and integration software ensures that all the parts work well together, as well as supporting access to multiple NuBus master processors.

According to Sixty Eight Thousand, Inc., the Dash 030 drives its Motorola 68030 processor at 36MHz, faster than the 33MHz at which Motorola currently rates the fastest 030 chip that's available in commercial quantities.

The machine also includes a 68882 math coprocessor chip, RAM cache, a direct memory access channel, and Connectix virtual memory, which lets disk memory seem like extra RAM to the system.

A basic Dash 030 lists for $15,000 with 4MB of RAM, the 180MB hard disk, a keyboard, a mouse, five available NuBus slots, space for ten half-height 5 ¼-inch or 3 ½-inch drives, and a Mac-compatible 800K floppy drive. The system is covered by a two-year warranty, and service contracts will be available through Honeywell Bull. For further information, contact Sixty Eight Thousand, Inc. in Carmel, California, at 408/626-1780.

Sixty Eight Thousand, Inc.'s Dash 030 is an accelerated Mac II whose 68030 processor runs at 36MHz, faster than Motorola currently rates the chip.

A Little Learning Goes a Long Way

Optical-character-recognition (OCR) systems can read varying forms of typed and typeset text in multiple columns and multiple fonts, but so far they've been unable to recognize handwriting or different character systems.

However, neural network technology is now being used to develop OCR systems that recognize handwriting and different languages and characters. The Nestor Learning System is trained on handwriting and then learns to recognize more individuals' handwriting on its own.

Using a Nestor Learning System, BancTec, in Dallas, is developing an application that will read handwritten numeric amounts on checks and remittance slips. The Industrial Vision division of AEG, located in Orlando, Florida, has also used the Nestor technology to write a signature-verification system for checks.

Because neural networks imitate human learning and classification, they work well in situations, such as those involving handwriting, where large and complex data sets make wholly rule-based systems impractical. Not only do neural nets have the ability to learn, Nestor claims that these systems can deal with variability and noise (such as dirty paper), an ability that's necessary for trying to recognize handwriting. Neural nets can also be trained to recognize symbols (like shorthand) as well as a person's "unique sloppiness."

(continues)

The power and performance of big system CADD...MicroStation Mac

Intergraph introduces MicroStation Mac – microCADD software merging the power of 2D/3D engineering design software with the ease of the Macintosh user interface.

Multiple-screen graphics

MicroStation Mac supports a maximum of eight separate views of a design. These are resizable and can be placed on any of up to six graphic screens, the maximum supported by the Macintosh. This allows for better display flexibility, resulting in more productivity and less design time.

Reference files

MicroStation supports 2D and 3D design and reference files so a user can attach up to 32 design files to the current file for reference. Reference files can reside locally or be accessed remotely over a network, thus allowing users working on the same project to view all the files simultaneously.

Fully Intergraph-compatible

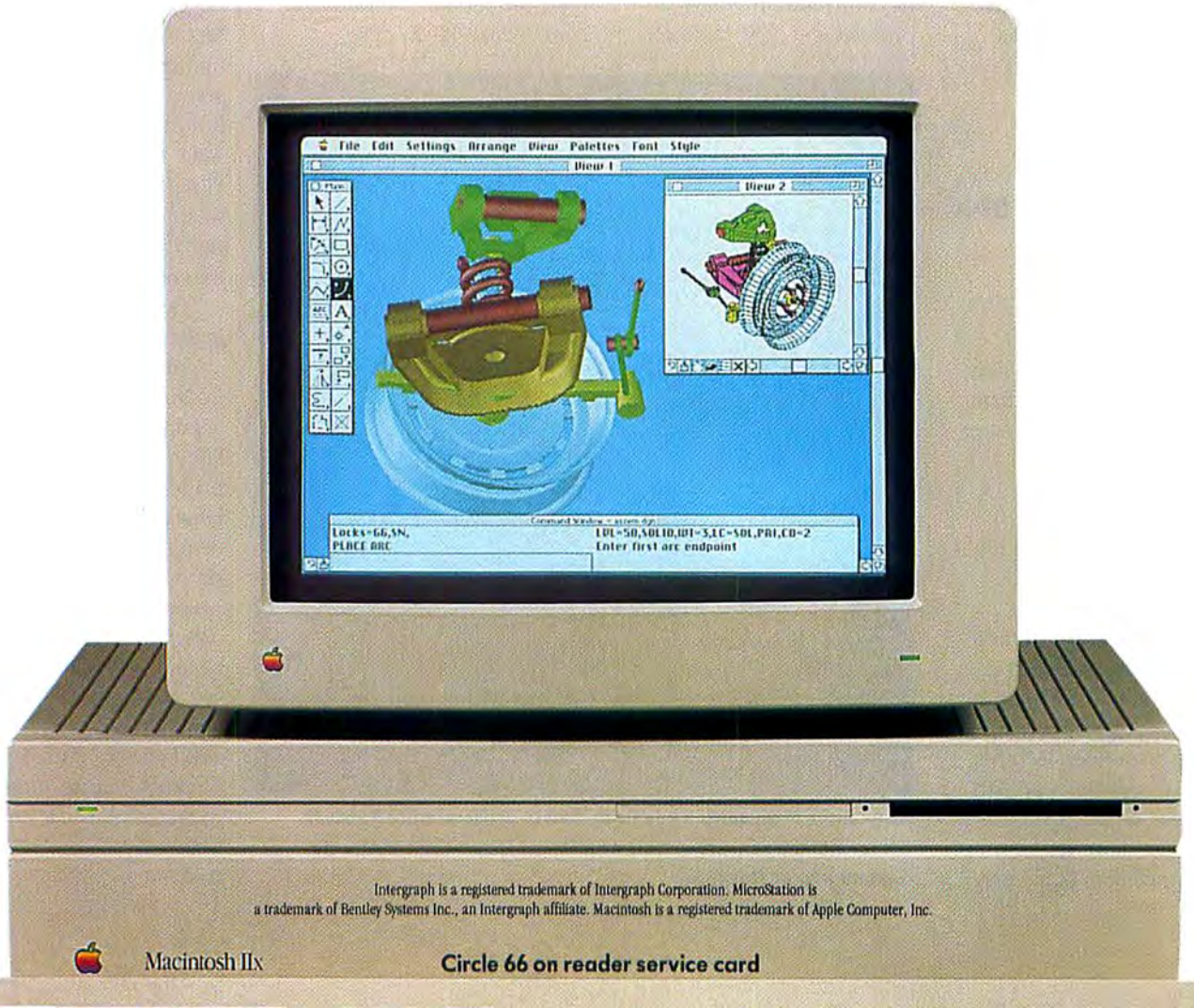
Files are maintained in the same binary format on every platform so that MicroStation/IGDS files can be freely transferred between the VAX, PC, Intergraph workstation, and Macintosh with no translation required.

With over 450 commands and features to meet your design needs, MicroStation Mac exemplifies the most complete functionality of any CADD package available for the Macintosh, making MicroStation Mac your best choice for design needs.

For further information on MicroStation and the Intergraph Education Center and Reseller programs: in the U.S., call 800-345-4856; in Alabama only, call 800-345-0218; outside the U.S., contact an Intergraph sales office.

INTERGRAPH

Image showing the Apple Macintosh user interface.



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Macintosh IIx

Circle 66 on reader service card

Subscribers to the *Amygdala* newsletter, dedicated to the geometric system called fractals, also receive 24 fractal-related color slides.

Nestor plans to bring a version of its neural network development environment—now on the IBM AT and PS/2—to the Mac within the next six months. When that happens, the handwriting will be on the Mac's screen. For further information, contact Nestor, in Providence, Rhode Island, at 401/331-9640.
—Brita Meng

Fractals, Anyone?

For you fractal fans, there's *Amygdala,* a newsletter on fractals, a system of geometry devised by Benoit Mandelbrot, IBM mathematician and professor of mathematics at Harvard University. *Mandelbrot* in Yiddish means almond bread, hence the pun with *Amygdala,* which refers to an almond-shaped part of the brain.

Many articles in *Amygdala* are written with the Macintosh II in mind. The Mac II's graphics capacity, math coprocessor, and dazzling color make it a favorite machine for generating images of complex fractal patterns. The newsletter includes an extensive fractal bibliography, pictures of fractals, reviews of programs for generating fractals on computers, and even fiction stories—usually science fiction—that relate to fractals.

Subscriptions are $25 for ten issues or $45 for ten issues plus 24 color slides. Prices overseas are higher. The newsletter comes out every four to six weeks. To subscribe or for more information, contact *Amygdala,* Box 219, San Cristobal, NM 87564; 505/758-7461.
—Amacker Bullwinkle

Texas School Network and CD ROM

The Hurst-Euless-Bedford Independent School District in Texas, which plans to use Cactus Computer's Ethernet-to-BroadTalk Gateway for linking its Hewlett-Packard minicomputers, recently discovered that the same system could link the Macintoshes scattered throughout the district's 27 campuses.

Part of the plan entails using the same commercial cable used by cable TV networks. Cactus' BroadTalk Gateway boards for the Mac II seemed like the best bet for linking the Hewlett-Packard Ethernet networks through the video channels on commercial broadband cable.

Taking the link one step further, the district has successfully connected some of its Macs via commercial cable to a Mac II equipped with Apple's CD ROM drive in the main administration building.

As the network evolves, each school will probably use Macs as remote workstations for accessing the district's central administrative database when a DEC VAX replaces the HP 3000. Thanks to the successful linkup in the administration building, the district is now considering using CD ROM as a repository of test questions. Using Macs connected via commercial cable, the teachers in each school would then be able to create new tests by selecting and combining test material from the CD ROM test bank in the district office.
—Dave Kosiur

Mac the Knife

Long hospital shifts and thousands of medical facts make the typical medical student's life a nightmare of cramming. At Case Western Reserve University in Cleveland, one professor is experimenting with HyperCard/videodisk applications.

Traditionally, third- and fourth-year medical students spend two months in a crash course that introduces the basics of surgery, learning from books, articles, lectures—and by observing operations. Unfortunately, however, operating rooms are usually crowded, surgical openings are often very small, and the fast-paced action is often hard to follow. Medical schools do keep videotapes of operations, but, according to Joel Weinstein, assistant professor of surgery, "Medical students don't have time to watch movies."

The most important part of learning about surgery is the looking, Weinstein notes. That's why he put together his two HyperCard/videodisk

(continues)

ROBBIE MCCLARAN

Dr. Forrest Watson, superintendent of the Hurst-Euless-Bedford Independent School District, navigates the network.

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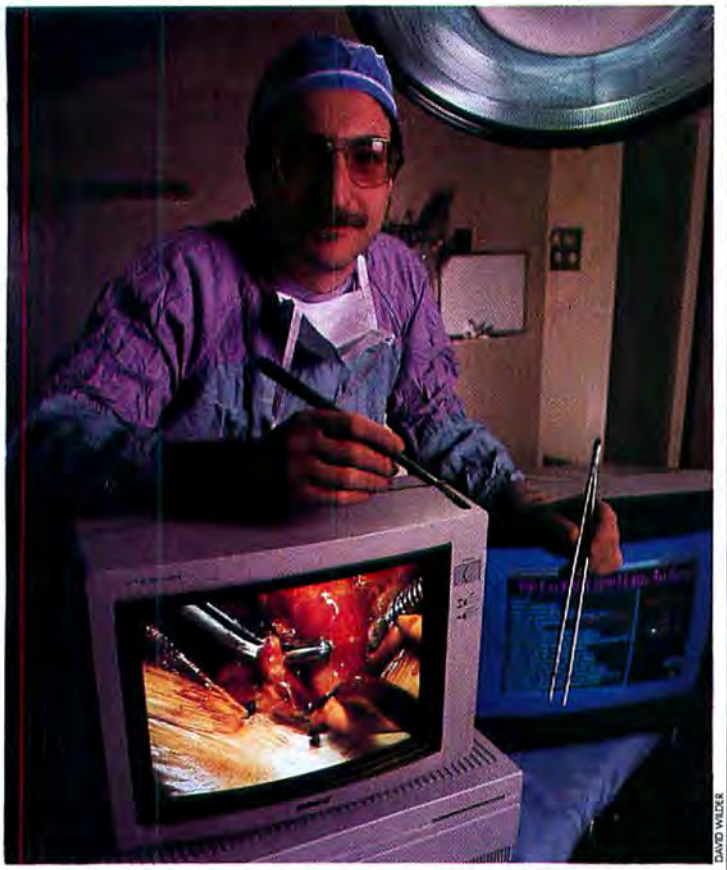


Dr. Joel Weinstein brought together masses of information from various sources for HyperCard/videodisk surgical training.

training programs—one on acute appendicitis, and one on an operation to correct incorrectly positioned arteries on a newborn's heart.

In his two Hyper Card/videodisk training programs, Weinstein integrates text, diagrams, abstracts of articles from medical journals, a glossary, and the video images. He brings together information students must otherwise hunt for in as many as a dozen different textbooks and journals. And the stack goes one better than the books, because students can look at closeups of the videotaped operation, or repeatedly view a single step in the operation.

The Surgical Information Management Project, as Weinstein has dubbed his effort, is meant to supplement traditional methods. The whole idea is to take a textbook and expand it so it includes everything you need to know. Macs and videodisk players will be placed right outside the operating room at Cleveland Metropolitan General Hospital so Weinstein's students can prepare immediately before an operation or quickly refer to the stack when they need more information.

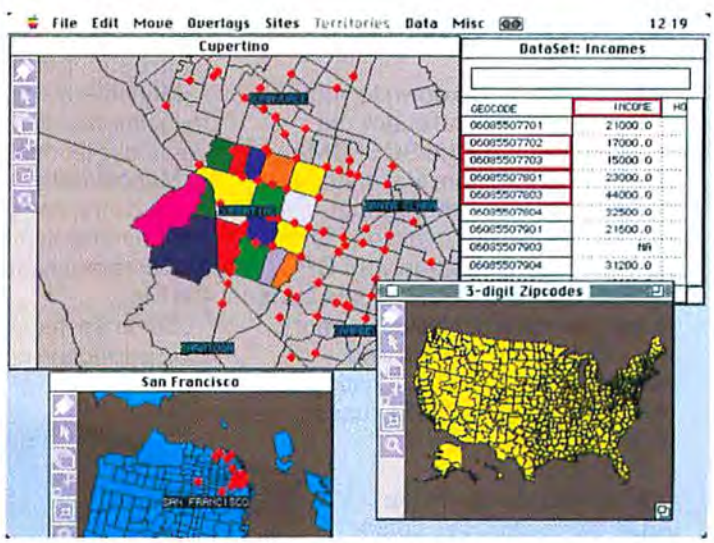
So far his students have responded enthusiastically, asking for more information in the stacks and for more stacks on other operations. Weinstein will add more graphics to his existing stacks, X rays and other diagnostic images; he plans another application on pancreatic tumors, and an associate has begun one on ectopic pregnancy. For future videodisk stacks, Weinstein has obtained the right to use any of the approximately 400 videotapes in the American College of Surgery library. The results of his efforts will be available to students at other medical schools; beta testing is underway at Stanford, Cornell, and the University of Michigan. The appendicitis application, which works with the appendectomy disk distributed by Miles Laboratories, is available now to any medical school. For further information contact Joel A. Weinstein, M.D., Department of Surgery, CMGH, 3395 Scranton Rd., Cleveland, OH 44109.
—*Nancy E. Dunn*

CL/1 Support Grows

At Dexpo East in New York City, five Macintosh developers jumped on the CL/1 bandwagon, showing applications taking advantage of CL/1, Network Innovations' SQL-based database connectivity language. CL/1 provides transparent access to data in VAX-resident databases from within Macintosh applications. VAX host databases supported include Informix, Ingres, Oracle, VAX Rdb, and VAX RMS.

The new developers are Andyne Computing with GQL, a graphical database query language; Fairfield Software with ClearAccess, a desk accessory with built-in CL/1 functionality; Neuron Data with Nexpert Object, an expert-system shell; Odesta Corporation with its business-mapping software GeoQuery; and Tactics International's Fastmap, a geographical marketing tool. Those applications join the ranks of others that support CL/1, including Access Technology's MacDBC, Acius' 4th Dimension, Ashton-Tate's Full Impact, and HyperCard.

For more information, call Network Innovations in Cupertino, California, at 408/257-6800; Andyne Computing *(continues)*



Among the CL/1 applications shown at Dexpo East was Tactics International's Fastmap, designed to aid in geographical marketing.

What happens when Macintosh performance becomes a National priority?

You regain your spare time. And you gain top-speed Mac II performance.

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Maccelerate removes the I/O bottleneck and frees-up your CPU by automatically handling data transfer to your main or NuBus memory. It works for both internal and external SCSI devices. Existing or new. Even multiple SCSI busses on a single Mac.

The result?

Maccelerate can make A/UX processing five times faster.

Your Mac OS will perform at new levels.

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—*Brita Meng*

Your Best Stacks

The best stack from the *Macworld News* mailbag recently is Japanese Garden Design, created by Kathy Wolf, a doctoral candidate in landscape architecture at the University of Michigan. Wolf's stack teaches the design principles that creators of traditional Japanese gardens folow. The stack won the student division of a campuswide contest last year and offers a good example of HyperCard realizing its potential.

Digitized music evokes the moods of the three garden styles—hill and water, flat, and tea gardens—described in this 800K chunk of a much larger application Wolf keeps on her hard disk. Short pieces of Japanese music play when you turn to cards illustrating or describing gardens. To further set the stage, Wolf used large *kanji* characters to act as buttons that lead to more information. (Unfortunately, she didn't always put the *kanji* buttons in the same spot on the card, so sometimes viewers may miss them.) The sounds and custom graphics establish a tone consistent with the stack's subject matter.

Japanese Garden Design includes details that put the landscape design into historical perspective. Scanned-in eighteenth- and nineteenth-century woodcuts of gardens convey an idea of what the gardens originally looked like and add another layer to the historical veneer of the stack's design. The stack is easy to navigate, and I had no trouble figuring out how to use it just by looking and clicking. I recommend that anyone planning an educational stack review the Japanese Garden Design's effective integration of audio and visual elements.

This stack and all other stacks reviewed in this column are available on my BBS at 408/253-3926 at 1200/9600 baud. The stack is also available by mail from the A-32 user groups, P.O. Box 634, Santa Clara, CA 95052. Ask for disk number M-1.

Macworld wants to see your HyperCard stacks. To submit them for possible inclusion in this occasional section, send them to Your Best Stacks, c/o News Editor, *Macworld*, 501 Second St., San Francisco, CA 94107.
—*Robert Murrow*

Kathy Wolf's Japanese Garden Design stack leads you through the classic garden styles of Japan in the age of the samurai.

Reach Out, Reach Out and Crush Someone. . .

Although not currently intended for the Mac, a new input device designed for the Nintendo Entertainment System may have applications for all computer systems. To be marketed by Brøderbund Software, U-Force is a revolutionary controller that eliminates all physical contact with the machine by detecting the player's exact motion, velocity, and relative position of the player and transforming the information instantly into on-screen action.

Nintendo demonstrated the U-Force controller with three of its hottest games—Mike Tyson's Punch-Out, Top Gun, and Rad Racer. In Punch-Out, you actually punch the air within the special U-Force grid. This translates into punches thrown by the player against Tyson, who's on the screen. In Top Gun, subtle thumb movements are rendered as machine gun or missile fire. In Rad Racer, high-speed car racing is simulated via simple hand motions within the invisible 3-D force field.

U-Force senses the location of the user's hands, replacing a mouse or joystick.

U-Force is able to detect player response by generating a three-dimensional infrared light grid that picks up and measures all movement within its field. The player does not have to touch, wear, or hold anything in order to interact with the machine. Nintendo claims that the new controller will work with many of its existing games and promises that "any game you thought you mastered is going to be a lot more intense and a lot more fun."

To appease players who feel more comfortable with a traditional arcade handgrip, the U-Force system comes with three accessories, including firing handles and a T-bar. You can play three ways—using only your hands, with just the firing handles, or using the handles in conjunction with the T-bar.

Although the proprietary technology behind the U-Force process still has two

(continues)

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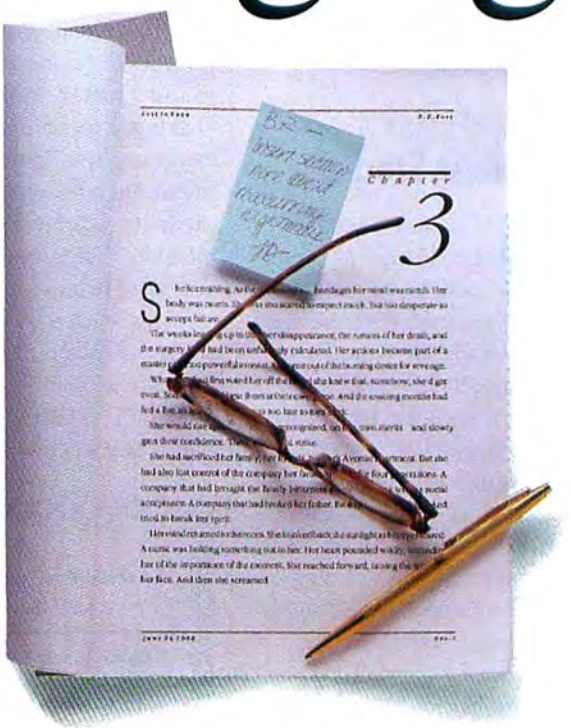

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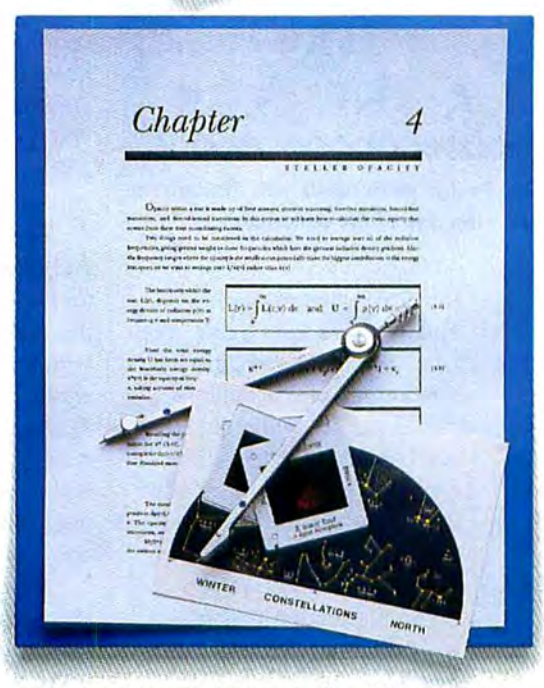

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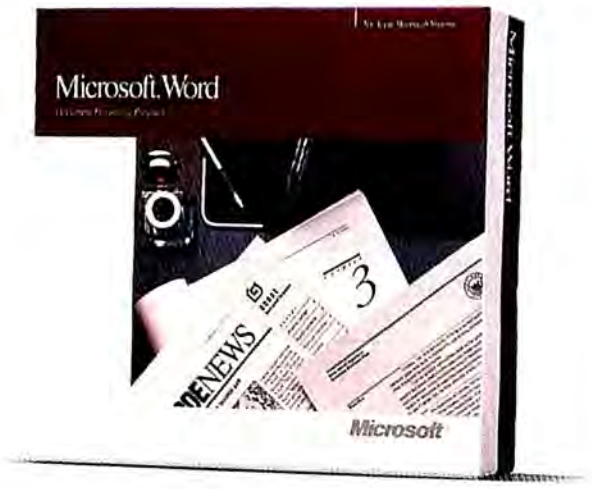
A new Word.



The expression that you can't please all of the people all of the time just got redefined.

In developing Microsoft® Word version 4.0, we took input from the over 400,000 Word users who made Word the best-selling Macintosh® product in history. Added startling, cutting-edge technology. And the result is a gracious, easy-to-use word processing program with features as dynamic and diverse as its users.

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And keep in mind Microsoft Word is part of an entire line of Microsoft products that work seamlessly together, so you can do more with your Macintosh.

Microsoft Word 4.0 can emphasize, articulate, clarify and organize your words. In fact, practically the only thing it can't do is think for you. Yet.

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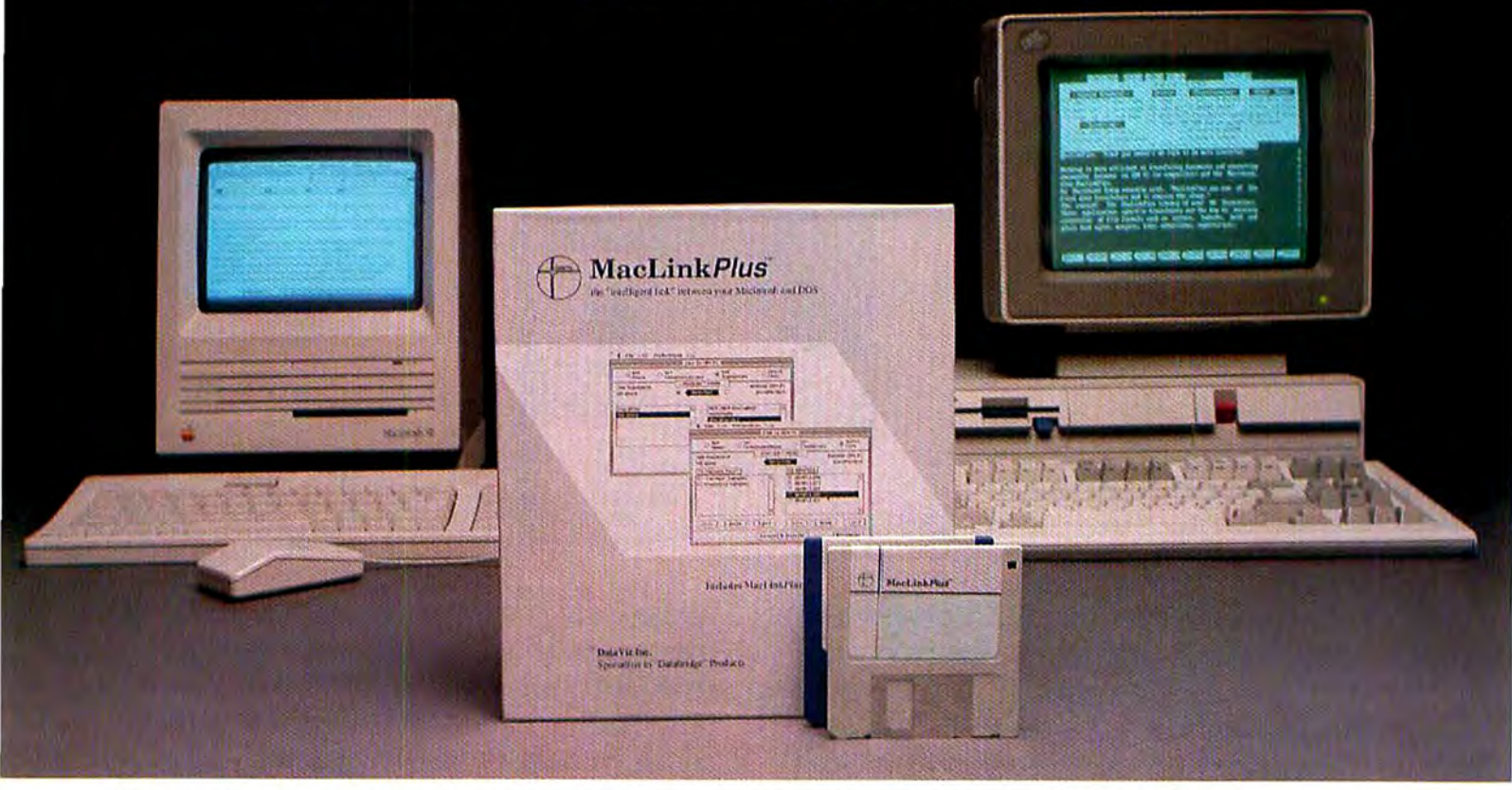

Whatever Macintosh-PC setup you have, MacLink*Plus*—at $195—provides the very best solution for transferring and translating files and documents between the two.

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So, if you want to be really well connected, the size of your wallet really doesn't matter. Just call (203) 268-0030 for your nearest DataViz dealer. Because as Macintosh Today recently said, "MacLink*Plus* was one of the first data translators and it remains the champ."

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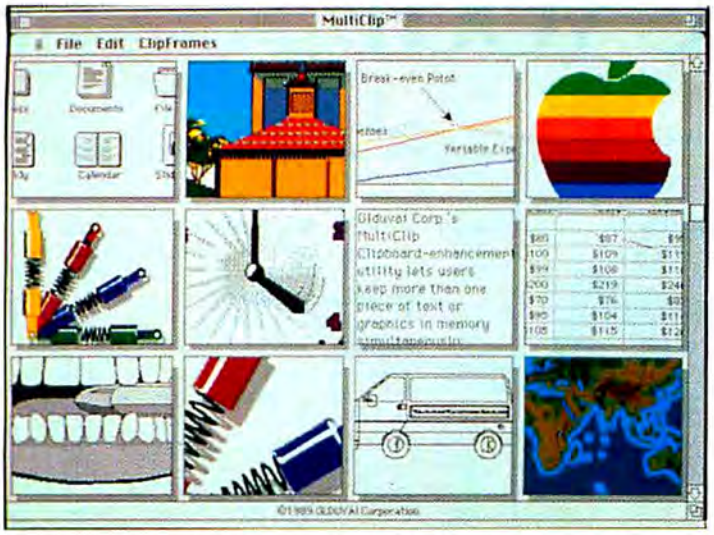


Olduvai's $99 MultiClip INIT saves all your cuts and copies from any program. It replaces the Clipboard and Scrapbook.

patents pending on the controller's circuits and sensors, a few units are to be shipped this summer. Limited distribution is scheduled for the fall. Retail pricing is slated to be between $60 and $80. For further information contact Brøderbund Software, in San Rafael, California, at 415/492-3200 or 800/527-6263.

The Kindest Cut of All

Finally there's a new and improved Clipboard and Scrapbook. Olduvai Corporation has created MultiClip, a $99 INIT file that takes the place of the standard-issue Clipboard and Scrapbook. Once installed in your System Folder, MultiClip saves all those fragments that result from cuts and copies when you work with any program. You can cut several things at once and then paste them all in sequence (or reverse order) much more efficiently than with the standard Clipboard.

If you want to see what you've cut or copied lately, you open MultiClip from the Apple menu or with a keyboard shortcut. An array of little boxes shows up containing all your text and graphics cast-offs. From there you can choose to delete items permanently or edit them a bit, move them around, modify the layout of the boxes, and assign keyboard shortcuts to some actions.

MultiClip is already shipping, as is ClipShare ($195), which lets you send a clipping across a network to another MultiClip user. For further details, contact Olduvai in South Miami, Florida, at 305/665-4665.

Reader Survey: Apple's 90-Day Warranty

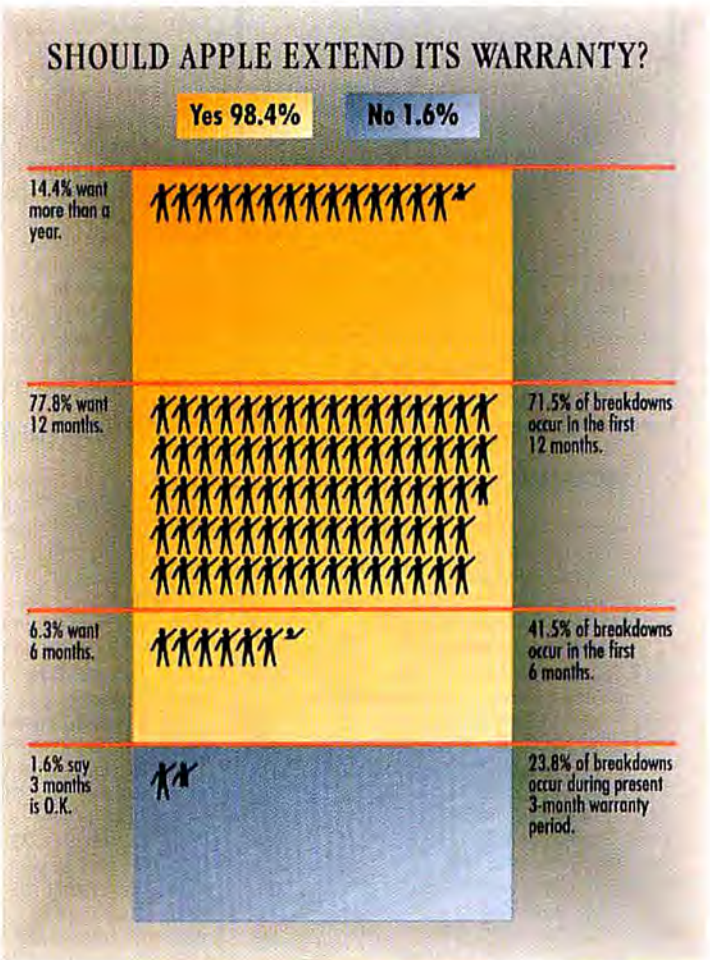
This month's survey, mailed to 1000 *Macworld* subscribers, focuses on Apple's 90-day warranty. The unusually high response rate (544, or about 55 percent) suggests that subscribers have strong feelings on this particular subject.

Seventy percent of all respondents said the length of Apple's warranty is inadequate, while 19 percent felt that it's adequate. Only 2 percent believed it to be a very good warranty, with the remaining 8 percent having no opinion.

An overwhelming 98.4 percent of all respondents with an opinion thought Apple should extend its warranty. Of that 98.4 percent, 77.8 percent thought that one year represented a more reasonable coverage period.

Forty-nine percent of all respondents experienced problems with their Apple hardware—24 percent of those within 3 months of purchase, 18 percent within 3 to 6 months, 30 percent within 6 to 12 months, and 29 percent in 12 months or more after purchase. When asked how much they had spent on repairs after the warranty's expiration, 21 percent said they'd spent nothing, 12 percent said under $100, 33 percent said between $100 and $249, 24 percent said between $250 and $499, and 9 percent said between $500 and $1000.

Forty-four percent of all respondents said the 90-day warranty makes them reluctant to buy Apple hardware. —*Ann Garrison*



An overwhelming majority of readers responding say Apple should extend its warranty beyond its current meager 90 days.

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4497 Top Honors 1.01 . . . . . 59.
4500 Springboard Publisher 1.0 . . . . . $109.

★T/Maker ... 30 day MBG
3635 EPS Illustrations . . . . . 75.
5167 EPS Business Art . . . . . 75.

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★Beacon Technology ... 30 day MBG
4967 HyperBible *(King James)* 1.0 . . . . 159.
4968 HyperBible *(New International)* 1.0 195.

Borland International
1511 Turbo Pascal 1.1 . . . . . 68.

★Digitalk ... 60 day MBG
5166 SmallTalk/V Mac . . . . . 129.

★DreamMaker ... 60 day MBG
4115 MacGallery *(HyperCard format)* . . . 27.

★Hyperpress Publish. ... 30 day MBG
4233 Icon Factory 1.0 . . . . . 29.
5089 Script Library 1.0 . . . . . 29.
5090 Silver Screen 1.0 . . . . . 42.
4265 Script Expert 1.0 . . . . . 46.

Individual Software
4719 101 Scripts & Buttons Hypercard 1.0 . 37.

★Manx Software ... 60 day MBG
4068 Aztec C 3.6B . . . . . 65.

XTree ... 30 day MBG
XTreeMac 1.0–An integrated disk manager for the Mac. Combines file management with the ability to recover deleted files. Directory Tree provides a tree-view of data on any volume. Includes extensive find/launch . . . . . $52.

4317 Aztec SDB . . . . . 65.
4316 Aztec C UniTools . . . . . 65.
4069 Aztec MPW C 3.6B . . . . . 99.
4075 Aztec C + SDB 3.6B . . . . . 99.

★Microsoft ... 30 day MBG
4471 QuickBasic 1.0 . . . . . 65.

★OWL International ... 30 day MBG
3082 Guide 2.0 . . . . . 99.

★SmethersBarnes ... 30 day MBG
1478 Prototyper 2.0 . . . . . 149.

Softworks, Inc.
4601 Stack Cleaner . . . . . 29.
4599 HyperTools #1 1.02 . . . . . 59.
4600 HyperTools #2 1.03 . . . . . 59.

★Symantec ... 30 day MBG
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3421 Think's Pascal 2.0 . . . . . 85.
3420 Think's C 3.01 . . . . . 149.

TENpoint0
1338 Reports! 1.2 . . . . . 69.
4638 Focal Point II 1.0 . . . . . 119.

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4989 TML Pascal II 3.0 *(w/o MPW 3.0)* . . $59.
3549 TML Pascal II 3.0 *(w/MPW 3.0)* . . . 115.

True BASIC, Inc.
3587 True BASIC 2.01 . . . . . 59.

★Zedcor ... 60 day MBG
3985 ZBASIC 5.0 . . . . . 99.

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★Affinity Microsystems ... 60 day MBG
1014 Affinifile 1.1 . . . . . 46.
1016 Tempo II 1.02 . . . . . 89.

★Berkeley Systems ... 30 day MBG
1541 Stepping Out II 2.01 . . . . . 52.

Beyond, Inc.
4203 MenuFonts 2.02 . . . . . 29.

★Casady & Greene ... 60 day MBG
2269 QuickDEX 1.4A . . . . . 32.

★CE Software ... 60 day MBG
1727 CalendarMaker 3.0 . . . . . 27.
1728 DiskTop 3.0.4 . . . . . 27.
4689 MockPackage Plus Utilities 4.4 . . . . 27.
1729 QuicKeys 1.2 . . . . . 53.

Central Point
5040 Copy II Mac 7.2 . . . . . 20.
5041 PC Tools Deluxe Mac 1.1 . . . . . 42.

Dubl-Click Software
1824 Calculator Construction Set 1.04 . . . 35.

Electronic Arts
1843 Disk Tools Plus 1.01 . . . . . 31.

★Fifth Generation ... 60 day MBG
4287 PYRO! 3.3 *(screen saver)* . . . . . 15.
3954 PowerStation 2.5 . . . . . 32.
3955 Suitcase II 1.2.2 . . . . . 45.
5178 FastBack II 1.0 . . . . . 109.

★FWB Software ... 30 day MBG
2232 Hard Disk Partition 2.0 . . . . . 41.
4683 Hard Disk DeadBolt 1.0 . . . . . 53.

★HJC Software ... 30 day MBG
4803 Virex 1.41 . . . . . 69.

ICOM Simulations
4084 On Cue 1.3 . . . . . 36.

Ideaform
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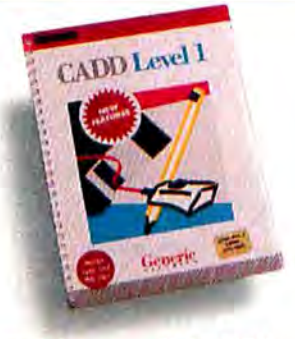
2420 MacLabeler Plus 3.0 . . . . . 42.

★Kent Marsh Ltd. ... 30 day MBG
2591 The NightWatch 1.03 . . . . . 87.
2592 MacSafe 1.08C . . . . . 87.



Generic Software ... 60 day MBG
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2732 GOfer 1.0 ..... 43.
★**Microseeds Pub. ... 60 day MBG**
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4210 Screen Gems 1.0 ..... 47.
2913 Redux 1.5 ..... 59.
Olduvai Software
4503 MultiClip 1.0 ..... 36.
3031 Icon-It! 1.1 ..... 39.
5030 ClipShare 1.0 ..... 99.
3030 FontShare 1.1 ..... 149.
★**PCPC ... 30 day MBG**
3175 HFS Backup 3.0 ..... 54.
★**Solutions, Intl. ... 60 day MBG**
3448 SmartScrap & The Clipper 2.0 ..... 46.
3449 SuperGlue 1.05 ..... 50.
★**SuperMac Software ... 60 day MBG**
3383 SuperSpool 5.0 ..... 53.
3382 SuperLaserSpool 2.0 ..... 79.
3378 Multi-User SuperLaserSpool 2.0 ..... 199.
3377 Diskfit 1.5 ..... 53.
3379 Network Diskfit 1.5 ..... 199.
3381 Sentinel 2.0 ..... 89.

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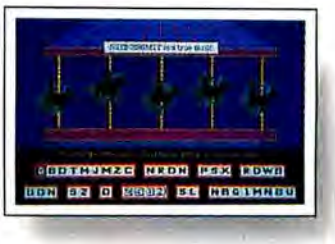
4728 MacSQZ! 1.51 ..... 52.
4729 S.U.M. 1.1 ..... 65.
5176 S.A.M. 1.0 ..... 65.
5171 S.U.M. & S.A.M. Bundle ..... 119.
★**Symmetry ... 30 day MBG**
3318 HyperDA 1.1 ..... 35.
★**Williams & Macias ... 30 day MBG**
3783 myDiskLabeler w/Color 2.9.1I ..... 31.
3784 myDiskLabeler w/LaserWriter 2.9.1LI ..... 34.
4976 Sticky Business 1.0.4 ..... 99.
Working Software
3788 Findswell 2.0 ..... 36.



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The Puzzle Gallery–The author of *Fool's Errand* takes you on a trip to Hazard Park, the last known carnival on earth. See any of the 40 attractions filled with 180 puzzles. Over 4 dozen digitized sounds. Color on the Mac II ..... $27.

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4109 MindWrite*Express* 2.1 ..... 139.
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1324 FullWrite 1.0 ..... 269.
★**Deneba Software ... 30 day MBG**
4700 BigThesaurus ..... 54.
1767 Comment 2.0 ..... 54.
1768 Coach Professional 3.0C ..... 105.
Electronic Arts
1543 Thunder II 1.0 ..... 52.
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2684 WorksPlus Spell 2.0 ..... 46.
★**Microlytics ... 60 day MBG**
2733 Word Finder 2.0 ..... 33.
4870 Electronic WordFinder 220 ..... 79.
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2885 Write 1.0 ..... 79.
2882 Word 4.0 ..... 255.
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4602 EndNote 1.1.1 ..... 82.
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4692 BookEnds 1.0E ..... 53.
3375 Sensible Grammar 1.1D ..... 53.
★**Symantec ... 30 day MBG**
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★**Symmetry ... 30 day MBG**
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★**T/Maker ... 30 day MBG**
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3961 Talking Tiles 1.0 ..... 69.
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1422 Geometry 1.2 *(CP)* ..... 59.
4067 Calculus 1.2 *(CP)* ..... 59.
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4367 MacDrums 1.01 *(CP)* ..... 32.
4483 Perceive 1.0 ..... 52.
Davidson & Associates
1734 Math Blaster! 1.0 *(CP)* ..... 27.
4978 Speed Reader II 1.0 *(CP)* ..... 36.
Electronic Arts
3941 SmoothTalker 2.1 ..... 33.
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4334 NumberMaze 1.0 ..... 27.
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4947 LearnWord *(beginner level)* ..... 39.
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★Spinnaker ... 30 day MBG
2329 SAT Score Improvement 1.0 *(CP)* .. 57.
Springboard
4493 Atlas Explorer *(CP)* ..... 28.
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3615 MacEdge II 1.0 *(CP)* ..... 27.
★Unicorn ... 30 day MBG
3751 Animal Kingdom *(CP)* ..... 27.
3756 Math Wizard *(CP)* ..... 27.

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Access Software
4655 World Class Leader Board Golf .... 28.
Activision
4475 Quarterstaff *(CP)* ..... 30.
4486 Manhole ..... 30.
5127 Manhole CD ROM ..... 35.
4592 Zork Zero *(CP)* ..... 35.
Broderbund Software
4099 Shufflepuck Cafe *(CP, air hockey)* .. 24.
4111 Moebius *(CP, adventure & arcade)* . 24.
4229 Where is Carmen Sandiego? *(CP)* .. 27.
4965 Auto Duel *(CP)* ..... 27.
4966 SimCity *(CP)* ..... 27.
1421 Ancient Art of War *(CP)* ..... 27.
4540 Ancient Art of War at Sea *(CP)* ..... 27.
Bullseye
1544 Ferrari Grand Prix *(CP)* ..... 32.
4074 P51 Mustang Flight Simulator *(CP)* . 32.
★Casady & Greene ... 60 day MBG
2268 Crystal Quest 2.2C ..... 26.
4119 Crystal Quest w/Critter Editor 2.2C . 42.
★Discovery Software ... 30 day MBG
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Electronic Arts
1842 Chessmaster 2000 *(CP)* ..... 28.
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4945 The Hunt for Red October *(CP)* .... 32.
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2037 Sub Battle Simulator ..... 29.
4660 Sub Battle Simulator for Mac II .... 29.
MicroProse
4697 Pirates! *(CP)* ..... 32.
★Microsoft ... 30 day MBG
2868 Flight Simulator *(CP)* ..... 33.
Miles Computing
2765 Fool's Errand *(CP)* ..... *special* 27.
5175 The Puzzle Gallery ..... 27.
2767 Harrier Strike Mission II *(CP)* ..... 32.
Mindscape
4083 Balance of Power 1990 *(CP)* ..... 30.
3987 Colony *(CP)* ..... 30.
4596 Deja Vu II *(CP)* ..... 30.
PCAI
3144 MacGolf 2.0 *(CP)* ..... 35.
4320 MacGolf Classic *(CP)* ..... 54.
4321 Lunar Rescue *(CP)* ..... 34.
4517 Road Racer *(CP)* ..... 39.
Sierra On-Line
3397 Leisure Suit Larry *(CP)* ..... 23.
3396 King's Quest III *(CP)* ..... 29.

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C.A.T. 2.0–A lightning-fast relational database for managing your contacts, tracking facts, figures, events, projects, writing letters, and performing mailmerges ..... $229.

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3503 Dark Castle ..... 27.
3502 Beyond Dark Castle ..... 27.
★Simon & Schuster ... 60 day MBG
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Sir-Tech
3347 Mac Wizardry *(CP)* ..... 35.
★Softstream Int'l., Inc. ... 60 day MBG
4071 Mac•Man *(w/adapter)* ..... 24.
4072 The Solitaire DA ..... 24.
4073 Colour Billiards ..... 35.
4995 Cribbage Tutor ..... 27.
★Spectrum Holobyte ... 30 day MBG
4175 Solitaire Royale *(for Mac SE)* ..... 20.
3464 Tetris ..... 20.
4472 Tetris *(color version)* ..... 24.
3462 PT-109 ..... 26.
3459 Falcon 2.0 ..... 32.
★Spinnaker ... 30 day MBG
2328 Sargon IV *(CP)* ..... 29.
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4988 Hidden Agenda ..... 36.

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★SubLogic ... 60 day MBG
4698 Jet *(CP)* ..... 32.

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4589 InterFAX Modem ..... 359.
★CE Software ... 60 day MBG
5172 QuickMail *(1 user add-on)* ..... 45.
5174 QuickMail *(5 user Pak)* ..... 175.
5173 QuickMail *(10 user Pak)* ..... 259.
★CompuServe ... 60 day MBG
1676 CompuServe Information Service .. 24.
1673 CompuServe Navigator 2.1 ..... 45.
1674 Standard Service/Navigator Bundle 59.
★DataViz ... 60 day MBG
1823 MacLink Plus 3.0 ..... 139.
4842 MacLink Plus/Translators ..... 119.
★Dove Computer ... 60 day MBG
4939 FastNet III ..... 450.
4938 FastNet SE ..... 450.
4937 FastNet SCSI ..... 925.
★Dow Jones ... 30 day MBG
1785 Desktop Express 1.03 ..... 95.
1786 Market Manager Plus 2.0 ..... 189.
★Farallon Computing ... 30 day MBG
4208 Timbuktu 2.0.1 ..... 65.
4866 Timbuktu Remote 1.0.1 ..... 195.
4867 Timbuktu 30-Pack 2.0.1 ..... 1395.
2201 TrafficWatch 1.08 ..... 139.
2203 PhoneNET PLUS *(DIN-8)* ..... 35.
2204 PhoneNET PLUS *(DB-9)* ..... 35.
4869 PhoneNET Connector 10-Pack ... 225.
4868 PhoneNET Repeater ..... 325.
2206 PhoneNET StarController ..... 1199.
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2219 Red Ryder 10.3 ..... 54.
Hayes
2300 Smartcom II 3.1 ..... 88.
2307 Smartmodem 2400 ..... 429.
5170 2400M *(internal)* ..... 419.
5169 2400M *(internal w/Smartcom II)* .. 459.
Insignia Solutions
4089 SoftPC 1.3 ..... 249.
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4975 LaCie Utilities 1.0 *(Includes SilverLining, SilverPlatter, and SilverServer)* ..... 89.

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My colleagues and I saved our pop cans for 3 months. On Monday, we had over 400—enough to buy *Crystal Quest*. It was time to call.

Reading your ordering instructions, we all laughed at the part about overnight delivery. You see, we're not close to Detroit, Chicago, Milwaukee, or Minneapolis. We're not even close to Duluth. We remember "overnight" deliveries that took 2 weeks.

Well, by 4:00 PM the next day we were already past the 5th wave, dealing with Dumples and Zarklephasers. Thanks for bringing the Upper Peninsula a little closer to the rest of the world.

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2214 **Fuji** 3½" DS/DD Disks . . . . . 17.
2792 **MAXELL** 3½" DS/DD Disks . . . . . 17.

3298 **Sony** 3½" HD Disks *(1.44 Meg)* . . . 39.
3773 **Verbatim** 3½" HD Disks *(1.44 Meg)* . 39.
2215 **Fuji** 3½" HD Disks *(1.44 Meg)* . . . . 39.
2793 **MAXELL** 3½" HD Disks *(1.44 Meg)* 39.

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★Avery ... 60 day MBG
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4865 3½" x 15/16" Address Labels *(Qty. 3750)* 15.
4811 8½" x 11" Transparencies *(Qty. 50)* 22.
4807 1" x 2⅝" Laser Labels *(Qty. 3000)* . 24.
Bantam Publishing
1403 Complete HyperCard Handbook . . 23.
★Computer Coverup ... 60 day MBG
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1722 ImageWriter LQ Cover . . . . . 8.
1725 Mac SE Ext. Keyboard Cover Set . . 10.
4657 LaserWriter II Cover. . . . . 10.
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2004 Mouse Cleaner 360° . . . . . 15.
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2379 MacLuggage Imageware II. . . . . 49.
2376 MacLuggage Macinware Plus . . . . 64.
2381 MacLuggage Macinware SE. . . . . 75.
Kalmar Designs
2531 Teakwood Roll-top Case *(holds 45 disks)* 14.
2532 Teakwood Roll-top Case *(holds 90 disks)* 21.
2533 Teakwood Roll-top Case *(holds 135 disks)* 31.
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2589 Universal Printer Stand . . . . . 15.
4126 LaserWriter II Cover. . . . . 17.

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Foreign keyboards are also available . . . . . call

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2545 Universal Copy Stand . . . . . 22.
4970 Modem/FAX Protector 10 . . . . . 19.
4971 Modem/FAX Protector 20 . . . . . 25.
4972 Power Tree 10 *(good)* . . . . . 19.
4973 Power Tree 20 *(better)* . . . . . 27.
4974 Power Tree 50 *(best)* . . . . . 54.
2559 Apple Security Kit . . . . . 34.
2556 Maccessories Anti-Glare Filter. . . . . 33.
2568 Maccessories SuperBase . . . . . 34.
2585 Printer Muffler 80 . . . . . 43.
2586 Printer Muffler 80 Stand . . . . . 24.
2583 Printer Muffler 132 . . . . . 58.
2584 Printer Muffler 132 Stand . . . . . 24.
4070 System Saver SE. . . . . 52.
2566 System Saver Mac *(platinum)* . . . . . 64.
2546 Maccessories A-B Box . . . . . 64.
5064 Apple Color Monitor Polarizing Filter 65.
5065 Full Page Display Polarizing Filter . . 65.
5066 Two Page Display Polarizing Filter . 135.
4941 Mac II Monitor Stand. . . . . 65.
4643 Mac II Stand and Cable Kit . . . . . 65.
2561 MasterPiece Mac II . . . . . 105.

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MacSnap 2S–Two 1-Megabyte 120ns SIMMs. Will expand a Mac Plus or SE from 1 Meg to 2.5 Meg with room for further expandability up to to 4 Meg. . . . . special $399.

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4623 Solid Oak Disk Case, made by New England craftsmen *(holds 90 disks)*. . 29.
★Mobius Technologies ... 60 day MBG
4470 Fanny Mac QT . . . . . 60.
★Moustrak ... 60 day MBG
2694 Moustrak Pad *(standard 7"x9")* . . . . 8.
2692 Moustrak Pad *(large 9"x11")* . . . . . 9.
2693 Moustrak Pad L/F *(9"x11")* . . . . . 10.
Moustrak Designer Series . . . . .ea. 12.
Ribbons
3255 ImageWriter II Ribbon. . . . . 4.
3261 ImageWriter II 4-color Ribbon . . . . . 9.
3270 ImageWriter II Rainbow Six Pack. . . 20.
3260 ImageWriter LQ Black Ribbon. . . . . 17.
★Simon & Schuster ... 60 day MBG
4230 *The Fully Powered Mac* book . . . . . 24.
★Sopris Softworks ... 60 day MBG
4016 MacPlus Cover *(navy)* . . . . . 15.
4171 Mac SE Std. Keyboard Cover *(navy)* . . 15.
4019 Mac SE & Ext. Keyboard Cover *(navy)* . 15.
4017 ImageWriter II Cover *(navy)* . . . . . 11.
4168 ImageWriter LQ Cover *(navy)* . . . . . 13.
4018 LaserWriter II Cover *(navy)*. . . . . 17.
4012 High Trek ImageWriter II carry case. 49.

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800k External Disk Drive–Features the latest in technology. Compatible with 512E, Plus, and SE. Includes LED disk access light. Formats disks as 400k or 800k HFS . . . . . $149.

4013 High Trek Mac Plus carry case . . . . 59.
4014 High Trek Mac SE & ext. kybd. case 69.
★Targus ... 60 day MBG
3618 ImageWriter II Carry Case. . . . . 49.
3617 Mac Plus/SE Carry Case. . . . . 59.
4015 Mac SE & Ext. Kybd. Carry Case . . 75.

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3102 2400 Baud External Modem..... 179.
3089 Mac Communications Pack 1.5 .. 225.
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3443 NetModem V2400 ..... 479.
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4308 BackFAX *(reqs. Apple FAX modem)*. 127.
★Synergy ... 30 day MBG
3130 VersaTerm 3.20..... 65.
3131 VersaTerm-PRO 3.0..... 189.
★TOPS ... 30 day MBG
3723 TOPS Mac 2.1..... 149.
3726 TOPS for DOS 2.1 ..... 119.
3724 NetPrint 2.0..... 119.
4715 InBox Connection Mac 2.2 ..... 75.
4714 InBox Starter Kit 2.2 ..... 199.
4188 TOPS Teleconnector *(DIN-8)* ..... 39.
4598 TOPS FlashBox..... 125.
3725 TOPS Repeater..... 129.
3720 TOPS Flashcard ..... 169.
★Traveling Software ... 60 day MBG
3729 LAP-LINK Mac 2.0 ..... 83.

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1819 MAC-101 Keyboard *(beige)*..... 145.

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2593 MacVision 2.0..... 219.
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2604 IS ADB 8½" x 11" Tablet ..... 255.
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5162 IS ADB 12" x 17" Tablet ..... 625.
2605 Cordless 4 Button Cursor ..... 65.
★Logitech ... 30 day MBG
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★Mobius Technologies ... 60 day MBG
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2808 A+ Mouse ..... 65.
2809 A+ Mouse ADB ..... 85.
★Nutmeg Systems ... 30 day MBG
2992 15" Monitor for Mac PLUS ..... 999.
2994 15" Monitor for Mac SE..... 999.
2993 15" Monitor for Mac II..... 999.
4002 19" Monitor for Mac PLUS ..... 1349.
4096 19" Monitor for Mac SE..... 1349.
4097 19" Monitor for Mac II..... 1449.
4849 LCD Interface *(Kodak DataShow)* . 399.
Olduvai Software
5138 Read-It! OCR Personal 2.0 ..... 99.
3034 Read-It! OCR 2.0 ..... 249.
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3036 Grappler C/Mac/GS 2.0 ..... 79.
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3282 Printworks (Dot Matrix) 3.5 ..... 43.
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4298 BitPad Plus ADB..... 325.
★Thunderware ... 30 day MBG
3648 ThunderScan 5.0 with PowerPort . 189.
4994 LightningScan ..... 409.

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5133 20 Meg Hard Drive..... 439.
3990 30+ Meg Hard Drive ..... 499.
3991 45+ Meg Hard Drive ..... 559.
★Dove Computer ... 60 day MBG
1801 SCSI Interface/Port ..... 109.
1807 MacSnap 524E..... 189.
1809 MacSnap 524S..... 249.
1811 MacSnap 548..... 499.
1812 MacSnap 548S..... 589.
1800 MacSnap 2SE..... 319.
1797 MacSnap Plus 2 ..... 319.
1804 MacSnap 2S ..... *special* 399.
1793 MaraThon 020 MSE1 ..... 585.
1794 MaraThon 020 MSE2 *(1 Meg)*.... 979.
1795 MaraThon 020 MSE3 *(math chip)* . 779.
1796 MaraThon 020 MSE4 *(1 Meg/chip)* 1159.
4663 MaraThon 030 Accelerator 32 Mhz . 999.
5103 Mac II Power Pack *(includes MaraThon 030 Accelerator, Four DIP SIMMs & RamSnap)* ..... 1799.
★LaCie, Ltd. ... 30 day MBG
4983 Maxcie Internal Drive Kit ..... 59.
(with Epson 40 Meg, 25ms)..... 509.
(with Epson 70 Meg, 25ms)..... 659.
4982 Maxcie External Drive Kit ..... 189.
(with Epson 40 Meg, 25ms)..... 625.
(with Epson 70 Meg, 25ms)..... 775.
★PCPC ... 30 day MBG
3177 HD-WSI *(Apple HD-20 to SCSI)*... 269.
3189 MacBottom HD 45 SCSI ..... 859.
4658 MacBottom HD 84 SCSI ..... 1249.

MATRIX
ProColor
montage FRI

FROM SCREEN TO SLIDE

Do film recorders live up to their promises?

Film recorders are being touted as the technology that can do for presentations what laser printers did for desktop publishing—take the control away from specialized off-site service bureaus and put it into the hands of individual users. These expensive machines supposedly let you create high-resolution 35mm slides of Macintosh images right at your desk, at the rate of one image every two or three minutes.

But are film recorders really the next laser printers? Doubtful. I tested seven film recorders—General Parametrics' PhotoMetric SlideMaker, Presentation Technologies' Montage FR1, Agfa Matrix's ProColor and SlideWriter, American Liquid Light's Still Light, Mirus' FilmPrinter, and Lasergraphics' LFR—and found them to be slow, memory-demanding, and finicky about the types of graphics and fonts they would produce. Add to this the fact that, with a single exception, film-recorder software takes complete control of the Mac while rasterizing images and exposing film. You may soon wish you had hired a service bureau to create the slides for you after all.

This isn't to say that film recorders don't have their good points. An under-$15,000 film recorder can pay for itself rather quickly if you produce a lot of slides. Image quality on most models is fine for presentations, and film recorders *do* give the user more control. But getting them to produce polished slides is a hassle you might not want to tackle without the support of a corporate graphics department or a person dedicated to understanding the film recorder's capabilities.

BY CHERYL ENGLAND SPENCER

PHOTOGRAPHS BY MICHAEL LEWELLYN

Simple Setup

Most film recorders are easy to set up; plug in a SCSI cable, install the software, and you're ready to start imaging. (The Still Light runs off a video board that you install in a Mac II slot.) The notable exception to the ease-of-installation rule is the Photo-Metric SlideMaker. You must install three separate pieces of hardware in order to run it.

Each film recorder comes with a modified 35mm camera: the viewfinder is sealed and, except for things like the film rewind and shutter button, all the controls have been removed. All but one of the film recorders use popular brand-name cameras such as Pentax. These cameras presented no problems in either ease of use or image quality. The Still Light's Mamiya camera, however, caused me several problems. After spending a couple of days exposing images, I discovered that the film had never caught in the sprocket—the whole roll came back from the photography lab unexposed. Another time the automatic rewind didn't work properly, and I lost the first three images on my roll when I opened the camera back to remove the film. The Still Light is the only film recorder that slips under the $4000 price barrier, but I'd pay a bit more for a reliable camera.

Several vendors offer optional Polaroid instant cameras for producing quick-and-dirty proofs of your slides. (Mirus is a notable exception: the FilmPrinter was designed so that the 35mm camera cannot be removed without disturbing the machine's calibration.) Although handy, instant cameras bring a new set of problems. Each time you take the camera off, you risk getting dust on the camera lens or on the film recorder's CRT. One round of slides I got from the PhotoMetric SlideMaker had highly visible spots on them. Cleaning the CRT with a cotton swab and the lens with a tissue took care of the problem, but I'd wasted a couple of days producing images I couldn't use. You'll want to clean the film recorder each time you switch cameras.

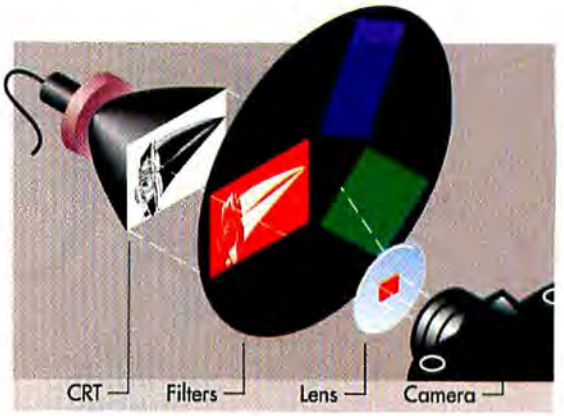
The only other hardware problems I ran into occurred with the LFR. First, it produces an annoying high-pitched whine. Second, I usually had to turn the LFR on and off a couple of times before it would begin imaging. Turning the LFR on and off too quickly, however, caused it to blow a fuse. Lasergraphics includes an extra fuse, but I blew both fuses before I had time to replace the spare.

Hey—Where Did the Lines Go?
The sailboat image from the LFR (left) and from the Montage was missing the white lines in the sail and in the body of the boat. The FilmPrinter picked up the lines (right) but didn't reproduce the small text at the bottom of the image.

A Wide Range of Software

Software varies greatly from very awkward (the FilmPrinter and the PhotoMetric SlideMaker) to extremely simple but extremely limited (the Still Light). Most of the film recorders work with PICT images. Because it has a Chooser-level driver, the FilmPrinter prints images directly from compatible software. This is especially useful in the case of a program like Cricket Presents, which does not create PICT files. With most film recorders, you must copy and paste a Cricket Presents image through the Clipboard, thereby losing background colors and effects. Since the FilmPrinter's Chooser driver directly supports Cricket Presents, you get all of an image's elements when you create a slide. None of the film recorders support PostScript yet, although Matrix and Lasergraphics claim their machines will be compatible soon.

The software for all of these machines lets you preview images to see how they will look in slide form. Presentation packages offer templates designed for the 35mm slide shape, but other software packages base their layouts on 8½-by-11-inch paper. What looks nice on letter-size paper might not turn out so well when viewed at the 3:2 aspect ratio of a slide. The best film-recorder software, such as that packaged with the Montage and the LFR, will also let you crop and scale images to fit the slide's aspect ratio.



The Inner Workings
Film recorders have a monochrome CRT at one end that acts as the light source for film exposure. This light shines through a color-filter wheel that positions red, green, and blue filters across the optical path. Finally, a 35mm camera exposes film to this light path, thus capturing the image. Only Mirus' FilmPrinter works differently: a mirror folds the optical path, allowing the film recorder to be as small as possible.

How the Software Performs

Sometimes an image looks fine on screen but will not print correctly. Usually the problem occurs because elements that can be displayed on screen cannot be imaged by the film recorder. In spite of its

Photographic Images
Only the LFR and the Montage can consistently produce 24-bit PICT images. None of the film recorders, however, can produce publication-quality images.

bad resolution, a Polaroid instant camera can give you an idea of what, if any, elements might not appear on a slide.

Matrix's Conductor software for the ProColor and the SlideWriter offers a good mix of options for producing images. You can batch (or group) images so that you can expose them overnight, or you can expose images one by one. You can set global or individual image defaults for background color (the color that will appear on the edges of the image if it does not take up the entire slide) and for horizontal and vertical layout options. You can also choose whether to use screen fonts or to have the software substitute high-resolution scalable fonts.

Except for the Still Light, which lets you preview, but not tweak, images, the other film recorders have almost the same set of features as the Matrix products. The difference is that only the Matrix software is designed to give reasonable results without your having to triple-check settings.

The Montage and LFR software (they both use Lasergraphics software) requires you to be alert when using it, but the packages that come with the FilmPrinter and the PhotoMetric SlideMaker require you to have saintlike patience. Mirus claims the FilmPrinter software was designed to accommodate users who want to print directly from applications—for instance, designing a slide and then printing it just as you would on a laser printer. But unlike an 8-page-per-minute laser printer, the FilmPrinter takes 20 minutes to print even a simple text image onto film (see "At a Snail's Pace").

The FilmPrinter scheme makes even less sense when you realize how poorly designed the software is for batching images. To set up your images you must go through more steps than with any other software. Furthermore, the software won't run unless you have the FilmPrinter attached and selected.

Just as hard to use, thanks to a convoluted hardware scheme, is the PhotoMetric SlideMaker software. When you purchase a PhotoMetric SlideMaker you're really buying into General Parametrics' presentation system. At the center is the VideoShow, a small box that displays

MICHAEL LEWELLYN

Although large, Matrix's SlideWriter comes on wheels for easy moving.

images on an analog RGB monitor that scans at multiple horizontal rates (a Macintosh color monitor won't work). You must use the VideoShow to drive the PhotoMetric SlideMaker.

Before using the PhotoMetric SlideMaker, you must go through a cumbersome process of adding images to a scrapbook, where you can tweak them. You can only apply background colors globally, and the method for selecting a color is convoluted and counterintuitive. Once your images are ready, you format a floppy disk so that it contains the images and the VideoShow operating system. Obviously, the number of images you can process at once is limited to the number that will fit on a floppy. You place the formatted floppy disk in the VideoShow and choose the image resolution and film type from an IBM PC–like menu on the RGB monitor. If you pick the wrong settings, you can't just return to the menu—you have to reboot the VideoShow.

The VideoShow is poorly designed for use as an individual film recorder. A corporation, however, might find the setup convenient. Users can create presentations at their desks on any type of Mac, then preview and image them at the VideoShow station. No Macintosh processing time is used. Still, the top-end VideoShow unit costs nearly $9000 alone.

Image Quality Concerns

How much you have to futz with a film recorder and its software, however, is

THE THEORY OF IMAGE QUALITY

All of the film recorders offer at least two imaging modes: final and draft. Final mode produces images at the highest resolution a film recorder can muster, while draft mode sacrifices some resolution to speed up the imaging. All except the Still Light claim a high resolution of 4000 lines (4096 pixels across by 2732 pixels down). In film recorder lingo, a 4000-line resolution is called 4K, while the lower 2048 by 1366 resolution is called 2K.

These numbers, however, don't mean anything out of context. Think of the CRT inside the film recorder as an array of pixels. Pixel size depends on the size of the spot made by the light beam inside the CRT. If the spot size is bigger than the amount of space the CRT has allotted, then the resulting pixels will overlap. Too much overlap makes two pixels look like one and often causes an image to look fuzzy.

The 2K and 4K statistics refer to the *addressable* resolution—the resolution the film recorder can draw. The more important *resolvable* resolution is what you see on the finished slide. To minimize pixel overlap—and increase resolvable resolution—the film recorder needs a high-quality CRT with a small spot size. Size partially determines CRT quality; in our tests, the film recorders with 6-inch or 7-inch CRTs (the SlideWriter, ProColor, and LFR) produced the sharpest text and smoothest curves.

Within a given CRT size range, however, quality varies. Both the SlideWriter and the ProColor use 7-inch CRTs, but according to Matrix, the SlideWriter has a higher-quality tube. The LFR uses a 6-inch CRT but beats out the ProColor in sharpness. Better quality comes at a price, however; the SlideWriter is the most expensive, followed by the LFR, and then the ProColor.

probably not your main concern. The real question is, "How good are the images?" The film recorder companies claim that their drivers support QuickDraw output, but from the problems I found, it's obvious that none of them have completely solved the riddle.

A quality film recorder should produce sharp text and graphics. How did I measure sharpness? One test image consisted of black text ranging from 9 to 127 points on a white background. A # symbol was placed in the center and in the four corners. When viewed under a 4x loupe on a light box, the 9-point text and the # symbols were sharpest on the SlideWriter, LFR, and ProColor. The Montage and the FilmPrinter both produced reasonable results, although the text and the symbols were not nearly as well defined or as dark as on the SlideWriter. The FilmPrinter also had a problem none of the other film recorders had—the symbols in the corners were much blurrier than the one in the center. Likewise, when I projected the images, the same differences were apparent, especially at longer distances.

The Still Light and the PhotoMetric SlideMaker flunked this test grandly. The text from the Still Light was brown, not black; it was very blurry, and because the Still Light uses screen fonts, it looked rough compared to the scalable fonts of the other film recorders. The PhotoMetric SlideMaker produced extremely "thick" text; it looked fine at large sizes but was illegible at 14 points and too closely spaced even at 36 points. The # symbol looked like a black blob.

Since not too many people use black text on white backgrounds for their graphics, I also looked at sample images from presentation and graphics packages. Not surprisingly, the film recorders that did the best on the black text image also did the best on the other images. During these tests the reason for the thickness of the PhotoMetric SlideMaker's text also became apparent: the film recorder outlines all fonts in black.

A

B

Handling Hairlines
On the world map, the ProColor (A) and the SlideWriter produced thin, true-to-the-screen lines. The Montage (B) and the LFR produced thicker, more visible lines.

AT A SNAIL'S PACE

To test the film recorder speeds, I ran three images at both high and low resolutions (see "Speed and Consistency"). The images were sharper, and in some cases the colors richer, when produced at the higher resolution. Using a lower resolution, however, most film recorders ran from two to four times faster.

The SlideWriter, ProColor, LFR, and FilmPrinter maintained consistent imaging speeds, no matter how simple or complex the image. The PhotoMetric SlideMaker and the Still Light bogged down considerably when asked to produce a complex image; the Montage slowed to a lesser extent.

Some film recorders, such as the SlideWriter, are slower when creating light-colored images than when creating darker ones. The SlideWriter is *time modulated;* it keeps a consistently bright beam of light in one place until the film is properly exposed. The ProColor, on the other hand, is *intensity modulated;* it increases the intensity of the beam to produce light areas, thereby shortening the time the beam has to stay in one place.

Unfortunately, the tricks for speeding up film recorders gain you only a few seconds and may not be realistic. For instance, you can speed up the Montage by adding more memory to the Mac and keeping as much free space as possible on the hard disk (I ran these tests on a Macintosh II with 5MB RAM, MultiFinder turned off, and 10MB free hard disk space). You can run the Montage in the background, but this slows your work to a crawl.

Since the machines are so slow, you'll probably want to print overnight. If you have more than 36 images (the maximum number of frames in a 35mm roll of film), either you'll have to plan on extra nights for printing or you'll need to get a bulk loader.

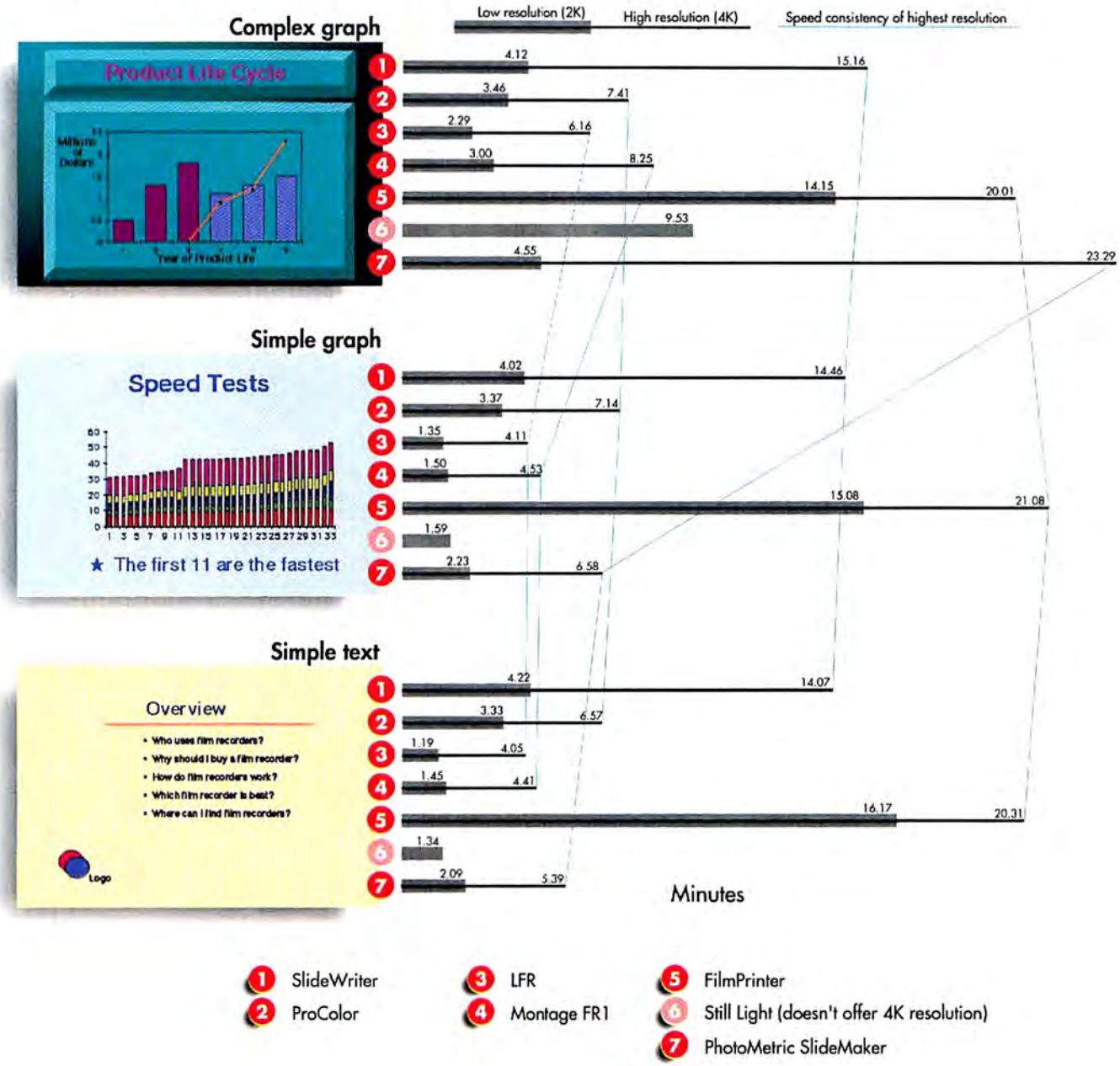
Is Sharpness Really What You Want?

In general, sharpness is considered a positive trait. But if a film recorder is very sharp, you risk losing hairlines because the spots on the CRT are small enough to get lost in the sea of surrounding color. Two images clearly demonstrated this effect—a world map that had thin lines connecting cities, and a slide with concentric rectangles of hairlines.

The high-resolution SlideWriter produced very thin lines that showed some breaks on the map; the hairline rectangles on the other image were hard to see. The Montage produced much thicker lines on both the map and the rectangle—the best of the lot. Oddly, however, the LFR, which placed second to the SlideWriter in sharp-

Paris to Seattle the Hard Way
The PhotoMetric SlideMaker had a tough time with the world map image. Lines didn't go where they were supposed to and were either too thick or too thin.

SPEED AND CONSISTENCY



ness, produced lines that equalled those of the Montage. The FilmPrinter, comparable in price and sharpness to the Montage, created thin lines with lots of breaks; color from the objects behind the lines also bled into the lines.

Once again, the PhotoMetric SlideMaker and the Still Light couldn't compete. The PhotoMetric SlideMaker produced some thick lines and some thin ones. Even worse, it couldn't send the lines where they were supposed to go (see "Paris to Seattle the Hard Way"). The Still Light at least got the connections right, but it showed extreme color bleed, bad line breaks, and very bad blurriness.

ALL THOSE COLORS

The colors a film recorder produces have a big influence on how satisfied you are with images. For instance, I was immediately impressed by the pinkish tints of the ProColor and the FilmPrinter images. A *Macworld* production editor, however, said the colors looked normal to him, since he typically uses film with a red tint.

Everyone who viewed the slides was instantly struck by the richness of the colors the LFR produced. The LFR, the ProColor, and the SlideWriter also produced colors that matched the monitor best. The Still Light was able to match the

FILM RECORDERS COMPARED

	LFR	FilmPrinter	Montage FR1	PhotoMetric SlideMaker	ProColor
	Lasergraphics	Mirus Corporation	Presentation Technologies	General Parametrics Corporation	Agfa Matrix
Price	$9750	$5895	$5995	$4495[1]	$6495
Addressable resolutions	4K, 2K	4K, 2K, 1K	4K, 2K	4K, 2K	4K, 2K
CRT size (in inches)	6	2.75	3	3	7
Spot size (in millimeters)	1.7	.04	.05	.048	.1
Uses Mac to rasterize image	•	•	•		•
Supports PICT files	•	•	•	•	•
Supports 24-bit images	•		•	[2]	•[3]
Maximum colors per slide	16.7 million	16.7 million	16.7 million	[1]	256
Color balance controls	•	•	•		•
Batches images	•	•	•	•	•
Batches images with different resolutions	•	•	•		
Chooser driver	•	•	optional		
Number of fonts supported	6	13	43	30	[4]
Optional fonts	43	22			
Aspect ratio	3:2	3:2	3:2	3:2	3:2; 4:3
Preview	•	•	•	•	•
Scaling	•	•	•	•	•
Cropping	•	•	•		•
Background coloring supported	•	•	•	•	•
Colorizing text or objects supported	•	•	•	•	•
Camera manufacturer	Pentax with Nikon lens	Konica	Pentax	Pentax	Pentax
Automatic rewind	•		•		
Optional bulk loader	•			•	
Optional Polaroid instant camera	•		•	•	•
Overall dimensions (l x w x h, in inches)	25 x 11 x 9	19.1 x 8.8 x 5.5	17 x 14.25 x 6.5	13.2 x 14.6 x 5.6	20 x 15 x 11
Weight (in pounds)	33	16	20	12.7	38
Warranty	90 days	1 year	90 days	90 days	1 year

[1] You must also purchase a VideoShow model; the VideoShow Companion ($1795) and the VideoShow Executive support 1000 colors; the VideoShow Professional ($8995) supports 5000 colors (100,000 for photographic images).

[2] Supports 24-bit images smaller than 1.5MB or ones from Truevision's NuVista board.

[3] TIFF only.

[4] Matrix replaces the seven most common fonts (such as Courier, Helvetica, and Symbol) with high-resolution fonts. Other fonts are produced as bitmaps.

screen well in some cases—for instance with darker greens and blues. But whenever a white background was involved, the colors faded drastically and even took on different hues.

Some film recorders provide ways to alter color brightness and hue. Each film recorder has a set of film-color tables built into the hardware. These tables are set to give you the best color results from a particular type of film. So although you can use any roll of 35mm slide film you have handy, you will have better color control if you use one of the types specified for the film recorder. Several of the film recorders also include color-balance controls, either in software or hardware, so that you can change the amount of red, green, or blue the film recorder produces.

TROUBLES? WE GOT TROUBLES

If you looked only at sharpness and color quality in film recorder results, you'd be satisfied with several of the products. Unfortunately, my slides gave me a lot of surprises. One image in particular, a sailboat example from Canvas 2.0, caused problems for several of the film recorders and indicated the kinds of trouble you can encounter if you just throw graphics at a film recorder without considering potential problems.

Neither the Montage nor the LFR could draw all the lines in the body of the boat. Presentation Technologies claims the lines were too thin for the software to manage, but the Montage didn't have this problem with the equally thin lines on the world map. The FilmPrinter lost the small text at the bottom of the image when it was produced at 4K resolution, but imaged the text fine in 2K mode.

Other problems appeared with a 24-bit PICT image. Currently, the SlideWriter

SlideWriter	Still Light
Agfa Matrix	American Liquid Light
$11,795	$3995
4K, 2K	2K, 1K
7	2.9
.05	.05
•	•
•	•
•[3]	
256	16.7 million
	•
•	•
•	
[4]	screen fonts
	n/a
3:2	3:2
•	•
•	
•	
•	
•	
Pentax	Mamiya
	•
•	•
	included
18 x 12 x 36	16.8 x 7.8 x 5.9
42	11.8
90 days	90 days

and ProColor can produce only 256 colors in a PICT image. When I called Matrix's technical support, identifying myself as a typical user, the support person offered to send me version 2.2 of the software, which handles 24-bit PICT images. This version produced the image satisfactorily, although the colors were not as crisp as on the LFR or Montage.

But just because a company claims that it can produce 16.7 million colors on a slide doesn't mean it can create 24-bit PICT images. Neither the FilmPrinter nor the Still Light could produce the 24-bit image. The PhotoMetric SlideMaker couldn't handle it either, since it doesn't work with images larger than 1.5MB (mine was over 2MB).

The biggest surprise, however, was the loss of background colors in some PowerPoint slides produced on the PhotoMetric SlideMaker. A call to General Parametrics revealed that the film recorder does not support pixel patterns—a technique used by some software products (like PowerPoint) to create colors. In addition, the PhotoMetric SlideMaker does not support clip regions.

Is There a Winner?

The Mirus FilmPrinter gets kudos for a good effort: the machine is small and sleek, the colors are good, and the software packs a lot of features. But this machine has some serious problems that won't be easy to solve. The software is awkward to use, image quality degrades around the edges of the slide, the machine is the slowest of them all, and there's no way to substitute other cameras.

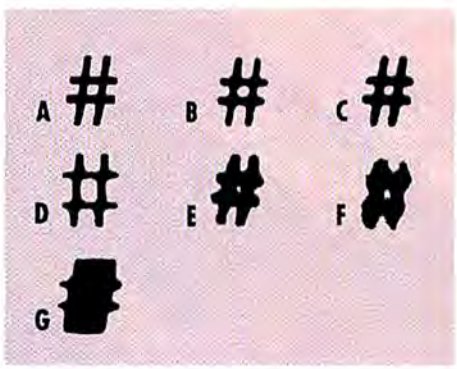
Several steps up on my shopping list is the LaserGraphics LFR, with its rich colors and sharp text. This film recorder, however, couldn't handle the sailboat image gracefully—dropping elements out of a graphic is no minor problem. Presentation Technologies' Montage also left out lines on the sailboat. Otherwise, this machine would have been a good choice, thanks to its relatively reasonable price, satisfactory image quality, small footprint, and well-thought-out options, such as a camera that creates miniature overhead transparencies.

I'd put Matrix's high-quality SlideWriter at the top of the list, followed by the ProColor. These two have the best combinations of features and ease of use in the software. None of the film recorders can produce publication-quality 24-bit images, so the fact that Matrix's current software does not support more than 256 colors per slide wasn't a factor. More important was the fact that these machines produce sharp text and consistent, reliable results. My first-choice product, the SlideWriter, with the best image quality by far, has an optional bulk loader, and can be wheeled easily from place to place.

General Parametrics' PhotoMetric SlideMaker and American Liquid Light's Still Light aren't even in the running. Poor

MICHAEL LITCHFIELD

Mirus' FilmPrinter (top left) and Presentation Technologies' Montage FR1 (top right) fit easily on a desktop. Matrix's ProColor (bottom left) and Lasergraphics' LFR (bottom right) are heavier and bulkier.



Fuzzy Symbols
You can see a wide difference in how sharply film recorders produce text. Shown in order from best to worst quality are the #-symbol images produced by SlideWriter (A), LFR (B), ProColor (C), Montage (D), FilmPrinter (E), Still Light (F), and PhotoMetric SlideMaker (G).

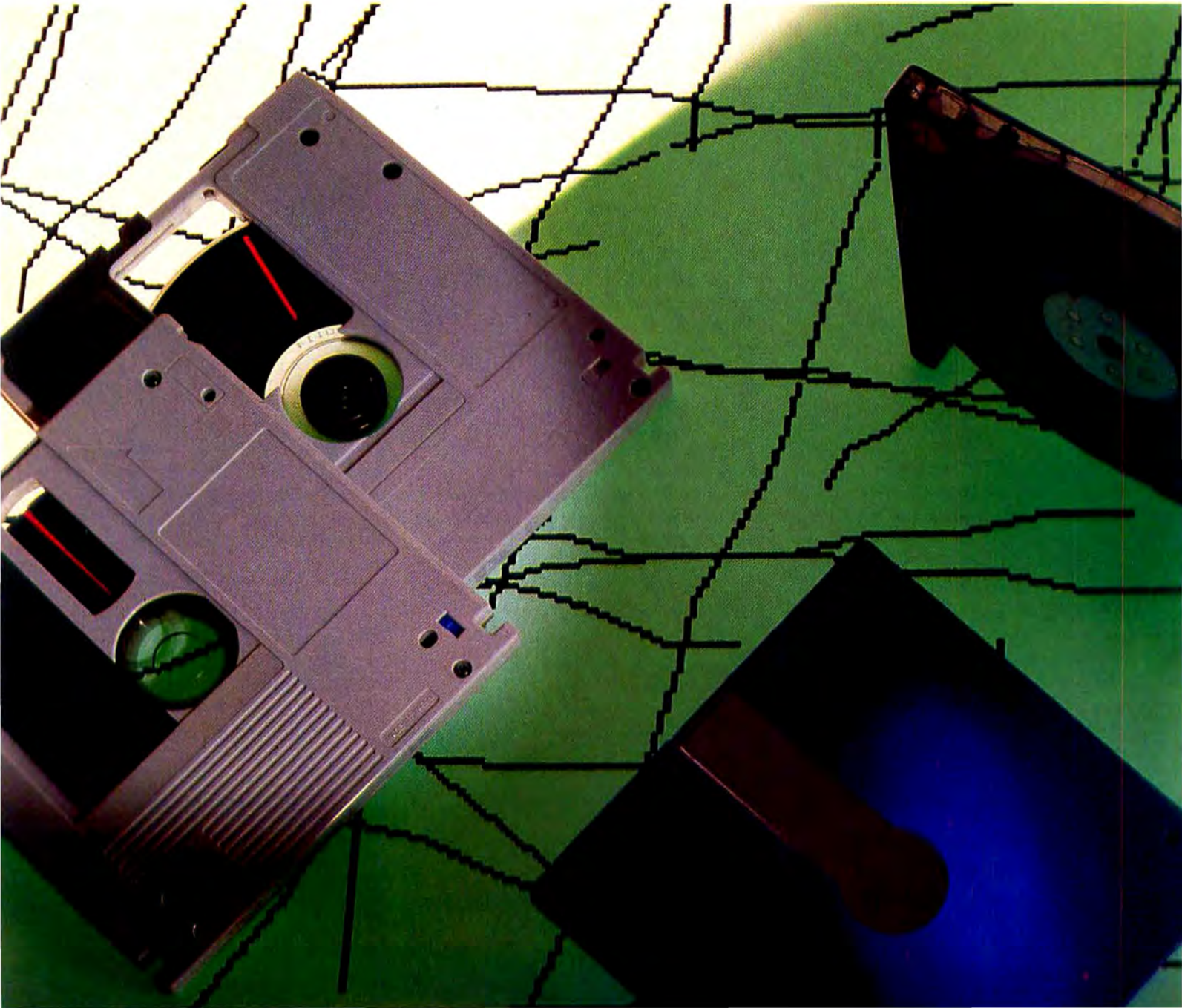
image quality alone knocks them out. If you add in problems with setup and convoluted software (the PhotoMetric SlideMaker) or zero-options software (the Still Light) these products aren't even within arm's reach of the others.

So stay tuned. If the problems get worked out, you'll see some machines that do take control away from a service bureau and put it into your hands. ■

See *Where to Buy* for contact information.

HARD DISK

ALTERNA



TIVES

A HARD DISK MIGHT NOT BE YOUR BEST BET FOR DATA STORAGE

by Charles Seiter

In an ideal world, storage devices should offer blazingly fast read/write speeds and nearly infinite capacity—all at dirt cheap prices. Well, some large-capacity hard disks do store up to 900MB of data and operate at speeds competitive with smaller-capacity disks, but these drives are far from dirt cheap.

In the past few years, however, alternatives to large-volume hard disks have been appearing—alternatives that are making headway in the search for fast, inexpensive, high-capacity storage media. For instance, Iomega provides very high density floppy disks, such as the 10MB-or-more Bernoullis (which require a special drive). Other companies offer removable, 40MB hard-disk cartridges and drives. (For an overview of these types of storage, see "Getting Started with Mass Storage," *Macworld,* December 1988.) Even more recently, optical storage systems such as write-once, read-many (WORM) drives and erasable optical (EO) drives have become available.

To find the right alternative to a large-capacity hard disk, you should assess how many megabytes of storage you need and how fast you want to access the data you store. Once you have an idea of your storage requirements and your impatience level, it will be easy to pick the right kind of storage device.

PHOTOGRAPHS BY FRED STIMSON

Technology and Economics: A Quick Study

Before discussing the virtues and vices of the different types of storage, it's worth spending a moment considering hardware and its cost.

First, to store lots of data on a disk, you need lots of data-writing tracks. A standard Mac 3 1/2-inch floppy has 80 data tracks and stores 0.4MB per side. One company, Kennect, offers two drives that increase the capacity of floppies and also read and write 3 1/2-inch IBM PC floppies. The Rapport increases capacity on 800K floppies to 1.2MB; the Drive 2.4 increases capacity to 2.4MB on 3 1/2-inch high-density disks—enough to store a 24-bit image.

But for storing numerous large files, an erasable optical disk is hard to beat. The Sony erasable optical disk (5 1/4 inches) has 18,751 tracks per side, and stores about 600MB total on the two sides. (The Sony and the Ricoh EO-drive engines differ somewhat in capacity because of different error-correction schemes.) If you do the math, you'll notice that the erasable optical disk requires fewer data tracks to hold the same amount of information as the floppy. That's because optical disks, both WORMs and erasables, have higher track densities than floppies or standard hard disks.

Second, to get fast data transfer a storage device must be able to spin the disk rapidly and also read and write at high rotational speeds. At present, the champion at these tasks is the familiar hard disk. The slowest rotational speeds belong to traditional floppy disks (in some cases they're about one tenth as fast as hard disks) while removable drives begin to approach hard disk speeds. Optical drives, which must heat data spots with a laser to read them, are much slower performers than drives that spin a disk.

The last point, simple economics, is that prices drop as more devices are sold. Prices of EO drives are likely to fall, since current drives represent only the first generation of these devices. Removable-cartridge hard disks, on the other hand, have dropped in price over the past two years as they have become more popular, and they now exhibit fairly stable prices. Technologies now occupying niche markets are unlikely to become much cheaper. Bernoulli drives, special high-density floppy drives, and WORM drives may be as far along the price/volume curve as they are ever likely to be. Although these trends are only approximate, they are worth keeping in mind if you can wait six months or a year before making a removable-storage selection.

Fun with Floppies

If you need some type of backup facility that calls for less disk handling than standard floppies require and also has more capacity, then a high-density (10MB or more) floppy disk is a good choice. These disks are ideal if don't need to process scores of megabytes per day, but you want to minimize costs.

The original high-density floppy was the 10MB Bernoulli pioneered by Iomega. The Bernoulli system allows a 5 1/4-inch floppy disk, spinning at high speed, to float on a cushion of air a few microinches away from a solid surface containing a read/write head. Iomega has pushed this technology to handle 40MB at speeds comparable to a hard disk. Even so, the newer Bernoulli drives have no cost advantage over 40MB removable-cartridge hard disks, and fewer of the benefits, such as cartridge compatibility from vendor to vendor. Bernoulli drives and media have an enviable reputation for reliability and durability—one of the benefits of a system that's been around for a few years.

Another type of high-capacity floppy drive uses special, preformatted disks in

FINDING ALTERNATIVES

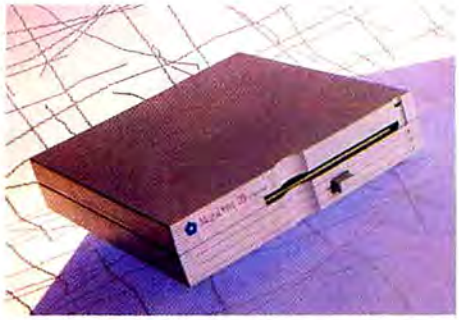
	Product	Drive Price	Media Capacity	Media Price
HIGH-DENSITY FLOPPY DRIVES				
Dolphin	Flipper 20	$995	20MB	$95
Jasmine Technologies	MegaDrive 20	$999	20MB	$83
Mirror Technologies	RM20	$897	20MB	$177[1]
Peripheral Land	Infinity 10	$1195	10MB	$149
BERNOULLI DRIVES				
Iomega	Bernoulli Box	$1999	20MB	$125
	Bernoulli Box Single 20	$1650	20MB	$83
	Bernoulli Box Dual 20	$1999	44MB	$125
Progress Systems	Bering Totem II	$1295	20MB	$85
SYQUEST CARTRIDGE DRIVES				
Bay Microsystems	44 Repack	$1149	42MB	$108
Crate	ExpandaCrate	$1525	42MB	$127
Dolphin	Flipper-44	$1776	42MB	$165
DPI	DPI 44	$1169	42MB	$129
FWB	hammerDisk44	$1895	42MB	$149
Info Technologies Drives	Info42R	$1200	42MB	$125
La Cie	Cirrus 45	$1099	42MB	$100
MacProducts USA	Magic 45	$1495	42MB	$149
Mass Microsystems	DataPak	$1799	42MB	$149
MicroNet Technology	Micro/Removable 45	$1645	42MB	$169
Peripheral Land	Infinity 40 Turbo	$1795	42MB	$149
Relax Technology	Mobile 42 Plus	$1695	42MB	$129

[1] *Price for pack of three.* [2] *Not sold separately.*

which signals coded on the disk allow ultraprecise drive-head positioning to boost track density. One such drive, Peripheral Land's Infinity 10, is only about a third as fast as a fast hard disk, but it can store 10MB on a preformatted 5¼-inch Konica floppy disk that costs only $25 (much cheaper than Bernoulli disks or removable–hard-disk cartridges, which typically cost $120 or more). The drive can also read data from MS-DOS–formatted floppies, an advantage that has been eroded slightly by the appearance of Apple's FDHD (Floppy Drive High Density), which can also read MS-DOS floppies. Two other drives, the MegaDrive 20 from Jasmine and the RM20 from Mirror Technologies, provide 20MB of storage using comparable technology. These drives are slightly faster than the Infinity 10, but the Verbatim disks they both use cost three to four times more than the Konica disks for the Infinity 10. Jasmine, in particular, deserves to be commended for providing professional, detailed documentation, superior product support, and a valuable set of disk-management utilities.

Removable Cartridges

If you wish you had a fast 400MB hard disk, but you don't need to use all 400MB at once, then a removable, 40MB hard disk cartridge could be the answer. These drives are typically as fast as or faster than the hard disk you use now. Removable-cartridge hard disks used to cost $3000 or more, but now they sell for as little as $1100. Standard 40MB (42.5MB, to be precise) cartridges can sometimes be found for as little as $100, and you just buy new ones as you fill up older ones.



Jasmine's MegaDrive 20 high-density floppy

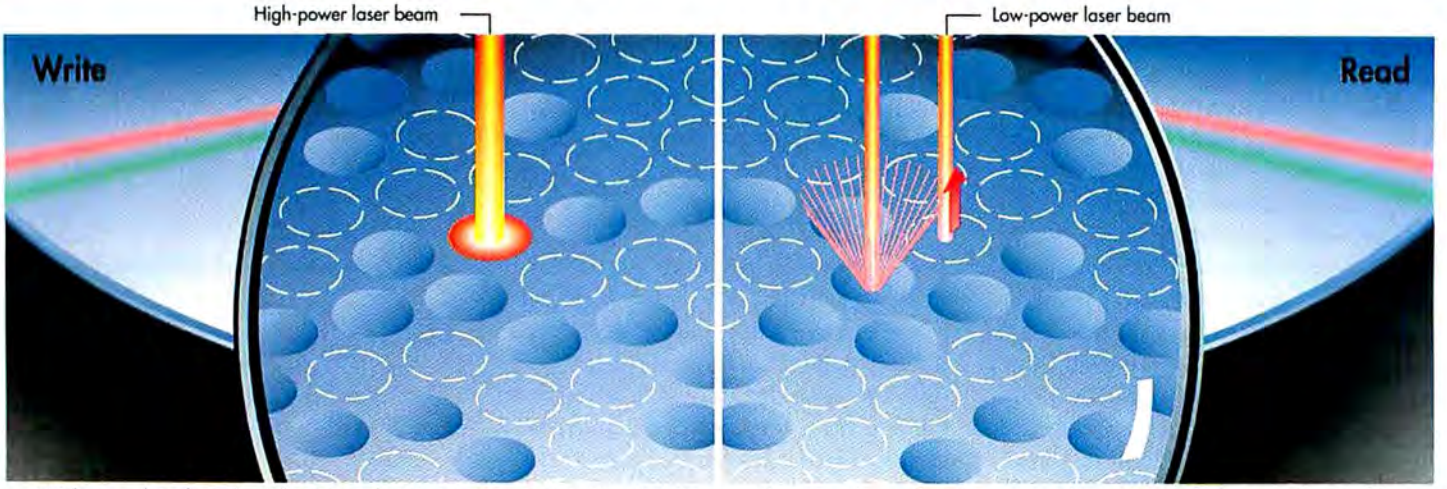
Racet's Cosmos 600 erasable optical drive

Syquest's removable cartridges and drives have been very successful in the Macintosh removable-storage market. Vendors purchase the drives from Syquest and repackage them. Because all of the drives are manufactured by Syquest, the disks can be used interchangeably between Syquest-based systems from different vendors (sometimes, however, you must avoid using a vendor's driver in order to maintain compatibility). You can pull a cartridge from a Syquest drive at the office, put it in your briefcase, and duplicate your office computing environment anywhere (home, for example) that you have another Syquest-based drive. Another popular use of cartridges is for building functional environments; one cartridge can contain all your spreadsheets, databases, and financial data; another can contain graphics and CAD applications. These drives offer performance as respectable as most hard drives—in the plain vanilla Mac SE I used for testing, they all seemed shockingly brisk compared to the internal HD20SC.

The retail price range of $1100 to $2000 for drives and approximately $100

	Product	Drive Price	Media Capacity	Media Price
REMOVABLE HARD DRIVES				
Mass Micro Systems	UniPak 50	$600 chassis	48MB	$1200
	UniPak 85		84MB	$1799
	UniPak 100		102MB	$2599
Mega Drive Systems	Disk Pack 21	$799 chassis (2-slot)	21MB	$899
	Disk Pack 42		42MB	$1299
	Disk Pack 84		84MB	$1699
ProStor	TransPac 32	$285 chassis	32MB	$1095
	TransPac 42		42MB	$1565
	TransPac 84		84MB	$2230
	TransPac 100		100MB	$2450
	TransPac 200		200MB	$4950
ERASABLE OPTICAL DRIVES				
FWB	hammerDisk600	$4995	600MB	$299
Jasmine Technologies	DirectOptical	$4995	600MB	$298
PCPC	OER600	$4995	600MB	?
Pinnacle Micro	REO-650	$5995	600MB	$250
Racet Computes	Cosmos 600	$5995	600MB	$295
Sumo Systems	RSSM-6000	$4500	600MB	$260
WORM DRIVES				
Colby System	Colby WORM	$2899	400MB	$125
Giga Cell Systems	Data WORM 800	$5460	800MB	$279
Laserdrive	Model 820	$5995	400MB or 800MB	$109/$199
Laser Optical Technology	Optical WORM	$3995	800MB	$150
Storage Dimensions	LaserStor	$4995	800MB	$150

HOW A WORM DRIVE WORKS



A high-power laser heats the disk substrate, leaving a permanent pit on its surface for a binary 0. A binary 1 is created by leaving the disk surface smooth and reflective. The binary numbers represent data in a way the Macintosh can understand.

A low-power laser reflects from areas with no pits to read a binary 1. The pits diffuse the laser, creating no reflection to read a binary 0. These binary numbers are read by the Macintosh and appear on your screen as data.

to $195 for cartridges is somewhat surprising, given that all these materials are made by a single manufacturer. Since many of the drives are available from mail-order retailers, as are the cartridges, competition decides the market price of these units. The removable-cartridge field is sufficiently competitive that you can expect some of the firms currently packaging this medium to eventually abandon this market. Your best bet is to visit a dealer and ask what utilities and documentation are provided with the different drives. Drive utilities from larger vendors (Jasmine, Mass Microsystems, and Peripheral Land, for example) are often worth several hundred dollars on their own. The drives also have slight packaging variations—size, shape, switch position—that may make a difference to you, and you won't be able to tell this until you see the drive at close range.

You needn't worry about the safety of data on a removable cartridge that gets bumped or dropped. An informal but extensive poll of Mac user groups and bulletin boards failed to turn up any horror stories. If you don't drop the cartridges from great heights onto hard surfaces, or drive your data around in the back of a pickup truck, it appears that this system is safe. If you are buying general-purpose removable storage for modest amounts of data in the next year or so, it's hard to think of reasons not to consider a Syquest-based system.

Removable Hard Drives

A variation on the Syquest drive is the removable hard drive. This setup, in which the drive mechanism is enclosed in a sealed cartridge along with the disk, is claimed by manufacturers to be more secure than the Syquest cartridges because of superior mechanical shock resistance. Removable hard drives are more expensive, however, since each cartridge contains an electromechanical device instead of just a disk. Where a removable-cartridge drive typically costs $1500 and a 40MB cartridge costs $150, a removable hard drive consists of an $800 chassis and a $1600, 80MB disk pack (40MB, 80MB, and 100MB packs are available for most systems). If you own two chassis, you can shuffle the disk pack between them.

Mega Drive's Disk Pack removable hard drive

MacProducts' Magic 45 Syquest cartridge drive

Removable hard drives are as fast as the fastest hard drives. This speed—rather than superior data security—is their principal advantage. If you insist on the fastest removable storage, and you can handle the price, these drives are what you want. Mega Drive, Mass Microsystems, and ProStor offer units in this category.

For both the Syquest-based removable cartridges and removable-hard-disk drive units, backup is fast and painless, giving you an exact reproduction of the contents of your hard disk.

WORM Drives

Optical removable-media–mass-storage schemes are now available from several

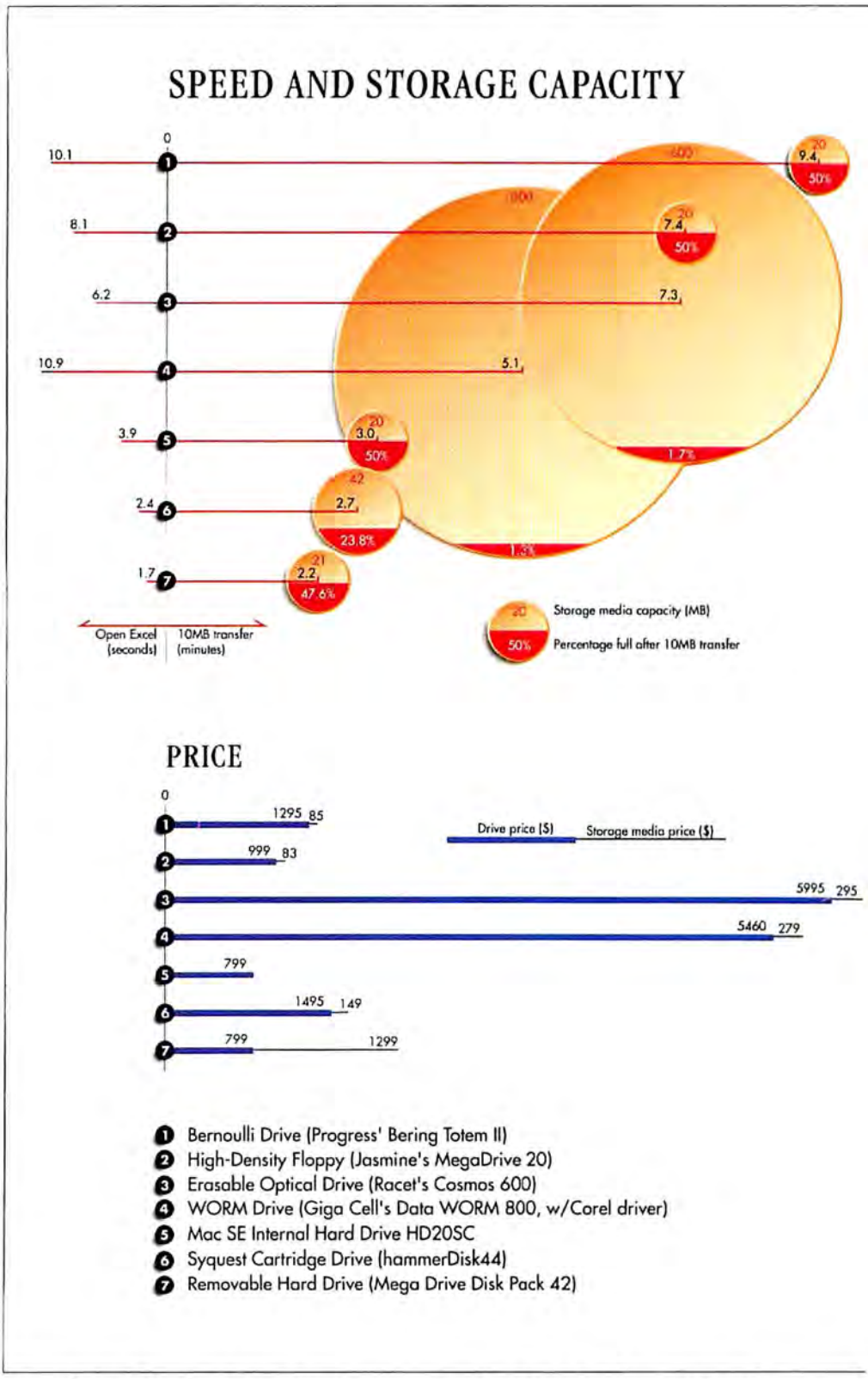
sources. One system, the WORM drive, uses a laser to burn optical "holes" in a reflective disk (see "How a WORM Drive Works"). The disk looks somewhat like a CD ROM (and is, in fact, basically a CD ROM that you can write on) that is enclosed in a cartridge for dust protection.

WORM disks have the same advantages as compact disks—they have large data capacity (400MB and 800MB) and are nearly indestructible. They also have the same disadvantages—they are expensive, and once they're written, that's it. But in many applications, such as archiving financial or medical information, or storing graphics, nonalterability is an important asset rather than a liability. WORM drives are slower than hard disks, but since they are typically used as archival media, that's not a serious drawback.

Each company that makes a WORM drive uses a slightly different disk, but all use the same basic read/write mechanism. The earliest drive media used photosensitive metal oxide coatings, whereas newer media employ a dye-polymer layer to accept the laser write-beam, promising cheaper disks and longer disk life. It's possible that activity in the WORM business could heat up overnight with widespread acceptance of a cheap, fast-writing new medium (see "Digital Paper?").

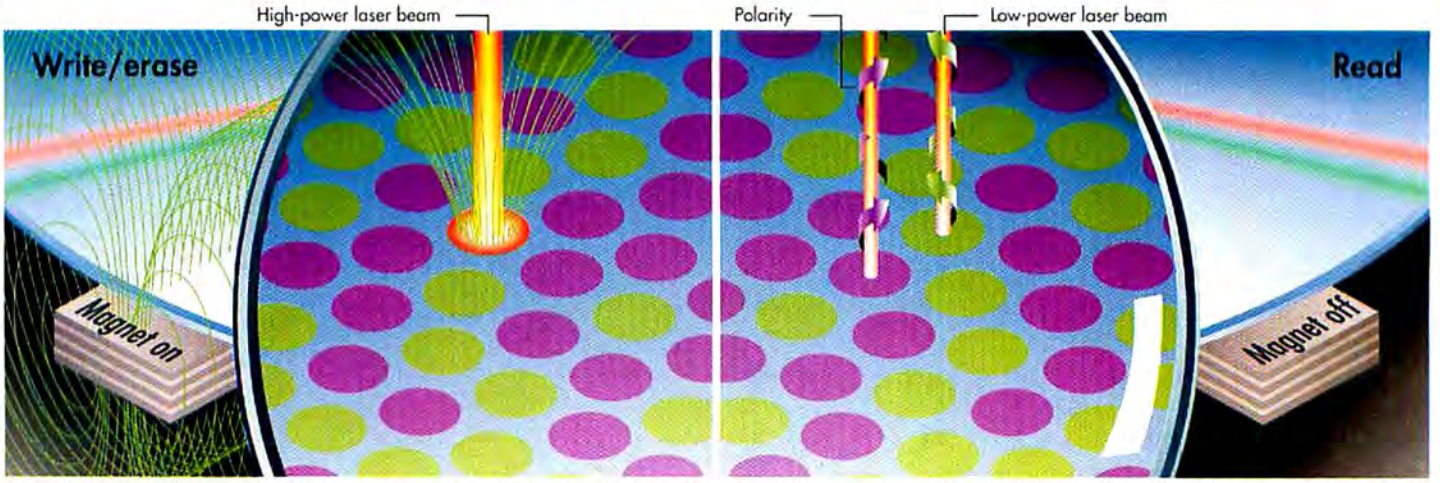
Erasable Optical Drives

In 1989 the hot optical technology is the long-awaited erasable optical (magneto-optical) disk (see "The Erasable Optical Difference"). In another triumph of American scientific know-how and Japanese business savvy, 3M invented a medium which is now available exclusively as a 650MB cartridge from Sony. (The actual capacity of the disk ranges from about 580MB to 650MB, depending on how the vendor's software formats the disk.) The drives are manufactured by Sony, Ricoh, and Maxtor. (Pinnacle Micro is Sony's U.S. vendor; Sumo, Jasmine, Racet, and PCPC are the Ricoh drive vendors; and Storage Dimensions, a Maxtor subsidiary, is the Maxtor drive vendor.) The two drives have similar access times and because they use the same Sony disk, they have similar capacity. Sumo astonished many



We timed a sample drive from each product category while opening a 4K Excel document. The removable drives were by far the fastest performers, with Syquest removable cartridges showing well in second place. The times remained consistent when we transferred 10MB of data to the drives, with the exception of the WORM drive, which sped up enough to put it in third place (albeit a distant third, taking twice the amount of time as the second-place Syquest drive). Circles represent storage capacity of the media.

THE ERASABLE OPTICAL DIFFERENCE



With the electromagnet on, a high-power laser heats dots, allowing them to take on the magnet's polarity to write a binary 0. The magnet's polarity is then reversed to write binary 1's. The disk can easily be erased by changing the polarity of the dots.

With the electromagnet shut off, a low-power laser detects the magnetic polarity of each dot, which is then translated into binary 0's or 1's. This allows the Macintosh to read data and display it.

visitors to January's Macworld Expo with an announced price of $3495 for a drive and about $200 for a disk—that's 33 cents per megabyte for storage space on the disk, and even less per megabyte for a drive and a disk than a hard disk with, say, a capacity of 600MB.

It's quite breathtaking to see nearly 325MB of capacity sitting on your desktop, with the knowledge that you have 325MB more on the other side of the disk, and 650MB more in each of the disks lying in a pile next to the drive. For many users, this kind of capacity could mean never discarding a file. What's more important is that certain Mac-critical tasks, such as storage of 24-bit color artwork, scientific data, and digital music, absolutely *demand* this kind of capacity. Like WORM disks, EO disks provide one of the few convenient ways to distribute a large database to off-site Macs. Although EO disks are even more costly than 300MB hard disks ($3500 to $5000, compared with $2500), their larger capacity (practically limitless, considering that the disks are removable), makes plenty of sense for high-volume storage requirements.

The main question is not whether you will have an EO disk some day, because over the next five years you very likely will (given the current OEM cost of drive mechanisms, the electrical engineering trade press speculates that prices below $1000 may be possible for smaller-capacity drives). Instead, consider whether your current needs will drive you to become a pioneer. Pioneers get things done first, but they pay more for the privilege.

A Removable Feast

There are, at least, plenty of options in removable storage media. At present, the mainstream choice, providing fast backup and large-scale storage at a reasonable price, is the removable–hard-disk cartridge. At lower cost and with less capacity there are several kinds of high-density floppy drives, such as Bernoullis from Iomega and Kodak-format drives from Jasmine. These, however, tend to be slower than the removables and, therefore, less appropriate as a substitute for a hard disk. For archiving files, the WORM drive is still a plausible choice. For erasable storage in vast quantities, erasable magneto-optical drives are expensive but nearly ideal, and may get cheaper soon. If you make an estimate of your mass storage needs in megabytes, and you have a fair appraisal of your budget, it should be no problem to pick out the most cost-effective device for managing your data.

See *Where to Buy* for contact information.

Charles Seiter *is a* Macworld *contributing editor active in scientific computing and the design of instruments.*

DIGITAL PAPER?

A subsidiary of Iomega has produced a prototype of a Bernoulli-style drive that performs write-once optical recording on a medium so cheap engineers call it digital paper. The drive uses a Bernoulli positioning scheme that keeps the drive head very close to the disk. This scheme allows the manufacturer to use cheaper optics and a low-cost, low-power laser for writing data onto inexpensive reflective plastic film. Preliminary estimates suggest a price of $50 for a 1.5-gigabyte cartridge, and a drive similar in price and speed to a standard hard disk.

With a little juggling, you could back up your files every day for a year on a single cartridge. As a complement to a hard disk containing applications programs and space for current work, a digital-paper Bernoulli drive would be hard to beat. Stay tuned, and we'll see if this piece of exotica gets out of the demo stage and onto computer store shelves in 1989.

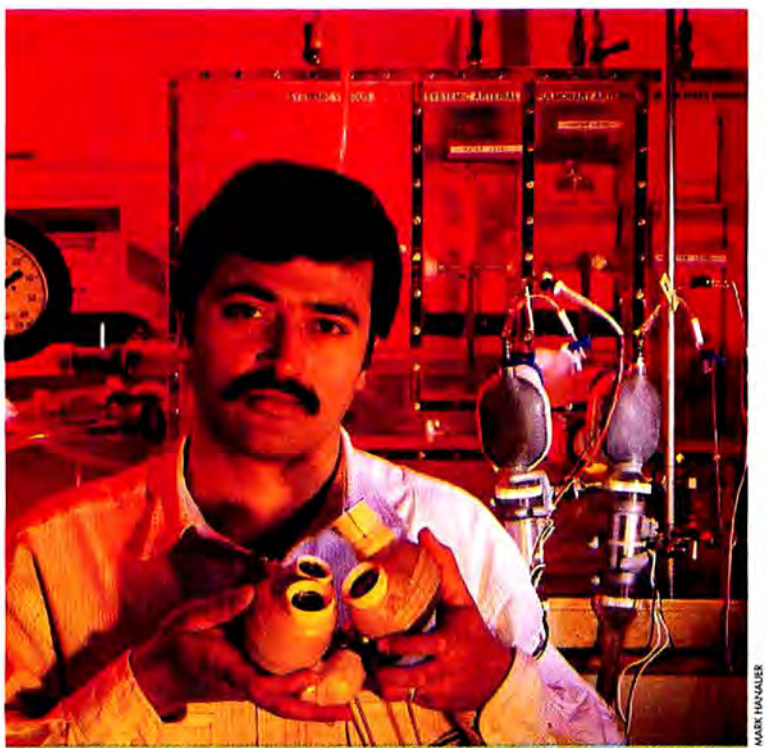
New Life for the NuBus

A Range of Boards Opens Up New Vistas for the Mac II

When introduced, the Mac II's open architecture promised to rejuvenate the Mac's seemingly unfulfilled potential. The NuBus opened new computing vistas by letting the Mac accommodate an assortment of specialized hardware boards. After more than two years of product development, a wide variety of expansion boards are now available that can help you augment the power and capabilities of your Mac II.

You may have read about some of these add-in boards in *Macworld*. Previous articles have covered video displays and image-capture boards. I won't discuss those categories here, but instead will focus on NuBus boards that augment the computing capabilities of the Mac.

Several exotic boards increase the computing power and input/output (I/O) capabilities of the Mac II. For example, a digital-signal processor board turns the Mac into an audio workstation that can record, play, and edit digital signals. Data-acquisition boards allow the Mac to connect to scientific and engineering equipment. Other boards enable the Mac to run artificial intelligence (AI), sophisticated graphics, or A/UX applications faster and more efficiently.



MARK HANAUER

PRATAP KHANWILKAR, an engineer at the Artificial Heart Research Laboratory, uses MacADIOS boards to help design electric-motor hearts.

Introducing the NuBus

Making all of these add-in boards possible is the NuBus, which is built into the Mac II, IIcx, and IIx. (Note that although the Mac SE and SE/30 each offer an expansion slot, that slot is not compatible with the NuBus.) To appreciate the Mac II's ability to transform the very nature of its computing capabilities, it's important to understand some of the design features of the NuBus. (If you're new to the NuBus, see "Getting Started with Expansion Slots" in *Macworld*, April 1989.)

The NuBus is responsible for ferrying information—in the form of electrical signals—between the Mac and its

BY BRITA MENG

DATA-ACQUISITION BOARDS

Product	Company	Price
ACM2-12-8	Strawberry Tree Computers	$795
ACM2-12-8A	Strawberry Tree Computers	$1190
ACM2-12-16	Strawberry Tree Computers	$1145
ACM2-16-8	Strawberry Tree Computers	$1490
ACM2-16-8A	Strawberry Tree Computers	$1790
ACM2-16-16	Strawberry Tree Computers	$1845
ACM2-IO-40	Strawberry Tree Computers	$345
ACM2-IO-160	Strawberry Tree Computers	$645
ForeRunner	Data Translation	$795
Lab Master II series	Scientific Solutions	$1250–$1500
Lab-NB	National Instruments	$695
MacADIOS II	GW Instruments	$1490*
MacADIOS II Junior	GW Instruments	$890
MACPIO-24	MetraByte	$200
MacII488	Strawberry Tree Computers	$695
MacII488	IOtech	$595
MBC-625	MetraByte	$1290
NB-AO-6	National Instruments	$895
NB-DIO-24	National Instruments	$245
NB-DIO-32F	National Instruments	$595
NB-DMA-8-G	National Instruments	$1295
NB-GPIB	National Instruments	$495
NB-MIO-16	National Instruments	$1195–$1495
NB-MIO-16X	National Instruments	$1695–$1895
NBS-GPIB	Fishcamp Engineering	$299
SpringBoard	GreenSpring Computers	$1495
SupportBoard	GreenSpring Computers	$295
TopFlight	Data Translation	$2295–$3795

For base board; piggyback boards provide add-on features.

expansion boards. The Mac CPU communicates with NuBus boards by reading and writing data to and from memory locations, called *memory address space*, set aside specifically for the NuBus.

The NuBus is a 32-bit bus. It provides 4 gigabytes of memory address space and can transfer data in 32-, 16-, or 8-bit quantities. As a result, the NuBus takes full advantage of the capabilities of 32-bit microprocessors like the 68020 and 68030 used in the Mac II, IIx, and IIcx.

The 68020 and 68030 aren't the only CPUs that can use the NuBus, however. Because it was designed to be processor-independent, the NuBus can accommodate almost any type of CPU. Levco and Paracom, for example, use an INMOS Transputer on their boards; Spectral Innovations' Mac-DSP board contains a digital-signal–processor chip set from AT&T called the DSP32.

To perform data transfers, a board must obtain ownership of the NuBus. It does so by requesting the bus from the Mac CPU and waiting until the request is granted. Only one board at a time can use the NuBus.

WORKING TOGETHER

In NuBus lingo, there are two types of boards, *master* and *slave*. Master boards initiate data transfers; slave boards respond to masters' instructions during data transfer. In addition to slave boards, a NuBus master can control Mac peripherals, such as SCSI drives. The SurfBoard from Jets Cybernetics, for example, accelerates disk-transfer rates.

Any or all of the Mac's six slots can hold bus masters. No board or slot has precedence over the others; all boards are peers. As a result, the NuBus can coordinate the operation of up to seven independent processors (including the 68020/68030 on the system board). Very powerful Mac II systems can be built by combining special-purpose boards.

DATA-ACQUISITION BOARDS

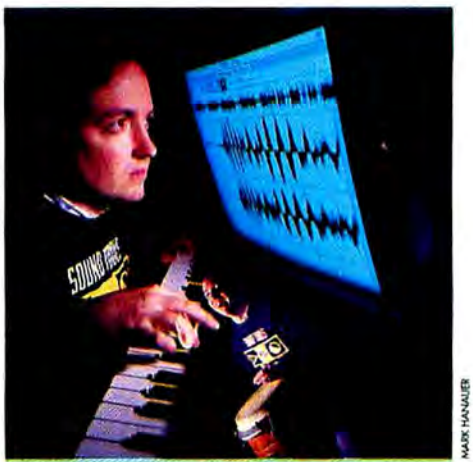
In science and engineering applications, it's often necessary to analyze and display real-world information—temperature, pressure, current, or sound—on the Mac. NuBus data-acquisition boards let the Mac II convert such analog information into digital signals the Mac can store and process (see "Data-Acquisition Boards").

Examples of data-acquisition boards include the MacADIOS II series from GW Instruments and the ACM2 series from Strawberry Tree Computers. They provide not only analog-to-digital converters, but also interfaces between the Mac and test equipment and measuring devices. With the appropriate software, the Mac can be transformed into an oscilloscope or a strip recorder for displaying and printing data.

In addition to NuBus support, National Instruments provides a real-time system integration (RTSI) bus with its NB series. The RTSI is a special bus designed to transfer data-acquisition signals quickly and efficiently. On-board connectors and a ribbon cable attach the NB series to the RTSI (and thus to each other). Because the RTSI enables direct connection of data-acquisition boards, it can avoid sending digital information over the NuBus.

COMMUNICATIONS BOARDS

NuBus add-in boards offer still more ways to expand the Mac's horizons (see "Communications Boards"). Communications options range from providing high-speed networking capabilities to giving the Mac access to add-in boards for buses other than the NuBus.



MARK HANAUER

PETER GOTCHER used to be a recording engineer. With his company's (DigiDesign) Sound Accelerator, the Mac becomes a recording studio in a box, letting him record, synthesize, and edit CD-quality audio.

Using an Ethernet interface board, you can network Macs with minicomputers and other personal computers (see "The Ethernet Solution," *Macworld,* January 1988). Add-in boards also provide direct connections between Macs and IBM mainframes or minicomputers (see "Making IBM Work for Your Mac," *Macworld,* June 1989).

Of course, there's more to communications than networking. For example,

A Mac can take several hours to perform a processor-intensive task

boards from Epic Technology, Ven-Tel, and Hayes Computer Products offer internal 2400-baud modems for the Mac.

Another variation on the communications theme lets a Mac II, IIx, or IIcx interface with add-in boards designed for other buses—for example, the VMEbus found in many computer systems used for engineering and factory control applications. Should a Mac II NuBus board not fit your needs, you can use Lexis' LexiLink or C&C Technology's MacVEE Micron to access VMEbus boards. Other boards provide links to printers that use a Centronics parallel port.

BusLink from Flavors Technology lets the Mac share data with other computers. Using an FT-60 BusLink subsystem, Macs can tap directly into the internal buses of Digital Equipment Corporation, Masscomp, and Gould computer systems.

COMMUNICATIONS BOARDS

Product	Company	Description	Price
ARCNET 260/II	Standard Microsystems	ARCNET local area network interface board	$595
BroadTalk Adaptor	Cactus Computer	Broadband Ethernet interface board	$895
BusLink	Flavors Technology	VMEbus, Qbus, Unibus, etc. system interface for DMA	$13,900
Datrilink ver. A	Datricon	STD bus board interface	$1279
Datrilink ver. B	Datricon	STD bus board interface	$1407
EtherLink/NB	3Com Corporation	Ethernet interface board	$595
EtherPort II	Kinetics	Ethernet interface board	$695
EtherPort IIL	Kinetics	twisted-pair Ethernet interface board	$695
EtherPort IIL	SynOptics Communications	twisted-pair Ethernet interface board	$695
EtherTalk	Apple Computer	Ethernet interface board	$699
FastNet II	Dove Computer Corporation	DECnet communications controller	$999
FastNet III	Dove Computer Corporation	Ethernet interface board	$549
FiberTalk	DuPont Electronics	fiber-optic interface board	$595
Hurdler-Centronics	Creative Solutions	Centronics parallel port	$199
Hurder-I/O Channel	Creative Solutions	Direct connection to Motorola I/O channel ribbon cable	$249
Hurdler-DPR	Creative Solutions	high-speed communications between Mac II and external system with dedicated CPU	$349
Hurdler-MBus	Creative Solutions	MetraByte data-acquisition bus interface	$299
Hurdler-PC	Creative Solutions	IBM PC I/O expansion chassis interface	$349
Hurdler-STD	Creative Solutions	STD bus board interface	$299
LANstar Interface Board	Northern Telecom	AppleTalk Lanstar interface board	$249
LexiLink	Lexis	VMEbus board chassis interface	$2795
MacConnect	Interlan	Ethernet interface board	$549
MacIrma	Digital Communications Associates	IBM 3270 mainframe communications interface	$1195
MacMainFrame II	Avatar Corporation	IBM 3270 mainframe communications interface	$995
MacVEE Mac-CC	C & C Technology	CAMAC rack chassis interface	$1560
MacVEE Micron	C & C Technology	VMEbus board chassis interface	$1204
Mac2400E	Ven-Tel	Internal 2400-baud modem	$449
NuBus Multibus I Adaptor	Bit 3 Computer	multibus computer interface	$1580
NPS	Dove Computer Corporation	Centronics parallel port; serial port	$299
NuBus Q22bus Adaptor	Bit 3 Computer	Qbus computer interface	$2695
SmartmodemM	Hayes Microcomputer Products	Internal 2400-baud modem	$549
Speedlink	Everex	Ethernet interface board	$549
Unigate	Computer Friends	Centronics parallel port	$299
NuBus VME Adaptor	Bit 3 Computer	VMEbus computer interface	$1995

COPROCESSORS

The Macintosh's CPU keeps track of mouse and keyboard clicks, updates the monitor, supervises floppy and hard disk data transfers, and controls network activity. It also has to run applications. Sometimes, the load gets to be too much. The result? A Mac that takes several hours to perform a processor-intensive task such as calculating and displaying a complex 3-D rendering.

By assuming responsibility for certain operations, coprocessors *offload* duties normally performed by the Mac CPU. This frees the CPU to control the Mac's user-interface, watch for disk transfers, and update the display. For example, a coprocessor could generate a 24-bit color image, then pass that information to the Mac's video memory for display. The two processors work together to finish the job.

Having more than one processor work on different aspects of a job is called *multiprocessing*. The Mac's main logic board is a master board, and the video board—which occupies one of the six slots—is a master as well, leaving room for as many as five coprocessors, any of which can also function as a master. In addition, Levco and Paracom offer boards that can have more than one coprocessor,

allowing you to install more than five coprocessors at a time.

In some cases, a particular calculation may still be too big a job for one coprocessor to handle efficiently. *Parallel processing*, a form of multiprocessing, allows separate CPUs to split one calculation between them. These CPUs can reside either on the same board or on different boards.

There's an important distinction between a coprocessor board and an accelerator board. Accelerators speed up the overall operation of a Mac II. You can run a standard Mac application on a Mac that has an accelerator installed. Coprocessors, on the other hand, speed up only specific types of computations—and then, only those types of computations for which its on-board CPU was designed: digital-signal processing, graphics, array processing, and so on.

To take advantage of a coprocessor, the Mac must have application software for it. For example, the 68881 floating-point unit (FPU) that comes with the Mac II is a type of coprocessor. When you run Microsoft Excel on a Mac II, the FPU takes over math calculations, but only when requested to do so by the Mac's primary CPU. If you simply plug in a coprocessor board, Excel doesn't know how to use it, so calculations proceed at normal speed. Applications may need to be modified or rewritten to work with coprocessor boards. Development tools for the coprocessor CPU, such as compilers, are sold by the same companies that sell the boards.

Depending on their CPUs, Mac add-in boards offer different coprocessing capabilities, any of which can augment the Mac (see "Coprocessing Boards"). AST Research's Mac286, for example, includes the same 80286 microprocessor found in IBM PC/AT computers and compatibles, allowing the Mac to run IBM PC software.

Another type of coprocessor board uses a special chip called a digital-signal processor (DSP), which manipulates massive amounts of data in real time. DSP boards offer signal processing capabilities that far exceed those of the Mac's CPU.

DSP coprocessor applications include audio, high-speed modems, image processing, and speech recognition. Digidesign's Sound Accelerator contains Motorola's 56001 DSP chip—the same chip used in the Next machine. In addition to general-purpose signal processing, Sound Accelerator allows real-time recording and playback of CD-quality sound from a Mac disk. Spectral Innovations' MacDSP board, which employs AT&T's DSP32 chip, can generate real-time displays of audio, seismic, or medical data.

MARK HANAUER

ARA CELIAKOPILOFF uses the Mercury Computer Systems MC3200NU board for fabric and fashion design at ModaCAD in Los Angeles, California.

Perceptics uses a NuBus board to interface the Mac II with a hardware unit called NuVision, which is dedicated to image processing. Boards in NuVision use Texas Instruments' 40MHz 32025 DSP chips to offload image processing from the Mac's CPU.

Other Macintosh coprocessor boards are tailored for specific programming languages. Texas Instruments and Symbolics use proprietary LISP chips (Explorer LISP and Ivory, respectively) to improve performance of LISP-based artificial intelligence applications. Both companies provide software tools that enable an application running on the Mac processor to communicate with applications running on the coprocessor board.

CPSA's Flashcard processor is a FORTH chip from Novix called the 4016. The 4016 implements all FORTH instructions in the chip itself; and because FORTH programs don't need to be translated into 68020 or 68030 assembly language, execution is very fast. Currently, the Flashcard can only function as a NuBus slave board; the second generation of the board, currently being designed, will use Harris' RTX200 FORTH chip rather than the 4016 and will function as both master and slave.

Another type of coprocessor board takes advantage of reduced-instruction

COPROCESSING BOARDS

Product	Company	Description	Price
Flashcard	CPSA	Novix 4016 coprocessor	$1495
Mac/DOS II	PerfecTEK Corporation	Intel 80286 coprocessor	$1595
MacDSP	Spectral Innovations	AT&T DSP32 coprocessor	$2245
MacIvory	Symbolics	proprietary LISP coprocessor	$10,900
Mac286	AST Research	Intel 80286 coprocessor	$1599
McCray	YARC Systems	AMD 29000 coprocessor	$4295
MC3200NU	Mercury Computer Systems	Weitek XL array processing coprocessor	$10,000 and up
microExplorer	Texas Instruments, Data Systems	Proprietary LISP coprocessor	$11,995
MTM-Mac	Paracom	INMOS Transputer coprocessor	$5125 and up
NuVision	Perceptics	NuVision image processing subsystem	$24,745 and up
Quad 56000 DSP Card	Southworth Music Systems	Motorola 56001 DSP coprocessor	$1395
Sound Accelerator	Digidesign	Motorola 56001 DSP coprocessor	$1295
TL88K-P	Tektronix	Motorola 88000 coprocessor	$10,995 and up
TPM-Mac	Paracom	INMOS Transputer coprocessor	$1525

set computer (RISC) chips to speed the Macintosh's execution of heavy numeric calculations.

YARC Systems' McCray board is based on Advanced Micro Devices' (AMD) Am29000 RISC chip. Another board that uses a RISC chip set, Motorola's 88000, is the TL88K-P from Tektronix. Mercury Computer Systems' MC3200NU board includes the Weitek XL chip set and is designed for very high speed numerical calculations and array processing.

Levco's TransLink board and Paracom's MTM-Mac both use a 32-bit RISC microprocessor called the Transputer, designed especially for parallel processing. You only need one of these boards for parallel processing; Levco allows up to four Transputers on one TransLink, Paracom's board holds two Transputers.

I/O Coprocessing Boards

I/O coprocessing boards don't relieve the Mac CPU from its calculating duties but rather from some of its I/O supervisory tasks. One way to speed SCSI disk-transfer times is by using a technique called *direct memory access* (DMA). Basically, DMA allows data to be moved from disk to memory without the Mac CPU's supervision. Because I/O coprocessor boards take care of disk transfers, the Mac CPU is free to perform other tasks.

This fact is particularly important for Macs running multitasking operating systems like A/UX. First, under A/UX, the more often the CPU is free, the sooner it can execute tasks. Second, the combination of fast SCSI controller and DMA speeds data transfers from disk to RAM.

A/UX allows programs to treat disk space as *virtual memory*, that is, exactly like RAM. Virtual memory tricks the operating system into thinking that it's getting data from RAM rather than from a disk; the operating system swaps data stored on disk in and out of RAM as needed. With all the swapping that occurs in A/UX, the number of data transfers increases, causing an I/O bottleneck for standard Macs.

To supervise the DMA process, a DMA controller is necessary. Although DMA controllers are built into the IBM PS/2, they are not integral to the Macintosh. The Jets Cybernetics' SurfBoard and Golden Triangle's FirePower provide the Mac with DMA capabilities. Each board also includes a SCSI controller that supports faster transfer rates than the Mac's built-in SCSI circuitry does.

Other DMA boards don't move data between disk and RAM, but between two boards. National Instruments' NB-DMA-8-G contains a DMA controller that can be shared among several data-acquisition boards. Levco has announced a DMA board that speeds data communications between its TransLink coprocessor board and the Mac's main memory.

Another type of I/O board can be particularly important for Macs running A/UX. Both AST's AST-ICP and SuperMac's CommCard allow you to attach multiple terminals to an A/UX system via extra serial ports. Rather than having the Mac's CPU supervise serial-port activities, a CPU on the coprocessor board does so. In addition, two ports on the boards can be configured to work with AppleTalk; in such cases, the coprocessor CPU takes over AppleTalk network duties.

I/O BOARDS

Product	Company	Description	Price
AST-ICP	AST Research	I/O coprocessors, two or four serial ports (two LocalTalk-compatible)	$949–$999
AST-RM4	AST Research	memory board	$899 and up
CommCard	SuperMac Technology	I/O coprocessor, four serial ports	$999
Expanse II	Second Wave	NuBus expansion chassis, provides eight extra NuBus slots and three SCSI ports	$2295
Expanse II/SA	Second Wave	stand-alone NuBus chassis, provides eight extra NuBus slots and three SCSI ports	$1595
FirePower	Golden Triangle	SCSI accelerator with DMA, two RS-232 ports	$2850
Hurdler-HDS	Creative Solutions	two additional serial ports	$379
Hurdler-HQS	Creative Solutions	four additional serial ports	$449
Maccelerate	National Semiconductor Corporation	SCSI accelerator with DMA	$595
MacClock II	MacSema	automatic timer/alarm board for Mac II	$99
NS8/16	National Semiconductor Corporation	memory board	$1995–$6995
NuControl	NuLogic	DC Servo Motor Controller board	$1795
Pronto	Golden Triangle	SCSI accelerator with DMA	$745
SurfBoard	Jets Cybernetics	SCSI accelerator with DMA	$995
Two+Two	Tara Systems Corporation	four additional serial ports	$995

The Incredible Expanding Mac

The majority of add-in boards address performance issues of interest mainly to scientists, engineers, and other technical users. That's because those are the users most likely to find it necessary to augment the Mac's capabilities.

In the future, you'll see more intelligent add-ins that expand the Mac's repertoire. For example, a NuBus board could offload optical character recognition from the Mac's CPU. Peripherals could also make use of NuBus boards to offload tasks; a good example might be a laser printer controller board for PostScript processing—similar to that offered by Next. Then, consider that very large scale integration (VLSI) technology allows entire computer systems to fit in one chip or chip set. Need a Cray in your Mac?

But you may not have to wait until a future date to customize the Mac to fit your needs. If you're suffering from the off-the-shelf Mac blues, chances are you can find a board to cure them now. ■

See *Where to Buy* for contact information.

Communicating at Speed

by Dave Kosiur

Where there's telecommunications, there's always a need for speed. Just a few years ago, 300-bps (bits per second) modems were the norm for personal computers like the Macintosh. Then users rapidly moved to 1200-bps and 2400-bps modems.

But the search for speed isn't over yet. More vendors now offer asynchronous high-speed modems of 9600 bps and above for Macs (see "Built for Speed"). If you transfer large files between Macs or dial into an AppleTalk network, the lure of high-speed modems is especially tempting.

File transfers at 9600 bps take roughly one-quarter the time of 2400-bps transfers. The amount of AppleTalk information transferred by electronic mail and file servers makes accessing such network services—even at 2400 bps—slow.

Are you ready to use these high-speed modems? A better question might be, are these modems ready for you? Thanks to the proliferation of different communications standards, not all high-speed modems can talk to each other at top speeds. At the prices these modems command, running at less than top speed can be a waste of money.

What's a Modem to Do?

The word modem derives from the device's primary functions. First, a modem *mod*ulates a digital signal (data from the Mac) into analog form so that it can be transmitted over a phone line. Second, it *dem*odulates that transmitted analog signal back into digital form.

Modems, however, handle other communications details. They detect and correct any transmission errors—an especially important function for high-speed communications. In addition, many high-speed modems use special data-compression and modulation techniques to achieve higher transmission rates over standard phone lines.

These behind-the-scenes activities should be transparent to the user. You shouldn't have to worry about which error-correction or data-compression technique your modem uses. And since modem communication is never a one-way street, you shouldn't have to know what your partner's modem uses either.

Too Many Standards

This situation holds true for 300-, 1200-, and 2400-bps modems. Standards, such as V.22 and V.22bis established by the Consultative Committee on International Telegraph and Telephone (CCITT) and Bell 212 and Bell 103 established by AT&T, ensure that you can transmit to and receive from such modems, regardless of their manufacturers.

Unfortunately, with high-speed modems this isn't the case. When you choose a high-speed modem, you must pay careful attention to not only the type of modem, but also the protocols and standards it supports.

Modem manufacturers can implement *full-duplex* communications in a variety of ways. These include true full-duplex

Not all 9600-bps modems speak the same language

modems as well as *half-duplex* modems—*asymmetrical* and *ping-pong* modems—that simulate full-duplex operation (see "Seeing Double").

True full-duplex modems have CCITT standards to dictate how they modulate and demodulate data (see "Where the Standards Roam"). Asymmetrical and ping-pong modems do not. In any case, because all three types of modems operate differently, they aren't compatible with each other at full speeds. That means you'll need a pair of the same modems—one to send, another to receive—for high-speed transmission.

To make things even more complicated, vendors currently utilize several different methods for error correction and data compression, which are implemented on top of CCITT modulation standards. Some error-correction techniques are themselves CCITT standards; others are proprietary techniques developed by vendors. Because the CCITT is in the midst of establishing a data-compression standard, vendors, again, use proprietary techniques. Thus error-correction and data-compression methods are not necessarily compatible with each other.

Not a Lot in Common

What do high-speed modems have in common? Let's start with the good news. The RS-232C physical connector—a standard set by the Electronic Industries Association (EIA)—is available on all high-speed modems.

At the same time, most high-speed modems also support a subset of the Hayes AT command language, a de facto industry standard for controlling modems. While many modem manufacturers also provide their own non-Hayes command sets, you'll find there's little to be gained by using them. Many Mac telecommunications software programs just don't support these proprietary languages.

Now for the bad news. Except for RS-232 connectors and Hayes AT commands, high-speed modems from different vendors currently have very little in common.

Let's take a look at the attempts to create—or subvert, depending on your point of view—high-speed modem standards. Following the data flow from the Mac to the modem, we'll examine standards for error checking, data compression, and modulation control.

Getting Rid of Errors

Phone lines are noisy. To deal with less-than-perfect connections, high-speed modems need a way to sense and correct errors that occur during transmission. At speeds lower than 9600 bps, file-transfer protocols like Kermit and Xmodem provide error correction. At higher speeds, however, such protocols just aren't appropriate.

For example, Xmodem works by sending a block of data and waiting for an acknowledgment of the block's receipt. This waiting considerably reduces data-transfer rates between full-duplex modems.

The current solution to error control

and detection at high speeds is a CCITT standard called V.42. Rather than relying on software like Kermit or Xmodem for error checking, modem manufacturers implement V.42 in ROM chips inside the modem.

The CCITT chose to include two distinct protocol sets in the V.42 standard. The primary protocol is called Link Access Protocol Modem (LAP-M), which is based on a long-standing synchronous protocol called HDLC (High-Level Data Link Control).

The CCITT also included support for classes 2, 3, and 4 of Microcom's proprietary Microcom Networking Protocol (MNP) as part of V.42. MNP support was included—as an appendix to the specs—in part because of the large number of MNP-based modems installed.

With the notable exception of the Hayes V-series modems, LAP-M–based modems are not yet widely available. However, LAP-M offers some features that look very promising, such as support for digital phone networks like the Integrated Services Digital Network (ISDN).

When you buy a high-speed modem, you should look for a modem that is V.42 *compliant*. A V.42-compliant modem supports both LAP-M and MNP, and can use either one. V.42-*compatible* modems support only one protocol set. You may find yourself without error checking if two V.42 modems don't agree on supported sets.

SQUEEZETHATDATA

Data compression helps modems achieve data-transmission rates of over 2400 bps by reducing the number of bits necessary to transmit frequently used characters.

To determine which characters get compressed, a modem must analyze transmitted data. This analysis statistically generates a frequency table of characters; the modem compresses particular characters based on this table. Since the frequency of particular characters changes during a transmission, the table calculated by the modem must also reflect those changes. This method of data compression is called *adaptive encoding* or *adaptive compression*, due to its on-the-fly

BUILT FOR SPEED

Company	Product	Speed (in bps)	Standards*	Error Correction	Data Compression	Price
CXR Telcom	9651-1	2400–9600	V.22bis, V.32	MNP	none	$1895
Ark Electronic Products	DL432	2400–9600	V.22bis, V.32	MNP	MNP	$1595
Bytcom	Strata 9600 Baud	300–9600	Bell 103, Bell 212, V.22bis, V.32, proprietary	MNP, Trellis	MNP, proprietary	$899
Cermetek Microelectronics	CSP9600E	4800–9600	V.32	LAP, MNP	none	$1145
	Spectrum 9600	300–9600	Bell 103, Bell 212, V.22bis, V.32	LAP, MNP	none	$1595
	9600S	4800–9600	V.32	LAP	none	$1595
Codex	Model 2250	4800–9600	V.32	Trellis	none	$1995
	Model 2264	1200–9600	Bell 212, V.22, V.22bis, V.32	MNP	MNP	$1895
Concord Data Systems	296 Trellis	4800–9600	V.32	MNP	MNP	$1795
	DialAccess 296	1200–9600	Bell 212, V.22, V.22bis, V.32	MNP	MNP	$1795
Connect	Service	4800–9600	V.32	MNP	MNP	$999
Data Race	Race OCS	300–18.4k	Bell 103, Bell 113, Bell 212, V.22bis, V.29, proprietary	MNP, proprietary	proprietary	$1345
	BMX VM	300–18.4k	Bell 103, Bell 113, Bell 212, V.22bis, V.29, proprietary	MNP, proprietary	proprietary	$1145
Digicom Systems	9624LE	1200–9600	Bell 212A, V.22, V.22bis, V.32	MNP	MNP	$795
	9624E	1200–9600	Bell 212A, V.22, V.22bis, V.32	MNP	MNP	$1595
FastComm Communications Corporation	F2496	300–9600	Bell 103, Bell 212, V.22bis, proprietary	proprietary	none	$999
	F2496T	300–19.2	Bell 103, Bell 212, V.22bis, proprietary	proprietary	none	$1099
	F9600	4800–9600	proprietary	proprietary	none	$919
	FDX9624	4800–17.2k	proprietary	proprietary	MNP	$899
	FDX9696	9600–19.2k	V.32, proprietary	proprietary	MNP	$1299
Hayes Microcomputer Products	V-series Smartmodem 9600	300–9600	Bell 103, Bell 212A, V.22, V.22bis, V.32hdx	LAP, MNP, X.25	proprietary	$1299
	Smartmodem 9600	300–9600	Bell 103, Bell 212A, V.22, V.22bis, V.32	none	none	$1999
Microcom	AX/9624c	300–9600	Bell 103, Bell 212A, V.27bis, proprietary	MNP	MNP	$1299
	AX/9600 Plus	300–9600	Bell 212, V.22bis, proprietary	MNP	MNP	$1099

V.32 protocol includes both full-duplex implementations and half-duplex forms

ability to adapt to transmitted data.

Most high-speed modems use some form of adaptive encoding, but the CCITT has not yet specified a data-compression standard. The proposal for data compression, called V.42bis, is still in the works; it may be finalized this summer or fall.

Currently, MNP's Class 5 data-compression protocol is the most popular, primarily because many vendors license MNP. However, it's important to note that in its current state, V.42bis only runs on top of the LAP-M protocol for V.42 error correction, not on MNP. Hayes, one of several modem vendors that developed proprietary data-compression schemes, has announced it will implement V.42bis once the standard is published.

Keeping Your V's Straight

As discussed earlier, a modem works by modulating digital data into an analog signal, called the *carrier wave*. To represent the digital bits, the modem alters the frequency, amplitude, or phase of the carrier wave. Low-speed modems generally use only two frequencies (amplitudes or phases) during transmission. These two frequencies are called *states* for the carrier wave.

Because of inherent limitations in standard phone wire, high-speed modems must employ more than two states during transmission (see "Data Carriers"). Ensuring that modems use the same states is the job of the modulation scheme. Modulation schemes for high-speed modems are standardized by the CCITT. For leased-line, 9600-bps modems, the full-duplex modulation standard is V.29. Leased phone lines have four wires, which makes implementing full-duplex a cinch. Each modem uses one wire for data signals and another as a reference.

Typical dial-up phone lines, meanwhile, only have two wires. There are V.29 modems designed to use two wires, most notably fax modems; however, they run in half-duplex mode.

The CCITT standard for full-duplex, 9600-bps communications on dial-up lines is V.32. The V.32 standard uses an advanced modulation scheme called Trellis Coded Modulation (TCM). To enable

Company	Product	Speed (in bps)	Standards*	Error Correction	Data Compression	Price
Microcom *(continued)*	QX/V.32c	300–9600	Bell 103, Bell 212, V.27bis, V.32	MNP	MNP	$1799
Multi-Tech Systems	MultiModem V32	300–9600	Bell 103, Bell 212, V.22, V.22bis, V.32	MNP	MNP	$1195
	MultiModem 696E	300–9600	Bell 103, Bell 212, V.22, V.22bis, proprietary	MNP	MNP	$795
NEC America	DSP9630	9600	V.32	Trellis	none	$1895
	N9631	300–9600	Bell 103, Bell 212, V.22, V.22bis, V.32	MNP	none	$995
	N9635	300–9600	Bell 103, Bell 212, V.22, V.22bis, V.32	MNP	MNP	$1595
OmniTel	9632SD	300–9600	Bell 103, Bell 212, V.22, V.22bis, V.21, V.32	MNP	MNP	$1249
Orchid Technology	MacFax	300–9600	Bell 103, Bell 212A, V.27ter, V.29	MNP	none	$599
Prometheus	ProModem 9600	1200–9600	Bell 212A, V.22, V.22bis, V.32	MNP	MNP	$995
Racal-Milgo	RM/9632	4800–9600	V.32	MNP	MNP	$1995
	RM/9632/2	4800–9600	V.32	MNP	MNP	$1675
Racal-Vadic	9600VP	300–9600	Bell 103, Bell 212, proprietary	MNP	MNP	$995
Smarteam	9600 Plus	300–9600	Bell 103, Bell 212, V.22, V.22bis, V.27, V.29	MNP	MNP	$1299
Telcor Systems Corporation	2938MA	300–9600	Bell 212, V.22bis, proprietary	none	none	$1295
Telebit Corporation	TrailBlazer Plus	300–19.2k	Bell 103, Bell 212A, V.22, V.22bis, proprietary	MNP, PEP	MNP, proprietary	$1345
	T1000	300–9600k	Bell 103, Bell 212A, V.22, V.22bis, proprietary	MNP, PEP	MNP	$1345
	T2000	300–19.2k	Bell 103, Bell 212A, V.22, V.22bis, proprietary	MNP, PEP	MNP, proprietary	$1395
	T2500	300–19.2k	Bell 103, Bell 212A, V.22, V.23, V.22bis, V.32, proprietary	MNP, PEP	MNP, proprietary	$1695
Telenetics Corporation	TC921	1200–9600	Bell 212, V.22, V.22bis, V.32	MNP	MNP	$1495
Tri-Data Systems	OZ 9600	300–9600	Bell 103, Bell 212, V.22, V.22bis, V.32	MNP	MNP	$1600
	OZ 9600E	300–9600	Bell 103, Bell 212, V.22, V.22bis, V.32	MNP	MNP	$1900
Universal Data Systems	V.3225	300–9600	Bell 103, Bell 212, V.22, V.22bis, V.32	MNP	MNP	$1145
	UDS V.32	4800–9600	V.32	Trellis	none	$995
U.S. Robotics	Courier HST	300–14.4k	Bell 103, Bell 212A, V.22, V.22bis, proprietary	MNP	MNP	$995
	Courier HST Dual Standard	300–14.4k	Bell 103, Bell 212A, V.22, V.22bis, V.32, proprietary	MNP	MNP	$1595
	Courier V.32	300–9600	Bell 103, Bell 212A, V.22, V.22bis, V.32	MNP	MNP	$1495

**V.32 protocol includes both full-duplex implementations and half-duplex forms*

SEEING DOUBLE

Full-duplex modems originated because the first users of communications lines—terminals connected to large computers—needed two separate communications *channels*, one to send data and another to receive data. Because full-duplex modems can send and receive data at the same time, they transmit information efficiently.

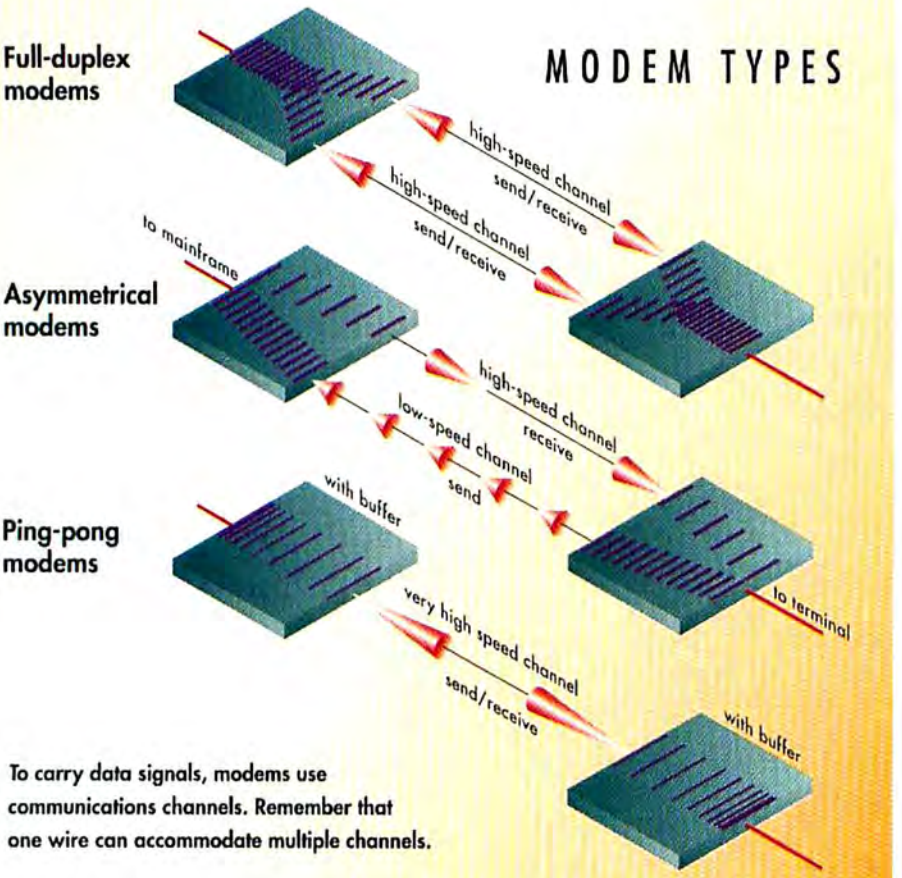
True *full-duplex* modems use two channels that run at the same speed for transmission and reception. However, there are ways to simulate full-duplex communications with a *half-duplex* modem.

In half-duplex modems, data travels in only one direction at a time over a telephone line. So, if modem A transmits to modem B, modem B must wait for modem A to stop transmitting before it can reply. The telephone line must be *turned around* for data to flow from modem B to modem A.

Asymmetrical modems utilize two channels, but one runs at the desired high speed and another at a lower speed. The high-speed channel always carries the greatest amount of data. For example, during terminal emulation, the high-speed channel transfers blocks of data from the mainframe to the Mac. The low-speed channel sends keyboard input from the Mac to the mainframe.

Ping-pong modems fool the computers into thinking that they are dealing with full-duplex modems. To do this, ping-pong modems switch the direction in which they transmit data more rapidly than they receive data from, or pass data to, the attached computers. In some cases, the modem uses a data buffer to accomplish this. At high speeds, however, ping-pong modems must be able to turn around a communications line in less than 250 milliseconds (see "Modem Types").

MODEM TYPES



To carry data signals, modems use communications channels. Remember that one wire can accommodate multiple channels.

modems to distinguish between incoming and outgoing data on one wire, V.32 incorporates a technique called *echo cancellation*. V.32 also provides an alternative 4800-bps mode for *fallback* when line conditions are too noisy to transmit at 9600 bps.

Examples of true full-duplex modems are the Smartmodem 9600 modem from Hayes and the T2500 from Telebit. In general, V.32 modems cost over $1000, one of the reasons they've not seen greater use in high-speed dial-up communications. The high price is a direct result of the circuitry needed to implement echo cancellation in V.32 modems; Rockwell's introduction of a V.32 chip set will enable modem vendors to lower costs.

Half-duplex modems that emulate full-duplex mode don't have CCITT standards—yet. A proposed specification for V.34 tentatively covers both asymmetrical and ping-pong modems communicating at speeds up to 19.2 kilobits per second (kbps).

An example of an asymmetrical high-speed modem is the Courier HST. The HST9600's high-speed channel runs at 9600 bps; its slow-speed channel runs at 300 bps. For what it's worth, the V.34 proposal suggests that the low-speed channel of asymmetrical modems run at 450 bps, not 300 bps.

At speeds higher than 2400 bps, Hayes V-series modems operate as ping-pong modems. The V-series Smartmodem 9600, for example, uses an adapted version of V.32 for half-duplex operation. Microcom's AX/9624c is also a ping-pong modem.

Another ping-pong modem, Telebit's TrailBlazer Plus, uses a different modulation scheme called the Packetized Ensemble Protocol (PEP) at speeds of 9600 bps and above (up to 18,000 bps). However, to achieve such rates, both modems must be running PEP. If they are not, communication rates automatically drop to 2400 bps.

WHAT'S A USER TO DO?

When you're looking for a flexible high-speed modem, the best choice is probably a V.32 modem that supports V.42 error

checking. But be careful: make sure that the V.32 modem has all the other features you want, namely data compression and 1200- and 2400-bps fallback support. After all, you don't want to have one modem for high-speed communications and another for low-speed communications. Determine whether the modem is V.42 compliant or V.42 compatible.

If the price of a full-duplex V.32 modem cramps your budget, the alternative is to buy a high-speed ping-pong or asymmetrical modem. Selecting one type over the other depends on what kinds of applications you intend to run over high-speed links.

Asymmetrical modems are a good choice if you need a high-speed link for minicomputer or mainframe terminal emulation. It's highly unlikely that you'll type fast enough to overload the slower channel. The high-speed channel, meanwhile, can usually handle transmission of large amounts of data—such as a full screen's worth of pixels for display—from the mainframe.

Distributed applications, which call for both the Mac and mainframe to generate large amounts of data, are another story. The slow-speed channel of asymmetrical modems will easily overload and become a communications bottleneck. Should you want to run distributed applications, either a true full-duplex or a ping-pong modem is a better choice.

The slow-speed channel of an asymmetrical modem can also become a bottleneck when you connect two AppleTalk local area networks (LANs) with modems and half-bridges (like the Hayes InterBridge, Shiva TeleBridge or Solana R-Server). You'll get the best results if you use true full-duplex or ping-pong modems for LAN-to-LAN communications.

As far as file transfers are concerned, modem selection may take a back seat to communications software. File-transfer protocols in the telecommunications program can limit a modem's throughput. For example, using Xmodem on any high-speed modem generally cuts throughput to one-half—or less—of the modem's optimum transfer rate. To really get the most out of a high-speed modem, you'll need software, such as SmartCom II and MacBlast, that support more sophisticated file-transfer protocols.

WHERE THE STANDARDS ROAM

Modulation Standard	Speed (in bps)	Full Duplex	Line Type
V.21	300	•	dial-up
Bell 103	300	•	dial-up
V.22	1200	•	dial-up
Bell 212	1200	•	dial-up
Bell 212A	1200, 300	•	dial-up
V.23	1200, 300	•	international
V.22bis	2400, 1200, 300	•	dial-up
V.27	4800	•	leased
Bell 208B	4800	•	dial-up
V.29	9600	•	leased
		*	dial-up
V.32	9600	•	dial-up
V.33	14.4k	•	leased

*Half duplex.

In addition to high-speed standards, any modem you consider should be able to fall back to standard lower-speed operations. If it can't, you may find yourself needing two modems—one for high-speed, another for low-speed communications.

GETTING THE MOST

We're not in a single-standard high-speed modem world yet. Because so many proprietary algorithms exist, two different manufacturers' modems may not communicate with each other at the speed you want. The safest solution to high-speed communications now is buying a pair of modems.

The emergence of V.32 as a standard should change this situation for the better. At least you'll be able to call any 9600-bps modem from your modem. In addition, many industry observers predict that the availability of low-cost V.32 modems will make half-duplex high-speed modems, like ping-pongs, extinct. Prices for V.32 modems are already dropping to under $1000.

DATA CARRIERS

The maximum number of states a carrier wave can have is directly related to the *bandwidth* of the transmission line. A typical dial-up phone line can transmit data within a frequency range of 300 to 3400Hz. In other words, its bandwidth is 3100Hz.

For this 3100Hz bandwidth, the maximum transmission rate is really about 3000 baud. But by increasing the number of states that they use to modulate the carrier, modems can transmit more than 3000 bps in the 3100Hz bandwidth.

You may have noticed that I've referred to all the modems as transmitting in bits per second (bps) and not baud. Baud is the same as bps only if each signal of information sent on the phone line represents one bit. With the data-compression and modulation schemes used in high-speed modems, this isn't true: a signal of information usually conveys more than one bit of data. As a result, once you go beyond 3000 baud, modem speeds should, strictly speaking, be measured in bps, not baud.

The compatibility outlook isn't as bright for modems running at speeds greater than 9600 bps. There are no standards for full-duplex dial-up communications at 19.2 kbps. Until those standards appear and modems that follow them are introduced, communicating at those speeds will not be as easy as communicating at lower speeds. ■

See *Where to Buy* for contact information.

Dave Kosiur, *a* Macworld *contributing editor, is the publisher of* Connections, *an international newsletter concerned with Macintosh networking. He wishes his telecommunications equipment ran at Ethernet speeds.*

Capturing Color

MARK JOHANN

Color scanners bring new possibilities and problems to the Mac

BY STEVE ROTH

Few items of Macintosh hardware have the immediate emotional appeal of a 24-bit color scanner. Grab a color photo, pop it in your scanner, and zap, it's on screen. With the right software you can manipulate colors, create masks for special effects, cut and paste, and generally work your will on the glowing display in front of you. Now that's what you bought a color Mac for.

If you're considering buying a color scanner, however, you'll do well to ask a few questions. What, for example, is the total cost of a system that can put an 8- or 24-bit color image to good use? What applications merit such an investment? What are the technical issues involved in getting the results you want? What are the limitations? Learning a little about how color scanners work and checking the features of the current crop of machines and software should help you decide whether you're ready to plunge into the world of capturing color.

What They Do

Simplifying just a bit, the possible applications for color scanners fall into four categories:

- *Mac screen display*
- *Video production*
- *Slide presentations*
- *Print publishing*

More esoteric applications include data analysis and image processing for military, industrial, and medical uses—counting the white blood cells in a slide or measuring the dispersion patterns of sulfur dioxide pollution, for example.

Mac Screen Display Suppose you want to scan 35mm slides from an archaeological dig and build them into an interactive, on-screen presentation to run in a museum along with an exhibit. It may seem like overkill to use a 24-bit, 1000-dpi scanner when your output will be to a 72-dpi, 8-bit Mac screen, but if you're capturing flat art or slides, these scanners are the only way to go.

In fact, screen display may be the best use for color scanners at this point. The necessary hardware is available, and the software is falling into place (though only two interactive display programs—MacroMind Director and SuperCard—display color scans, and the latter isn't shipping as of this writing).

Even though the Mac screen can't display all the information a color scanner can capture, by scanning at lower resolutions and using dithering and other techniques, you can produce really stunning screen images (see "Looking for Guidance"). You can also edit, modify, and combine images in ways that would be difficult or impossible—and definitely expensive—using photographic tools.

Video Production Next, suppose you want to use your slides in a video presentation. You still may wonder why you need a high-resolution color scanner when you've already got a video camera and digitizing interface. The final output is video resolution, so why exceed that at scan time?

There are two good reasons: environment control and flexibility. Color scanners let you capture flat art without worrying about photographic considerations like lighting and focus. And though you

display at a lower resolution and perhaps with fewer colors than are captured by your scanner, the "extra" data still comes into play (see "Scanning for Video").

Slide Presentations Next, suppose you want to annotate the scanned images with arrows and callouts and produce color slides for a presentation at the museum. The slide makers on the market let you do just that, though as with screen display, the software tools are just emerging (see "From Screen to Slide" in this issue).

PowerPoint, for instance, a favorite slide-making program, can't handle 24-bit images—nor can PowerPoint's competitors. Conductor, the software that comes with the Matrix film recorder, just started providing that support. If you want to annotate Matrix-destined images with object-oriented text and graphics, you need to call the files up with LaserPaint Color II, add the annotations, save the whole thing in PICT format, then print it using Conductor. The software that comes with the Montage film recorder has similar limitations.

Twenty-four-bit images printed on film recorders provide excellent quality—virtually photographic—and take between 15 minutes and an hour to produce (less time with the Matrix, more with the Montage). The quality is so good that some print publishers choose slide output rather than Linotronic separations and then have the slide separated traditionally. Eight-bit–color scanned images do not reproduce well on film recorders, though, so the 24-bit software connection is necessary.

With 24-bit images, you have the pedestrian but very real problem of getting massive files to your service bureau. You can bring in your hard disk, or if you and your service have compatible removable-media devices, you can send a cartridge. Floppies (*lots* of floppies) are a last-ditch solution, but don't even think about modems.

Print Publishing Finally, you might want to publish a brochure or article featuring your archaeological images. High-res scanners seem like an obvious tool for print publishing, and—with a few reservations—they are. At least two Mac page-makeup programs, QuarkXPress and the Lightspeed Color Layout System, let you place and view color scans on a page, move them around, size them, and correct the colors. You can't pull separations of the scans with either of these programs, but they're useful for designing and prototyping layouts, and you can print the layouts on color printers.

So why not use some of the hot graphics programs on the market to pull separations of your color scans, rather than going the expensive traditional route? You can do so and realize some savings. Programs like PhotoMac, LaserPaint Color II, and the soon-to-be-released SpectrePrint I and SpectreMatch I will create separations from scan files (see "Do Process"), but you'll be hard-pressed to get the quality that results from traditional scanning and separation systems. And since no Mac page-layout program currently separates bitmapped graphics, you'll still have to have your Mac separations stripped in manually.

Most of the problems associated with the process of separating bitmaps were outlined in "Color Separation Explained," *Macworld,* February 1989, and "Selecting a Color Separator," *Macworld,* March 1989. In addition, don't forget about the problem of transferring huge files to the service bureau. And once you've delivered the files, expect other problems with software, hardware, and output devices. Nothing happens fast with 4MB files, and some things don't happen at all. My advice would be that if you need to manipulate or combine images (for advertising, say), if your quality requirements allow for

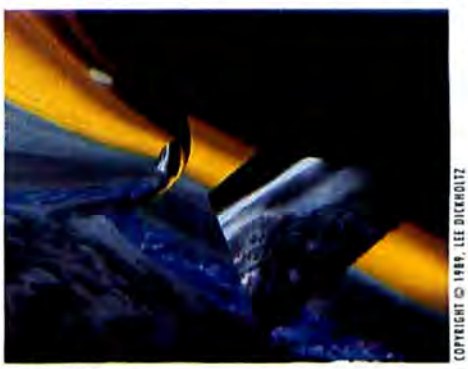
SCANNING FOR VIDEO

Rodney Stock, president of the Computer Arts Institute in San Francisco, points out that while there are drawbacks to using color scanners for video production, there are also several advantages. "Color scanners are slow compared to video frame grabbers, you can't capture three-dimensional objects, and you can't capture images in motion. But for still-video applications—for instance, if you want to use an image as a background for moving video—color scanners can be really useful.

"To begin with, scanners provide a completely controlled environment. With video cameras you're always adjusting the focus, moving lights around to avoid glare and get the illumination just right, getting dust off lenses—all sorts of messing around to capture a good image. Getting a truly flat field of illumination for flat art takes a lot of work. With scanners, the image is defined in size, color range, illumination, and focus. You just pop it in, push the button, and the scanner takes over from there.

"While you throw most of the resolution away when you go to video, depending on the software tools you're using, you can throw it away in a very educated way. You can average the image down to the resolution you want, retaining levels of detail you wouldn't have achieved if you had started with video. You can take something that's smaller than a video pixel, and average it into the video pixel with a crisper software filter than the optical filter in a video camera.

"You pay a price for that flexibility, of course, in computing time. While you might get a better image by filtering it in software, the optical filters in video cameras do the whole image at once, instantly."



Video Visions
Lee Dickholtz of the Computer Arts Center, San Francisco, used a Howtek ScanMaster to capture these aerial photographs (river and town) for an animation,* Abes in Toyland, *he is producing.

COLOR SCANNING SOFTWARE

	Price	Maximum Bits per Sample	8-Bit Dithers Apple/Custom	Brightness/ Contrast/Gamma	Disk or RAM Limited	Save Scanning Parameters	Film-Type Presets
Barneyscan Mac 1.6.3	n/a	24		•	RAM	•	
BarneyscanXP .70	n/a	24	4/2	•	disk		
ChromaScan 1.0b	$195	24	6/6	•	RAM	•	
Laserpaint Color II 1.9.2C	$595	24	2/1	•	RAM		
MacScan-It 1.0	n/a	24		•	RAM	•	•
PixelScan 2.0	n/a	24[1]	3/6	•[2]	RAM		
Studio/8 driver	n/a	8	1/1		RAM		
TruScan	n/a	24		•	RAM		

[1] Requires a 24-bit video board to capture 24-bit scans.

[2] Four levels of brightness only, 2 gamma settings only.

coarser line screens than 133, and if you're not printing very large or very many images, color separation of scan files with the Macintosh is possible and worthwhile. If you need the image-manipulation capability, but finer quality, consider outputting scanned images to slides and making separations traditionally.

No matter what your application, you need quite a machine to really take advantage of these scanners. A Mac II or SE/30 with color display, of course, is de rigueur. For some applications you can get by with 2MB of memory—especially with 8-bit files—but for 24-bit work, you're best off with 4MB or more. Plan on devoting 10MB of disk *minimum* to storing your 8-bit files, and triple that for 24-bit files.

Do Process

This image was captured from a 35mm slide with Barneyscan Mac, brightened using BarneyscanXP's Levels command, and separated using PhotoMac. The file was 3.6MB, and it took just under 40 minutes to print all four pieces of film.

What to Look For

Any scanning setup has two components: hardware and software. To get the most performance from the investment you'll be making, you'll need to ensure not only that you get the right scanner for your needs, but also that your hardware and software fit each other. Otherwise you may find your scanning software limiting what your hardware can do and vice versa. Here are some factors to consider in building a scanning system.

Source Format The first question you have to answer concerns the type of original images you'll be capturing—slides, flat art, or three-dimensional images. For 3-D images, your best bet is a video camera with a digitizer interface to your Mac. I don't have room to cover video systems in this article, but for small 3-D images (up to 2 inches tall), you might consider the overhead scanners from Truvel.

For flat art, there are three solutions—overheads, flatbeds, and slide scanners. Truvel, the only producer of color overheads, has been unable to deliver a unit to *Macworld* for review, so the discussion here applies mainly to flatbeds and slide scanners.

Flatbed scanners let you capture any flat art, and with optional transparency attachments (mirrors that reflect the image back to the scanning elements) you can also scan transparencies. You can use these units to scan 35mm slides, but resolution is a problem with such a small original. Even for screen display, the resulting images tend to look blurry.

Slide scanners, obviously, capture images from 35mm slides. They provide extremely high resolution within the constraints of the image size. The resolution is still borderline, though, if you want to create full-page color separations from a 35mm slide (the high-res Nikon scanner that's in the works may well change that).

Resolution How much resolution you need depends on the size of your source images; the size of final output; the type of output (screen, four-color printing, slides); and for color separations, the screen frequency you require.

For separations, you may frequently want to scan at twice your intended screen frequency—200 samples per inch, for example, for a destination frequency of 100 lines per inch. This *oversampling* provides for sharper scans with some types of images. (Remember, if you scan at 300 samples per inch, for example, and then scale up 200 percent, you are effectively reduced to 150 dpi.)

By comparison, high-end *drum* scanners capture huge amounts of data, correct the data in analog form, then average the information down and convert it to digital data, ending up with about 360K of data per square inch of output (that's 30MB for a full-page separation).

Mac scanners come close to that resolution (a 300-dpi, 24-bit scan results in 264K per square inch), but they don't have the huge sampling rate to begin with, or the analog correction (the Truvel and Nikon scanners are partial exceptions).

For 72-dpi screen display or output to video, you will want to scan at 100 dpi or better. Although the file will be larger, the image will be sharper than if you simply scanned at 72 samples per inch to begin with.

Dynamic Range and Bits per Sample Another important consideration is dynamic range. A typical slide or color print with a good range of brightness values includes about 15 bits of information. All the scanners covered in this article capture 24 bits, which seems like more than enough, but they actually make three passes—one each for red, green, and blue—capturing 8 bits at each pass. The result? Either the dark areas go black, or the light areas go white. It's especially hard to pull up details in dark slides. This problem is exacerbated when you want to correct the image after scanning. You've already lost information from the high and low ends. If you then boost the brightness, for instance, you lose even more detail in the light areas.

Howtek's Scanmaster models 35-I and 35-II stand out here in that they scan 12 bits at each pass, then compress that information into 8 bits for transmission to the Mac. Howtek's software lets you adjust sharpness, contrast, brightness, and the overall exposure (gamma) curve at scan time, operating on the 12-bit information before it's compressed to 8-bit.

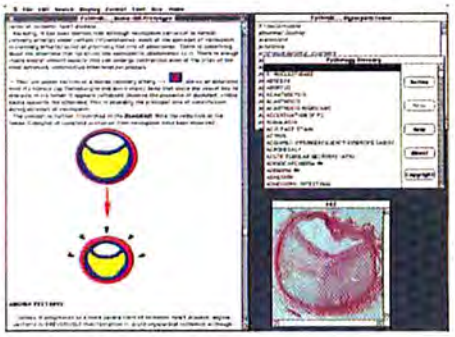
The soon-to-be-released Nikon slide scanner adjusts brightness, contrast, and sharpness while the data is still in analog form—before it's converted to 8-bit digital information. The result is the same: you can make corrections at scan time without losing dynamic range.

Barneyscan is a straight, three-pass, 8-bit scanner, but it lets you adjust exposure by changing the speed of the scan. A fast pass means less light is captured for each sample point, resulting in a darker scan that gives detail in light areas. A slower scan captures more light, emphasizing dark areas. You are still losing either the high or the low end of the picture's full dynamic range, but you can choose the optimum portion of the curve for the image and final output that you're using. The Truvel overheads enable you to adjust lens aperture, which achieves a similar effect.

Palettes and Dithers All of this discussion of dynamic range is based on capturing 24-bit scan files with their 16 million colors. But if you're planning to display images on an 8-bit monitor where you're limited to a 256-color palette, you have to convert the 24-bit image to 8 bits.

You can convert an image using either the standard Macintosh system palette or a custom palette, in which case the software analyzes the 24-bit file and creates a custom 256-color palette optimized for the colors it finds. Custom palettes result in more accurate renditions, but the system palette is useful when you want to transfer the image to programs that don't know how to use custom palettes.

When you convert to an 8-bit palette, even a custom palette, you may find that



Looking for Guidance
An electronic textbook of pathophysiology, running under the Guide hypermedia program at the Cornell University Medical College, provides several levels of information. The window at left is lecture material, studded with icons that call up color scanned images like the microscopic image in the lower right. The color diagram, created in a draw program, has hidden Guide buttons that provide tips on interpreting the image.

THE ELECTRONIC TEXTBOOK

Diana Macken, Dr. Daniel Alonso, and Dr. Steven Erde, a team at the Cornell University Medical College in New York City, are using a Barneyscan slide scanner and a Sharp JX-450 flatbed to capture images for an electronic textbook of pathophysiology. The team captures images in 24-bit format, color-corrects them with BarneyscanXP, then saves them in 8-bit format.

Using Guide, a hypermedia program, and aided by custom-coded screen drivers, students can display the images on 19-inch monitors on any of 20 networked, 2MB Mac IIs. The textbook includes more than 10,000 images, and the system has more than a gigabyte online.

Each image includes a custom 8-bit palette, so while more than one image can appear on screen at a time, only one of those images displays with the proper colors. The team is considering 24-bit displays so they can display an unlimited number of images (limited by memory), each with an accurate, custom palette.

Dynamic range is also a problem for the Cornell team; they must show detail in both light and dark areas—dark red heart tissue, for instance, with white lesions. Till recently they've simply done their best, but BarneyscanXP has given them a new technique. They scan an image with a slightly dark exposure setting, so light areas aren't lost, then "add" copies of the image, building up the brightness with each addition, but keeping detail in light areas. The team's use of custom drivers for Guide points up another limitation of using color scans for Macintosh screen display: only a couple of interactive media programs right now can handle color scan files. Even Guide, the Cornell team's program of choice, couldn't handle the images without the custom-coded drivers.

Patterns and Diffusion
As these screen captures made with BarneyscanXP show, custom palettes and dithering are helpful when you're displaying 24-bit files in 8 bits. The top image was converted using the system palette and no dithering. The middle image was dithered using a Pattern dither and the Apple system palette. The bottom image employs a Diffusion dither and a custom palette.

what were smooth transitions from one color to another in 24 bits aren't quite so smooth anymore. The solution is dithering. Dithering involves mixing different-colored pixels in close proximity to give the impression of intermediate shades. This technique fools the eye into thinking that there are more colors on screen than the computer can actually produce (see "Patterns and Diffusion").

There are many methods of dithering, and all the color scanner programs use different names for their dithering techniques. BarneyscanXP offers a pattern dither that uses MacPaint-like patterns, and a diffusion dither that results in much finer detail. PixelScan offers three levels of dithering—fine, medium, and coarse. For the greatest flexibility in manipulating your images, capture them at 24 bits and then dither down to 8 bits, as opposed to simply capturing at 8 bits. On the other hand, if you know disk space is going to be a problem, look for software that gives you a wide choice of dither techniques at scan time.

Software Features All of the amazing hardware capabilities discussed here don't really add up to much if your software can't take advantage of them. That is the first and most important job of any scanner software—to give you complete control of your scanner's features in a transparent and easy-to-use fashion. "Shopping for Scanners," *Macworld,* May 1989, provides a good discussion of features to look for in any scanner.

For color scanners, specifically, be sure to get software with gamma control—the ability to adjust the brightness/contrast curve, preferably for each of the three passes (red, green, and blue). Also look for preset corrections that adjust for different film types—Kodachrome, Ektachrome, Fuji, and so on.

Color Scanners Compared

It's difficult to state absolutes when there are so many possible hardware/software combinations. The following, however, is a rundown of several scanners the editors have worked with at *Macworld,* and various scanning software packages, with some insights into how they work and how they work together.

The Sharp JXs and the Howtek Scanmasters The Sharp and Howtek flatbed scanners use 300-dpi Sharp engines coupled with National Instruments interface boards. All of these scanners let you adjust brightness, contrast, and sharpening at scan time.

The Scanmasters come with MacScan-It software, which gives good access to the Scanmaster hardware features and lets you adjust brightness, contrast, and gamma for the red, green, and blue layers individually, as well as apply a number of canned correction procedures. MacScan-It's manual doesn't correspond to the software in some places, and it's pretty skimpy on details and suggestions. Overall, however, the package provides a usable, basic environment for capturing good-looking scans.

The Sharps come with PixelScan—four different versions of PixelScan, in fact, all without documentation (talk about a program in transition). Version 2.0 can scan 24-bit images, but only if you have a 24-bit display board. It has very limited control over contrast and brightness, but offers good options for dithering to 8 bits.

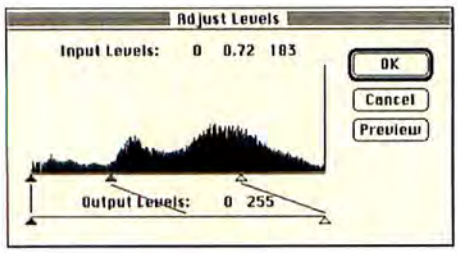
The Sharp and Howtek flatbeds are both reliable performers that have been around for several years, though they have shown problems with streaking at some resolution settings. A ROM update has reportedly solved the problems, but Sharp is charging current owners $75 for the new ROM chips, and Howtek is asking $150. While these scanners' 8-bit, three-pass technology doesn't provide the dynamic range that some of the slide scanners do, you can capture very usable images—especially for video or screen display—and the price is the best around.

Scanmasters 35-I and 35-II Howtek's 35mm slide scanners use the same software and interface board as its flatbeds. Both have the advantage of working with 12-bit data internally. Their resolution far surpasses the Barneyscan's, making them more appropriate if you want to create color separations.

The one infuriating thing about MacScan-It when used with the Scanmaster 35 models is its incredibly obtuse method of setting resolution and scaling. It's not worth discussing the details; suffice it

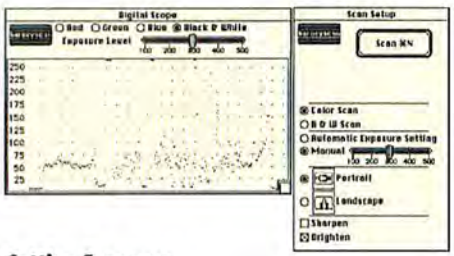
Scan Settings	
Scanning from:	ScanMaster35-I
Scan area (pixels):	
offset (x,y):	0, 0
width & height:	2048 x 2000
Output size (pixels):	
width & height:	110 x 108
Output resolution:	72 dpi
Type of scan:	contone color
Type of original:	KODAK_EKTACHROME_100
Sharpness:	normal

Huh?
Setting resolution and scaling with the Scanmaster 35 models is incredibly confusing. The relationships between scan area, output size, output resolution, and file size are not explained in the manual.



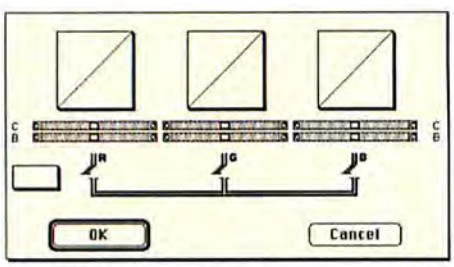
Stretch to Fit

BarneyscanXP (a.k.a. PhotoShop) has one of the best tools around for adjusting the overall brightness of an image. The line directly beneath the graph shows input values, and the lower line shows output values. Here, all values between 183 and 255 have been cut off, and the midtone has been set to 72 percent of the original. The remaining values are "stretched" so they fill the full 256-value range, brightening the image. The diagonal lines were added to show which input values have been mapped to which output values.



Setting Exposure

Turn on the Digital Scope in either Barneyscan Mac or BarneyscanXP, move the slide back and forth, and they show you the brightness values for a one-sample-wide slice of your slide. Then adjust the on-screen slider to change the exposure, and watch the values change. Or if you want, the software will prescan the image and set the exposure for you based on the values it finds.



Changing the Channel

LaserPaint Color II's gamma correction lets you adjust contrast and brightness sliders for the red, green, and blue channels independently. For nonlinear control, you can draw the graphs or type a number to create an exponential curve.

to say that you need a pencil, paper, and calculator to set up your scans properly (see "Huh?").

Aside from the resolution/scaling problems, MacScan-It does a very good job with the 35-I and the 35-II. You can preview an image, choose the portion you want to capture, and set all the image-enhancement options interactively (including several presets for different film types), viewing the results of your changes on screen. Once the image looks right, you rescan, and the software downloads your settings to the scanner, which uses those settings to effect any changes on the 12-bit data, only converting to 8-bit once the corrections have been made.

Barneyscan Perhaps the best-known of the slide scanners on the market, the Barneyscan package includes a scanner, an interface board, two impressive pieces of software, slides for calibration and just playing around with, and even a loupe and a blower/brush for cleaning slides. It's a very usable package based on well-constructed and reliable hardware.

Barneyscan Mac, the basic scanning application, offers impressive postscan controls for adjusting brightness, contrast, gamma, and sharpening. It is limited to scanning in memory, though, so you need a 5MB machine running under the Finder, with all the software goodies stripped out.

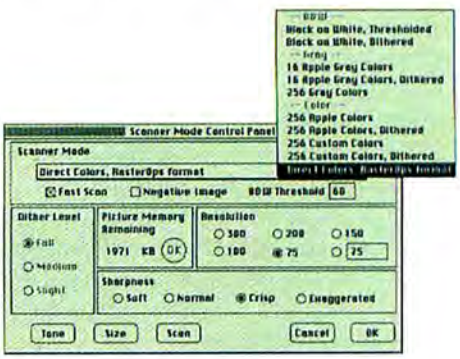
The other application, which will scan a full slide with only 2MB of memory, is BarneyscanXP—a proprietary version of an as yet unreleased program widely known as PhotoShop. Barneyscan's shipping version is only .70, but it is solid and works well, missing only a few tools. This program is about the best image-manipulation software available. It won't create process color separations, but it will do just about everything you've seen in ImageStudio and a lot more—in color. Its Levels control, in particular, makes adjusting the values in a scan very easy (see "Stretch to Fit"). You can split an image into component *channels* (RGB, CMYK, HSB), edit each channel, and then recombine them. The program offers impressive features for creating masks and enables you to apply effects very selectively to only specific regions or values within an image. You can also dither an image to 1–8 bits using either pattern or diffusion dither techniques. And that's just the tip of the iceberg.

While Barneyscan is a straight three-pass, 8-bit scanner with limited dynamic range, the software makes it easy to set the exposure of the scan so you can get optimum values for the areas you want to capture (see "Setting Exposure"). The Howtek Scanmaster 35s have more impressive specs (higher resolution, 12 bits internal); but the Barneyscan is faster, the documentation is excellent (though BarneyscanXP's manual still needs a lot of filling out), and the software is top-notch. It's so good that you can see very clearly the 8-bit limitations of the hardware. It makes you wish for a model with Barneyscan's software and exposure control, but the Scanmaster 35's hardware specs.

Stand-Alone Software

If you're considering the Sharp or Howtek flatbeds, there are now a few third-party scanning programs that work with them. With the Sharp you will probably want to buy one of these, and with the Howtek you may choose to buy one for the sake of convenience and control.

ChromaScan, from Imagenesis, lets you tap all the scanners' features from within one dialog box (see "A la Mode"). It also offers good controls for gamma correction. You get two dither methods using custom palettes and two using the Apple palette, with three choices in each case for



A la Mode

ChromaScan provides good control over the features of the Sharp and Howtek flatbeds. The option to dither the colors using the Apple system palette is especially useful when you will be moving the image to programs that don't understand custom palettes.

COLOR SCANNERS COMPARED

	Scanner	Price	Type[1]	Maximum Optical Resolution (in dpi)	Bits per Sample	Bundled Software	Maximum Image Size (in inches)	Comments
Barneyscan	Barneyscan	$9495	35mm	1000[2]	3 x 8	Barneyscan Mac, BarneyscanXP	n/a	Speed can be set for adjustable exposure.
Howtek	Scanmaster	$8195	FB	300	3 x 8	MacScan-It	11 x 17[3]	Transparency attachment available.
	Scanmaster II	$6195	FB	300	3 x 8	MacScan-It	8.5 x 11	
	Scanmaster 35-I	$8195	35mm	1580 x 1488[4]	3 x 8[5]	MacScan-It	n/a	
	Scanmaster 35-II	$8195	35mm	2370 x 2232[6]	3 x 8[5]	MacScan-It	n/a	No rotation.
Sharp	JX-450	$6995	FB	300	3 x 8	PixelScan	11 x 17[3]	Transparency attachment available.
	JX-300	$4995	FB	300	3 x 8	PixelScan	8.5 x 11	
	JX-100[7]	$995	HH	200	3 x 6	PixelScan	3.9 x 6.3	
Truvel	TZ-3BWC	$11,090	OH	300[9]	3 x 8	TruScan	12 x 17[10]	Scans 3-D objects up to 2 in.
	T-35BWC	$9590[8]	35mm	3760 x 3760	3 x 8	TruScan	n/a	

[1] *35mm = slide scanner, FB = flatbed, HH = hand held, OH = overhead.*

[2] *Per-inch figure is approximate. Overall scan area is 1024 x 1520.*

[3] *8.5 x 11 inches for transparencies.*

[4] *Per-inch figure is approximate. Overall scan area is 1333 x 2000.*

[5] *12 bits internally, compressed to 8 bits.*

[6] *Per-inch figure is approximate. Overall scan area is 2000 x 3000.*

[7] *Prerelease information, subject to change.*

[8] *$13,590 for transparency version.*

[9] *Optical resolution up to 900 dpi (controlled by zoom lens), averaged down to 300 digital dpi.*

[10] *At 300 dpi, 4 x 17 inches at 900 dpi.*

how fine a dither you want. The sizing and scaling dialog is easy and intuitive, and you are always well apprised of how much memory you have left. Scan size is limited by memory, though, not disk space.

LaserPaint Color II, the Swiss army knife of Mac graphics programs, also has a scanning function. Choose Scan from the File menu and you're presented with a whole new set of menus for the scanner you're using. You can scan using three different palette options, in either 8- or 24-bit mode, and you have all of LaserPaint's gamma-correction, image-editing, and color-separation tools (see "Changing the Channel"). But again, your scan size is limited by memory.

Studio/8, an up-and-coming color paint program, has a driver that lets you scan 8-bit images without leaving the program. Studio/32 is on the way, which may make Electronic Arts a real contender for color scanning software.

WHAT'S COMING

At least three other significant scanning products were in the works when this article went to press: Sharp's JX-100 hand-held scanner, the Nikon LS-3000 Slide Scanner, and the SpectrePrint/SpectreMatch software combo.

With its 200-dpi resolution, the $1295 Sharp hand-held scanner won't set the color separation world ablaze, but it will be perfect for screen display and a real boon to those who don't have the budget to jump into the expensive scanners currently available.

At the other end, the $10,000 Nikon slide scanner offers very high resolution and precision—the kind you need for large, sharply-focused color separations —as well as analog gamma correction and sharpening that bypass the dynamic range limitations of 3-by-8-bit scanners. Nineteen preset corrections for different film types are built into the scanner, and you can add your own.

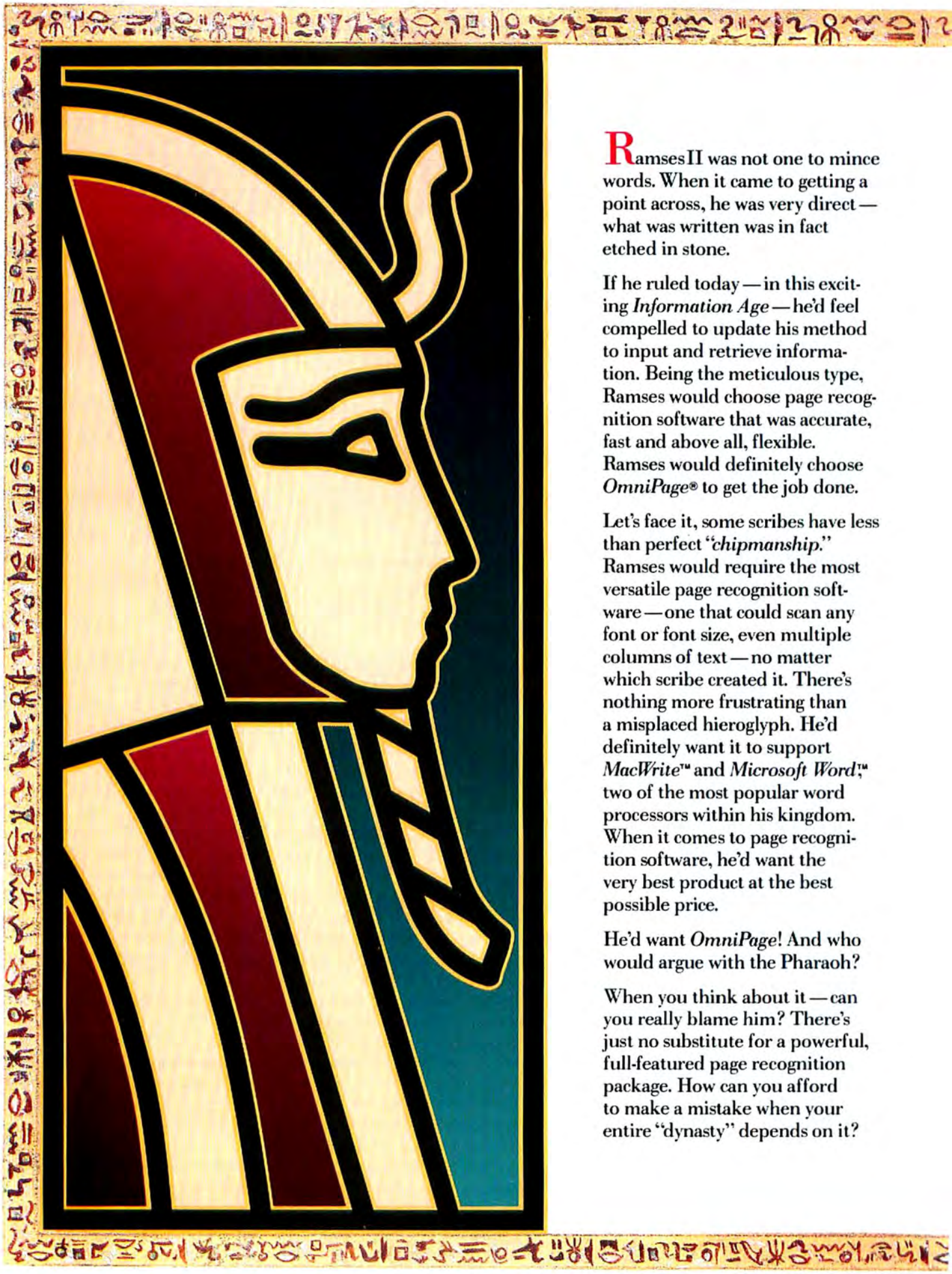
At $9000 for the pair, SpectreMatch and SpectrePrint are not for the occasional user. SpectreMatch is a color-correction tool, and SpectrePrint handles separations. Between them, they provide the tools that traditional separators are used to. And at that price, traditional separators are probably the only people who will buy them.

The future of color scanning on the Mac is still unclear, but some things are certain. Apple's 32-bit color QuickDraw will play a big part in bringing high-quality images to the Mac screen, as will interactive multimedia programs like SuperCard and MacroMind Director. Faster, higher-resolution PostScript-compatible imagesetters will make color separations more feasible. And new scanners, such as the high-end Nikon and the low-end Sharp hand-held, will provide scanning tools for a wide range of users.

See *Where to Buy* for contact information.

Steve Roth *operates Open House in Seattle, producing editorial packages for book and magazine publishers. He is the editor of* Real World PostScript *(Addison-Wesley, 1988).*

Thanks to David Biedny, of Incredible/I, in New York City, for contributions on color palettes and dithering, and Douglas Wolfson, of Digital Photo, in Omaha, for input on slide production.



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

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

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

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

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

So It Is Written...
So It Shall Be.

Means that *OmniPage* can read virtually any font, in sizes that range from 8 pt. to 72 pt.

This unique landscape feature means that spreadsheets and financial documents are only a scan away. A great addition to your royal granary if storing and accessing numerical data really counts!

Multiple column feature means that complex, compound pages of text and graphics can be handled—automatically.

Transitional Editor™ lets you review scanned text before exporting it to a file. Cut, copy, paste, insert and delete text — or take advantage of the powerful search and replace tools which allow you to modify a page.

Reads and outputs underlines, bold faces and italics.

Supports the most popular word processing programs for the Macintosh, including *Microsoft Word* and *MacWrite*.

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

WYSIScan™ interface takes full advantage of Macintosh's incredible ease-of-use.

OmniPage 2.0 has even more features than ever before — this translates into the most comprehensive page recognition software available — anywhere — for any dynasty — at any price.

The bottom line in page recognition software — eliminating excessive key strokes* for all time.

OmniPage 2.0 now available!

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

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Circle 230 on reader service card

REVIEWS

MACINTOSH IIX

Modular Six-Slot 68030/68882 Macintosh

Pros: *Fast speed and expandable; FDHD floppy drive; integrated Paged Memory Management Unit (PMMU); accepts Mac II NuBus cards.* ***Cons:*** *Only modest performance improvement over the Mac II.*
Company: *Apple Computer.* ***List price:*** *Varies depending on components; reviewed configuration 4MB RAM, one 1.44MB FDHD, 80MB hard drive $7869.*

MARK JOHANN

If you were designing a Macintosh from scratch, there are several things you could do to make your life easier in the future. First, you could put the ROM chips that contain the Macintosh Toolbox on removable SIMMs. Second, you could use a processor that incorporated paged memory management, looking forward to true multitasking and ever-larger amounts of RAM. As a precaution you could keep the CPU in a socket rather than soldering it to the board, so it would be relatively easy to upgrade to a faster processor or an enhanced processor in the same series (there's a 68040 out there somewhere). As a last progressive touch, you could throw in a floppy drive that reads a variety of formats. In a world full of MS-DOS disks, it would enhance the Mac's usefulness in mainstream American business.

All of these things, in fact, were done in the design of the Mac IIx, a computer destined to be Apple's top of the line for at least the next few years. Just as SE was humorously said to designate slightly enhanced in comparison to the Plus, the x in IIx really signifies extra touches to the II rather than a breakthrough. The Macintosh IIx was designed to improve on the Mac II without creating massive compatibility problems. As it happened, caution was justified. Early reports on the IIx showed troublesome problems with Excel, A/UX, CAD programs, and a handful of NuBus cards—problems that have been fixed during the last few months by small amounts of software recoding and a somewhat larger amount of system software tune-up. Now that the excitement of new product introduction is over, let's take a look at what you get now, what you might get next, and whether you need it.

What You Get Now

Because Apple decided to use a 16MHz 68030/68882 combination, raw computational performance is not phenomenally enhanced over the standard Mac II. The II's processor is a 16MHz 68020/68881, so you might justifiably wonder why you get any enhancement at all. Two points work in favor of the IIx. The 68030 has a data cache as well as a code cache, and this helps reduce calls to main memory. The 68882 with a fast numeric format converter has better floating-point performance than the 68881. The resulting speed improvement, however, is highly software dependent: improvement ranges from a few percentage points with some applications, up to 40 percent in special cases. Number crunching tends to bog down in both the II and IIx by calls to SANE, but floating-point–intensive applications that access the 68882 directly can be ten times faster than the same application on an SE,

or more. Nonetheless, if you want the ultimate workstation performance currently possible on a Mac you will have to consider a 33MHz 030/882 accelerator for a II or IIx, rather than a standard IIx. Also note that the 80MB hard disk in the IIx is the same as that in the II, so I/O-bound operations are approximately the same in both cases.

Looking Ahead

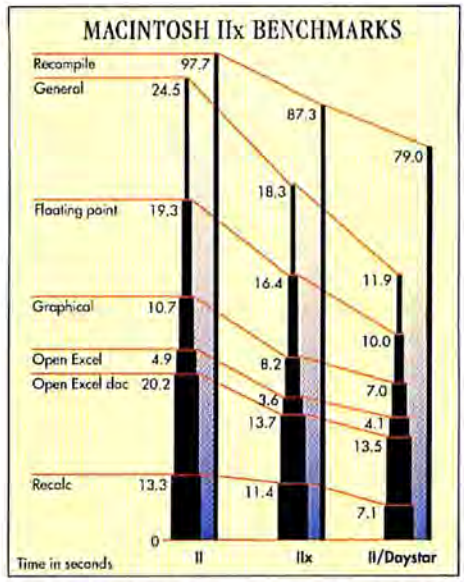
Other IIx features waiting for optimal software are the Floppy Drive High Density (FDHD) and the 68030's built-in memory management. As it stands now, you can read data from MS-DOS disks using the FDHD in conjunction with the Apple File Exchange utility. In practice, this procedure is remarkably clumsy. It's clear that Apple and third-party developers can someday make it possible, for example, to open MS-DOS word processor or database files directly within Macintosh applications, and to save files directly to MS-DOS format when the work is finished. At the very least, some inspired programmer will write a compact DA that operates Apple File Exchange and some simple conversions.

Similarly, enhancements to both A/UX and development of multitasking variants of the System/Finder will have wider applicability now that the standard high-end system has a paged memory scheme built into its CPU.

Does X Mark Your Spot?

If you do mostly word processing, get yourself an SE and a LaserWriter instead of a IIx, and pocket your savings. If you're beginning to process color separations, the IIx is not only a good choice technically but a reasonable value for the application. If you need one card for a network, another for your neural-net simulation hardware, and yet another for data acquisition, then the IIx is your best choice (remember, you need a graphics card too). The Mac II to IIx upgrade, costing about $3300 for an FDHD, memory-management chip, and extra memory, makes economic sense in special cases, but most Mac II users will probably pass on this option. New purchasers, however, will almost certainly opt for a IIx rather than a II. As a last consideration, remember that within a few months of its introduction, Apple began offering a IIx price of $4879 to high-volume national accounts, suggesting that discounted IIx's may ultimately make their way onto the desks of the rest of us.—*Charles Seiter*

See* Where to Buy *or circle 827 on reader service card.



The speed tests used for this graph are a subset of the benchmark suite* Macworld *used to compare Macs and accelerator boards (see March 1989* Macworld *accelerator review). The Daystar board is the Daystar 33/030 Accelerator II.

SMARTFORM DESIGNER

Forms Creation and Fill-Out Program

Pros: *Capable, easy-to-use design tools; sophisticated functions for automatic calculation; comprehensive validation criteria; includes SmartForm Assistant.*
Cons: *Can't export easily to databases, doesn't import EPS or MacPaint files; no DA version of Assistant.*
Company: *Claris.* ***Requires:*** *Mac Plus; second disk drive. Hard disk recommended. Requires System 6.0 and Finder 6.1.* ***List price:*** *$399.*

If you use your Mac to run your business, but you still buy invoice and order forms from a stationer, or you hack forms together in MacDraw or PageMaker, forms software is worth investigating. While many other products have already been introduced, Claris' SmartForm Designer 1.0v1 combines a well-tuned set of features that might finally convince you to turn to genuine forms software.

SmartForm competes with Adobe's True Form and Power Up Corporation's Fast Forms. All three products address three separate functions: reproducing existing paper forms, creating new forms, and filling out forms.

Designer Forms

The key advantages of filling out forms electronically include entry validation, automatic calculations, and better record keeping. If company policy dictates the use of an existing design, you may simply want a quick way to duplicate your current paper forms on the Mac. The best bet in this situation is to scan them into Adobe's True Form. SmartForm and Fast Forms, in contrast, allow you to create custom-tailored forms that can be changed almost instantly.

SmartForm divvies up its major functions into two separate programs: SmartForm Designer handles creating the forms, and SmartForm Assistant lets you fill them out. If you plan to stick with paper forms, you just need Designer to draw them up; you can then print them on a LaserWriter or a Linotronic. For filling out forms electronically, you'll need to buy additional copies of Assistant for everyone who works with the forms.

Form and Function

Designer has few layout tools, but they're ideally suited to the task they address: accurate placement of simple, often repetitious elements (see "Well Formed"). In addition to conventional text tools, draw-program lines, rectangles, and ovals, you get several types of tools for creating fields, which are areas for entering data. As in a good drawing or desktop publishing application, you can have any of these objects snap to an underlying grid or place them using numeric coordinates. Improving on a similar Fast Forms feature, the flexible Super Duplicate command lets you make multiple evenly spaced copies of an object and place them using numeric coordinates or the mouse. Designer also

(continues)

permits you to define master pages, so that elements such as logos can appear on every page.

Designer's text capabilities are complete. Each font comes in eight styles—including condensed, extended, and reverse type—and a full range of font sizes from 4 to 127 points. Designer makes it easier than most programs do to enter text within an oval or rectangle—all you have to do is select the oval or rectangle and start typing.

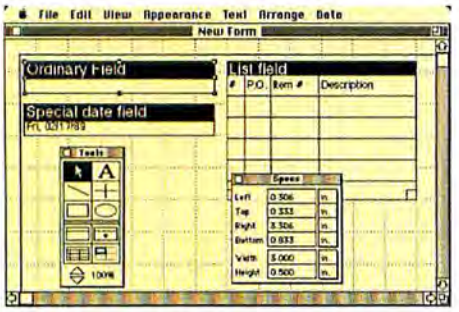
Intelligent Red Tape

Although Designer's layout tools make form design faster, you could get the same results with a drawing or DTP application. What really separates Designer and its competitors from general-purpose layout software are the built-in features that help you enter and even analyze data.

But even the simplest SmartForm field has some smarts: for example, when you press the Tab key in Assistant, the cursor jumps from field to field, according to the order you define in Designer. And fields in SmartForm can be a lot more than passive data receptacles. You can enter a default value, define constraints or validation criteria, or offer a list of choices for entry. You can write help messages for individual fields, or for invalid entries (see "Eager Assistance").

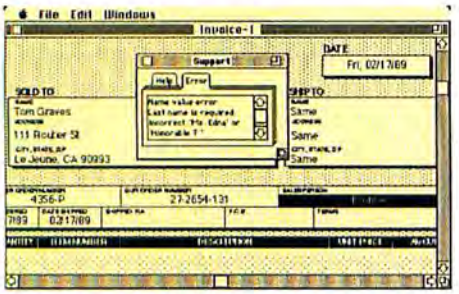
Fields can also be calculated: an obvious example would be the total field at the bottom of a sales slip. In addition to ordinary single-item fields, Designer offers three other field types: one for automatically calculated numbers such as the form number or page number; one for tables of entries, called lists; and one for repeating custom-defined groups of fields.

The lack of a data entry facility is Designer's most irksome fault. While you can place text into the form you're designing, you can't test the form's formulas or its field-validation functions without switching over to Assistant. For those who want to add logos or some other type of illustrations Designer's inability to import EPS graphics, or for that matter MacPaint files, will be another drawback—though you can import the images via the Clipboard as PICT files.



Well Formed

The workspace in SmartForm Designer includes several field types (ordinary, special, and list). The Specs window displays the location and dimensions of the currently selected field or graphic object.



Eager Assistance

You use SmartForm Assistant to fill in an already created form. Here the currently active field was completed incorrectly, so the error message in the Support window gives a few pointers.

An Able Assistant

SmartForm Assistant bears the relatively simple responsibility for form fill-out. Unless you fill out forms for long periods at a stretch, Assistant has a noticeable drawback; unlike Fast Forms, whose DA gives you access to forms at a moment's notice, Assistant is a stand-alone application. Also, you'll be disappointed with Assistant if you're looking for an easy way to get your entries into a database. Although Claris promises that future Smart series products will provide database links, all Assistant can do now is export the contents of one form at a time to a standard text file.

Still the SmartForm package excels at its current mission. And with Claris' aggressive pricing of Assistant—$5 per copy at the bulk rate—SmartForm is certainly the most economical way to convert to electronic forms.—*Steve Cummings*

See Where to Buy or circle 899 on reader service card.

LETRASTUDIO 1.0

Display-Type Customization Program

Pros: *Excellent screen displays; precise control over letter and word spacing.* ***Cons:*** *Limited font selection; very slow.* ***Company:*** *Letraset USA.* ***Requires:*** *Mac Plus; 2MB for use with MultiFinder; hard disk. Color or gray-scale monitor recommended for best-quality screen displays.* ***List price:*** *$495; fonts $75 each (four included with program).*

The Macintosh is a typographically versatile computer, but the creation of display type—the large, attention-getting text that appears in headlines and on product packaging—is not its strong suit. Creating display type requires fine control over letter and word spacing; unfortunately, at large sizes the Mac's bitmapped screen fonts take on a jagged appearance that makes precise positioning difficult.

Letraset's LetraStudio solves this problem by eschewing the Mac's fonts in favor of its own. LetraStudio's custom fonts allow it to display tack-sharp type at any size and in any orientation. Combine these talents with the ability to stretch and distort type, Pantone-color support, and simple drawing tools, and you have a versatile addition to the desktop typographer's toolbox.

Type Casting

LetraStudio provides an on-screen work area similar to that of most desktop publishing and drawing programs: rulers line the top and left edges of the document window, and a palette provides access to tools for editing text, zooming in and out, and drawing lines, arcs, rectangles, and circles (see "In the Studio").

Although LetraStudio offers some drawing features, it isn't intended to replace an illustration program such as Adobe Illustrator 88 or Aldus FreeHand. You won't find bitmap tracing features or freehand drawing tools. LetraStudio's specialty is manipulating text—and it does that very well.

(continues)

SHARP INTRODUCES A FULL COLOR SCANNER FOR YOUR MACINTOSH.®

Now you can feed high-resolution four color artwork directly into your computer system, and get color reproductions that will astound you with their accuracy.

The new Sharp JX-450 makes it possible—a desktop phenomenon that marks a quantum leap in publishing and presentation graphics systems.

Sharp's resolution of 300 dots per inch provides scanning equal to conventional console types, and gives accurate, finely detailed images with every nuance captured. Also, 64 shade gradations for each element seize the subtlest details, and yield a color tone capacity of over 260,000 shades. Even when you use it with a black or white Mac system, it gives superior grey gradations and middle tones.

Scanning capacity is up to 11″ x 17″—enough to scan a two page spread. It will also scan 35mm and overhead projection film with an optional mirror unit. Picture, if you will, how a two-page spread of finely colored images could enhance and dramatize your presentations.

All this, in an attractive desktop size.

To create exquisite, economical hard copies of your color graphics, Sharp also offers the companion JX-730 four color inkjet printer.

Once again, Sharp shows its true colors. For more information: 1-800-BE-SHARP.

SHARP®
FROM SHARP MINDS COME SHARP PRODUCTS™

JX-450

SIMULATED PICTURE ON MONITOR

© 1987 Sharp Electronics Corp.

Circle 327 on reader service card

In the Studio

LetraStudio lets you create custom display type by stretching and distorting characters and their baselines. LetraStudio's custom fonts take advantage of the shading capabilities of color and gray-scale monitors to eliminate jagged edges.

The first step in creating display type with LetraStudio is to enter the text. Next you'll want to precisely refine the word and letter spacing. LetraStudio kerns (decreases intercharacter spacing) in increments as small as .01 point. More impressive, however, is the way it lets you kern your characters by hand: press ⌘ while clicking on a character and drag the character left or right until it's exactly where you want it.

Like quality illustration programs such as Illustrator 88 and FreeHand, LetraStudio lets you create special effects such as stroked (outlined) characters. You can also stretch and condense text, create drop shadows, and choose from the full rainbow of Pantone hues for fill and stroke colors. When it's time to print, you can specify that LetraStudio print spot-color separations, in which each color is printed on its own page. The program supports color output on color PostScript printers such as the QMS ColorScript. You can also save documents as encapsulated PostScript (EPS) files for subsequent inclusion in desktop publications.

Display type is often distorted type. Text curving up and down on a wavy baseline, characters receding into the distance with apparent perspective, a brand name curving as if printed on a bottle—effects like these can enhance the effectiveness of display type. LetraStudio offers a complete array of type-alteration features that operate on baselines or on a text *envelope*, a boundary that surrounds a word or sentence. And your effects appear on screen exactly as they will when printed; completing a design doesn't require test prints and tweaking.

It's All in the Fonts

LetraStudio's remarkably accurate screen display is made possible by the intelligent design of its proprietary fonts. When viewed on a color or gray-scale monitor, LetraStudio's fonts look downright stunning, thanks to the program's technique of using a slight shade of color to soften a character's contours, thus all but eliminating the jaggies.

LetraStudio first appeared with copy-protected versions of its fonts, but this proved wildly unpopular with the Mac community. Letraset is now sending to all registered owners (free of charge) a new font disk that contains nonprotected versions of the four LetraFont faces originally shipped with LetraStudio. Owners of individual font disks can also upgrade for free by sending their disks to Letraset's customer service department.

A potential drawback to LetraStudio is the selection of fonts. Some well-known faces such as Times, Helvetica, Avant Garde, and Bodoni are available, but many of the typefaces in the LetraStudio library look like fonts you'd expect to see on "Pee-Wee's Playhouse." I can't wait to see a newsletter masthead printed in Frankfurter Medium.

A more serious problem is LetraStudio's downright sluggish performance. On my 2MB Mac II, the program takes 20 seconds to draw the label shown in "In the Studio." Worse, it often redraws most of a window when you make only a minor adjustment to an image. LetraStudio needs a redraw halting feature (common in advanced drafting programs where lengthy screen updates would normally result from editing changes) that lets you stop the screen updating process by clicking the mouse or pressing a key.

LetraStudio could certainly be faster, but otherwise the program performs its role well. Its capabilities are remarkable, and its documentation is clear and complete. But do ask to see the font catalog before you buy it.—*Jim Heid*

See* Where to Buy *or circle 816 on reader service card.

CALCOMP DRAWING BOARD

Drawing Board Digitizer

Pros: *Well-made drawing board plugs directly into Mac's ADB port; easy-to-use 16-button cursor adds useful functions.* ***Cons:*** *Skimpy documentation; slightly more expensive than the competition.* ***Company:*** *CalComp.* ***Requires:*** *Mac SE.* ***List price:*** *$595.*

MACMASTER TEMPLATES 1.0

Templates for Digitizing Tables

Pros: *Speeds selection and execution of commands; enables you to pick commands and trace drawings without looking at the Mac screen.* ***Cons:*** *subtemplates available for only a few applications; limited ability to customize.* ***Company:*** *Promontory Systems.* ***Requires:*** *CalComp drawing tablet.* ***List price:*** *Driver and master template free with registration card; subtemplates $195 each.*

The mouse—in spite of its elegance, simplicity, and power—is not the best tool for all types of input. Special-purpose computer-aided-design (CAD) and graphics workstations have for years used digitizing pads instead of mice because they offer greater drawing precision and a choice of drawing tools specifically designed for CAD and graphics applications.

CalComp is well known as a manufacturer of high-end plotters and digitizers for the CAD industry. The CalComp Drawing Board includes a 15-by-16-inch drawing tablet with a 12-inch-square active area, a 16-button cursor, driver software, and MacMaster template. (CalComp also offers 12-by-18-inch and 18-by-24-inch boards.) The tablet plugs into the Mac's ADB port and is compatible with all SEs and IIs.

Digitizing tablets are useful for all freehand drawing, tracing, and layout applications. Instead of a mouse, you use a cursor or stylus on a plastic pad. The position of the pointing device on the pad translates into digital coordinates on the

(continues)

William Lombardo, Modelmaking & Illustration
Created with Swivel 3D and PixelPaint

Roy Santiago, Business Presentation
Animated Swivel 3D images in VideoWorks

"A superb presentation tool... Swivel 3D raises the standard of 3-D graphics on the Macintosh."
Joost Romeu, MacWeek

"It's a speed-demon. It's your basic $395 must-have."
Salvatore Parascadolo, MacUser

"Creating objects with complex surfaces couldn't be easier...only Swivel 3D lets you cast shadows on images."
David Peltz, MacWorld

Jim Ludtke, Graphic Artist
Magazine illustration created with Swivel 3D.

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Jack Davis, Verbum

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Swivel 3D is the first and only program to feature Linking. Linking allows you to create realistic images with wheels, doors, levers, arms, legs, and objects that move.

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Three-Dimensional Drawing/Modeling for the Macintosh.

Suggested Retail Price: $395

Minimum System Requirements: 1 meg

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Circle 213 on reader service card

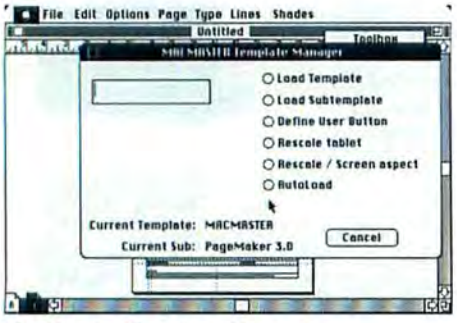
Mac screen. The Drawing Board has a resolution of 1000 lines per inch versus the mouse's 200 or so. There are no Mac applications that recognize the higher resolution, but VersaCAD is reportedly working on one.

The CalComp cursor is approximately the same size as the Mac's mouse, but it has a pointer that consists of a clear plastic circle with cross hairs, which makes it relatively easy to trace drawings, something a mouse cannot do easily. The cursor also works well as a general-purpose mouse substitute.

Eleven of the cursor's buttons are programmed to send Macintosh commands; for instance, button 8 sends ⌘-Q, which in most Mac applications means quit. Button 1 corresponds to the standard mouse button; button 2 enables you to choose commands from the templates; and button 3 sends a double-click. The other 5 buttons are not programmed to Macintosh commands but might be in the future.

Sixteen buttons can be confusing for a habitual one-button user. At first you have to look at the cursor to use it effectively; but with practice the placement of the buttons becomes familiar and they provide a handy shortcut.

The stylus, purchased separately for $92, is similar to a pen, and many artists find it easier to draw with than a mouse. The stylus has one button, in the tip, so you simply press down to click. I did not test the stylus, but from past experience, I know that a stylus is the best tool for freehand drawing. No one I spoke with at CalComp or Promontory Systems (formerly known as AutoEase) knew if the stylus worked with the templates.



MacMaster Template Manager
The template-manager desk accessory has all the basic commands but no frills—not even a close box. You have to cancel to leave the manager.

MARK JOHANN

The CalComp Drawing Board

When you plug in the Drawing Board, it is immediately active, and the CalComp cursor behaves just like the mouse—when you pick it up and put it down in another location the Mac's on-screen cursor doesn't move. This is called relative positioning. The newest version of the software, 1.0.1, supports multiple monitors simultaneously, but I did not have this version to test.

Command Templates: An Extra Dimension

For tracing you need absolute positioning—in which each spot on the Drawing Board translates into a corresponding point on the Mac screen. To activate absolute positioning, you must install the CalComp driver, written by Promontory Systems, in the System Folder and restart the Mac. The first time you use the templates, you must also install a template-manager desk accessory called AEManager, as well as a MacMaster template file.

With the AEManager you can change the active area of the drawing tablet to suit your drawing preference, you can load command templates, and you can define software buttons for subtemplates. Promontory Systems currently offers the MacMaster template, which includes Finder and HyperCard commands, and subtemplates with commands for VersaCAD 2.0, PageMaker 3.0, and WordPerfect 1.0.1. Each subtemplate consists of a sheet of plastic, printed with the application's menu commands, and a corresponding driver file that you install in the System Folder. The subtemplates fit into the MacMaster template, so that commands from both are always available. You receive the MacMaster template free when you return your registration card to CalComp. Subtemplates cost $195 each.

Each subtemplate offers over a hundred commands or options from the application's menu bar. Instead of pulling down a menu and selecting a command, when using the CalComp board with a template, you simply click on the command with the cursor's Pick button (button 2). Because there isn't room for every possible command, font, and type style, each subtemplate has an area designated specifically for user-defined template buttons.

You still have to hunt for less frequently used commands, but templates offer the advantage of letting you see commands you might have forgotten. One disadvantage is that even though commands are arranged by menu, the layouts seem based more on the size and shape of the templates than on a useful juxtaposition of related commands.

Promontory Systems promises that there will be more templates and more features for defining your own templates, but until then, this is a fairly rigid system.

Is It Worth It?

Command picking with digitizing tablets is a standard feature of many graphics systems, and for an experienced user it is fast and convenient. In general, whenever you spend most of your time in an application using the mouse, the command templates are a great addition to a tablet. If most of your time is spent at the keyboard, however, don't waste your money.

The CalComp board is nicely made and trouble free, and the cursor works well and feels comfortable in the hand. It comes with a manual of only four pages, but you can call CalComp or Promontory Systems for free technical support. The board has a five-year warranty. Since the Drawing Board's features are all available on other tablets, CalComp will have to rely on its reputation for building durable hardware and giving high-quality support to differentiate its tablets from others. This product seems to uphold that reputation.—*Clay Andres*

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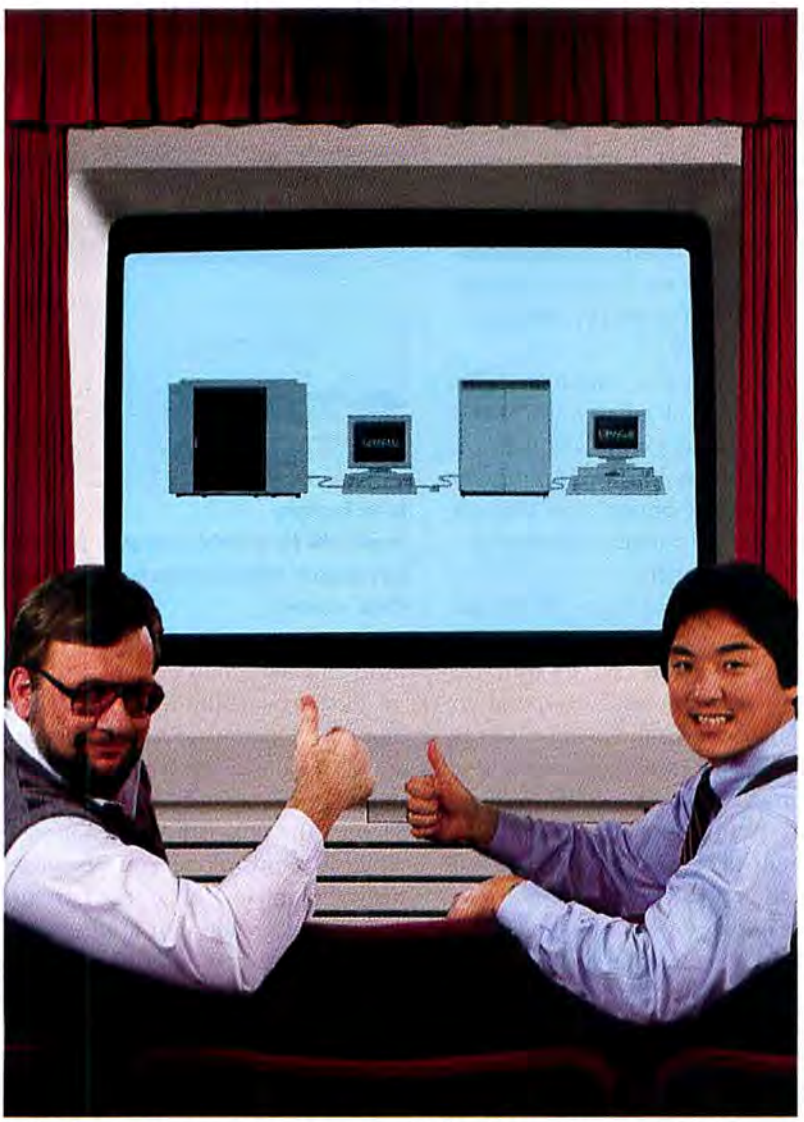

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JUST ENOUGH PASCAL 1.0

Interactive Programming Tutor

Pros: *Infinitely patient; good introduction to Mac programming and Pascal language; well integrated with Lightspeed Pascal programming environment.*
Cons: *Works best on large-screen monitor; doesn't cover all aspects of application development.*
Company: *Symantec.* ***Requires:*** *Mac Plus; hard disk and large-screen monitor strongly recommended. Requires Lightspeed Pascal 2.0.* ***List price:*** *$75.*

So you've always wanted to program the Mac or perhaps take a refresher programming course? Well, Symantec's Just Enough Pascal (JEP) might start you on your way to hacker nirvana. By the time you've finished its 20 chapters, or stages, you'll have created a stand-alone Mac program called GridWalker (see "Look Ma!"). You'll also have a good understanding of Symantec's Think Lightspeed Pascal programming environment and its tools.

The JEP package includes a DA and a manual that provide step-by-step help while building a program in the Pascal application. The DA is the interactive portion of the tutor, and provides online instructions and explanations for each stage of JEP (building the GridWalker program), as well as a Pascal reference section, background information, and troubleshooting tips. All these topics are accessible through buttons in the DA window, or you can navigate through the topics by using the JEP menu. In addition, Symantec allows you to look up terms (boldfaced in DA text) cross-referenced elsewhere in JEP by double-clicking on them.

While JEP's manual is by no means a substitute for a Pascal language or Macintosh reference, it doesn't pretend to be one, and suggestions for further reading are included with the package. But the manual does offer a way to learn more about programming without sitting in front of your Macintosh all the time. And it does a more in-depth job of explaining the whys, wherefores, and technical issues of GridWalker than does the Just Enough Pascal DA.

Starting Class

In each stage of the JEP curriculum, terms and concepts are covered in the same order as they would be in most programming courses. For example, the first stage covers variables, the second repeat loops, and so on. The only difference is that Macintosh particulars—such as events, resources, menus, and the Toolbox—are discussed in addition to general programming concepts.

You start each stage by assembling a part of the GridWalker project with the DA (see "In the Beginning"). Assembly can mean adding individual code statements or separate blocks of code, called units, to the GridWalker project. These units make it easier to find and correct errors, because GridWalker is a fairly large program. In addition, there are troubleshooting suggestions included in the DA in case your program doesn't run correctly after each assembly stage.

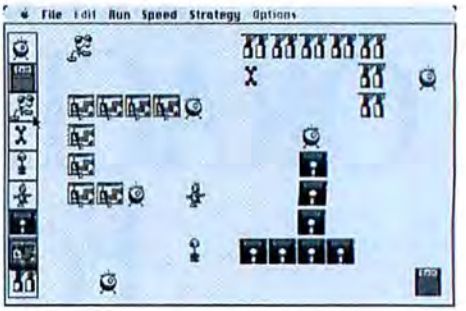
After assembly, you can read JEP's online explanation of what you just did and why. JEP doesn't expect you to work through all 20 stages in one day; it even instructs you to take breaks. You can use these breaks to read the more detailed discussions in the manual.

Each stage also includes directions and suggestions for tinkering with the program (JEP reminds you to turn off Lightspeed Pascal's AutoSave option to protect from inadvertently saving errors as you work.) In some cases, you take a close look at particular aspects of GridWalker, such as a specific loop or variable. In others, you explore the Lightspeed Pascal environment and its debugging tools.

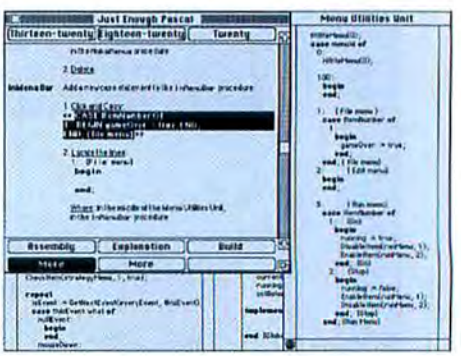
The final part of each stage is the Challenge, an assignment that allows you to apply what you've learned by experimenting on your own; the Challenges range from easy to complex. They aren't mandatory, but you can learn a lot from your mistakes and gain a sense of accomplishment when you succeed.

Teacher, Teacher

Symantec has put a lot of thought into Just Enough Pascal, and it shows. All aspects of the program—the content of the lessons, the structured practice, and the manual—are well integrated. I did have a couple of problems with the program, however.



Look Ma!
GridWalker, the application you create with JEP, includes menus, icons, and even animation and sound. Creatures move around the maze trying to escape without getting blown up.



In the Beginning
To assemble the GridWalker program, you select and copy program statements from the DA to Lightspeed Pascal windows.

First, you really need a large-screen monitor. Once GridWalker gets up to about Stage Nine, you may find yourself buried under Lightspeed Pascal windows. Second, the final GridWalker application, while it stands alone and operates, isn't really complete. JEP doesn't cover Mac details like creating an application icon, nor does it show you how to activate the desk accessory menu in GridWalker. The manual should cover these elements or at least provide hints on how to do them.

The best part about JEP is that it encourages you to take your time and explore. Rather than worrying about deadlines, you're more concerned with finding out why a program compiles or doesn't compile and how the program works. Learning how to program shouldn't be frustrating. Just Enough Pascal makes it fun.—*Brita Meng*

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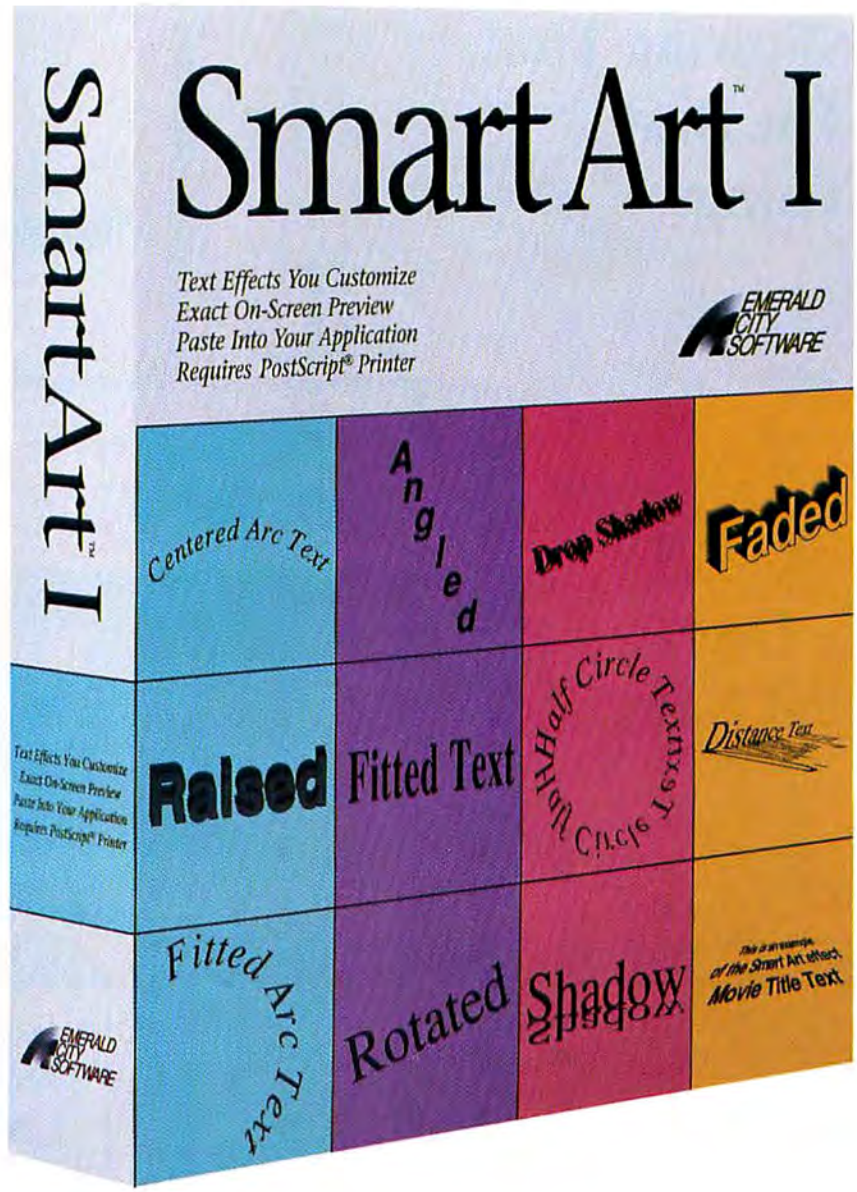

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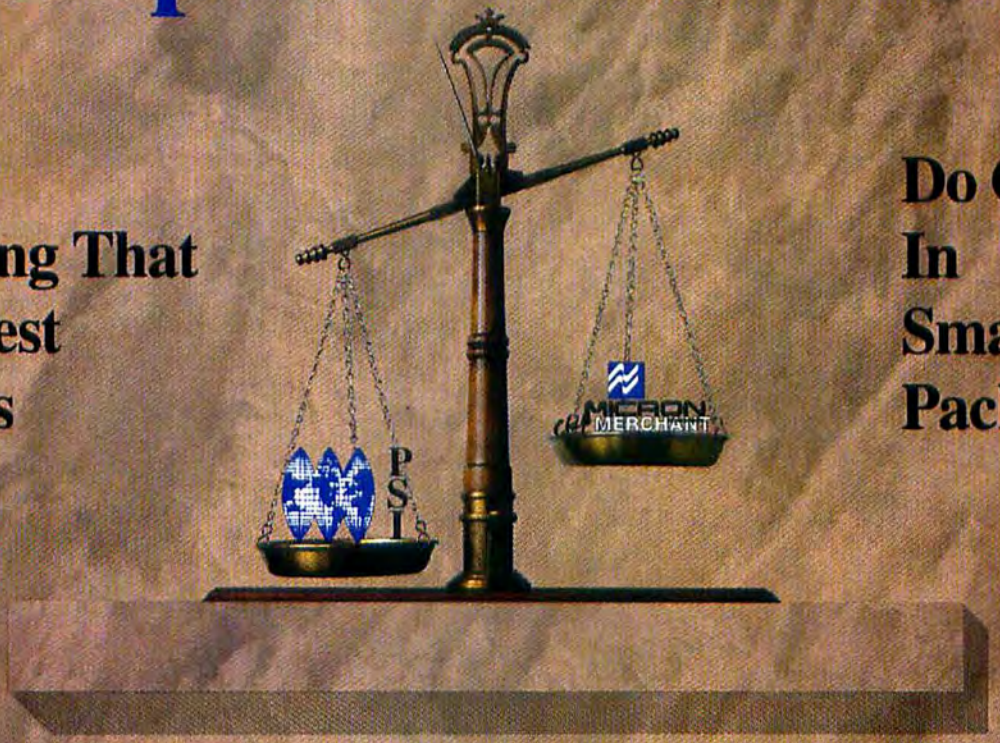

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COMPUTEREYES 1.2.1

Video Digitizer

Pros: *Inexpensive; automatic brightness and contrast settings.* ***Cons:*** *Image quality slightly lower than MacVision's; fewer image-processing functions.* ***Company:*** *Digital Visions.* ***Requires:*** *MacPlus; System 6.0.* ***List price:*** *$249.95.*

MACVISION 2.0

Video Digitizer

Pros: *Images slightly better than ComputerEyes'; more image-manipulation tools.* ***Cons:*** *Higher cost than ComputerEyes.* ***Company:*** *Koala Technologies/Pentron Corporation.* ***Requires:*** *MacPlus.* ***List price:*** *$399.95.*

There's no shortage of commercial and public domain images to choose from to design your company newsletter or to spruce up your start-up screen. But what if you want to include that priceless scene from the vacation video you shot last summer? It's surprisingly easy with either ComputerEyes or MacVision, two economical video digitizers for the Mac. And unlike frame grabbers that only work on the Macintosh II, both applications are compatible with the Mac Plus and SE.

ComputerEyes

Although the ComputerEyes manual only covers basic procedures and is missing an index, setting ComputerEyes up is straightforward. The box has no external controls and only three connections: one for power, one for the Mac's printer or modem port, and a third for a video source.

Using ComputerEyes is equally uncomplicated. You begin by activating the Preview function, which digitizes the video signal and displays the image in a window in the center of the screen. Previewed images can't be saved, but they're useful for making adjustments to your camera or VCR. Once you're satisfied, you open the image window and click on the Capture button. ComputerEyes gives you a choice of Fast or Slow mode. In Fast mode, the digitizer takes about 6 seconds to produce a 320-by-240 pixel image with 256 gray levels. Slow scanning takes 24 seconds to acquire a 640-by-480-pixel image.

The software does a reliable job of optimizing brightness and contrast, so you don't have to tinker much to achieve a satisfactory result. (It's just as well—each time you change the brightness or contrast, you have to click on the Adjust button to redraw the image.)

On a Mac II set to display 256 shades, the scanned image appears in glorious gray scale. On other models, black and white dots are patterned to approximate shades of gray (dithering), and there are four dithering patterns to choose from. (The image that's actually stored in memory retains all 256 gray levels, no matter what type of Macintosh you've got.) Images can be saved as MacPaint, PICT2, TIFF, or EPS files or as a start-up screen. Image processing is limited to flipping, mirroring, and inverting. In a glaring deviation from the usual Macintosh guidelines, the application lets you close untitled images without first checking if you want to save them.

MacVision

Koala Technologies' MacVision was one of the first Macintosh video digitizers on the market and has evolved along with the Mac. It is slightly larger than ComputerEyes and has similar connections for power, serial, and video cables. The most notable difference is the two large brightness and contrast knobs on the top. The manual is more extensive (including sections on lighting and video cameras), but it also lacks an index.

Setup is simple. The Quick View function previews the video frame so you can adjust the brightness and contrast by turning the dials and check composition and lighting. MacVision's Adjust Controls command is supposed to help you calibrate brightness and contrast, but I found this easier to do by eye. The process takes only a minute or two, and the controls are recessed so they can't be moved inadvertently.

MacVision offers the same two scanning modes as ComputerEyes, but only MacVision lets you average the two fields that make up each video frame so you can smoothly capture freeze-frame images from videotape. And when viewing images on a Mac that can't display gray scale, you can choose among ten dithering patterns. MacVision also offers more file-saving options: you can save images in RIFF, TIFF, PICT1, PICT2, MacPaint, or EPS format. RIFF and TIFF files can be stored in compressed form to save disk space.

In addition to using the hardware brightness and contrast knobs, you can change the brightness and contrast of the screen image using MacVision's Graymap Editor. As you adjust the sliding controls, the displayed image changes in real time. You can also alter the gray-scale mapping between the raw and displayed images by changing the shape of the graph in the Graymap Editor window. A set of special

(continues)

MARK JOHANN

ComputerEyes and MacVision have similar connections for power, serial, and video cables. The most notable difference between the two is that MacVision (on the left) has two large brightness and contrast knobs on the top.

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Caslon NO. 224 BOLD ITAL.
Century BOOK
Century BOOK ITALIC
Century BOLD
Century BOLD ITALIC
Century BOOK COND.
Century BOOK COND. ITALIC
Century BOLD COND.
Century BOLD COND. ITALIC
Cheltenham BOOK
Cheltenham BOOK ITALIC
Cheltenham BOLD
Cheltenham BOLD ITAL
Cheltenham BOOK COND
Cheltenham BOOK COND. ITALIC
Cheltenham BOLD COND.
Cheltenham BOLD COND. ITALIC
Cheltenham OUTLINE
Cheltenham OUTLINE SHAD.
Cheltenham CONTOUR
City LIGHT
City BOLD
Clearface* REGULAR
Clearface* ITALIC
Clearface* BOLD
Clearface* BOLD ITALIC
Clearface* OUTLINE
Clearface* OUTLINE SHAD
Clearface* CONTOUR
Dom Casual
Dom Diagonal
Egyptian 505 BOLD
Egyptian 505 OUTLINE
Élan BOOK
Élan BOOK ITALIC
Élan BOLD
Élan BOLD ITALIC
Élan BLACK
Élan BLACK ITALIC
Eras DEMI
Eras* LIGHT
Eras* BOOK
Eras* MEDIUM
Eras* DEMI
Eras* BOLD
Eras* ULTRA
Eras* OUTLINE
Esprit BOOK
Esprit BOOK ITALIC
Esprit BOLD
Esprit BOLD ITALIC
Estro
Eurostile
Eurostile BOLD
Eurostile BOLD COND.
Eurostile EXT.
Eurostile B
Eurostile BOLD OUT
FatFace
Fenice REGULAR
Fenice REGULAR ITALIC
Fenice BOLD
Fenice BOLD ITALIC
Firenze
Franklin GOTHIC BOOK
Franklin GOTHIC BOOK ITALIC
Franklin GOTHIC DEMI
Friz QUADRATA
Friz QUADRATA BOLD
Futura BOLD
Folio
Cushing BOOK
Cushing BOOK ITALIC
Cushing BOLD
Cushing BOLD ITALIC
Franklin GOTHIC BOOK
Franklin GOTHIC BOOK ITALIC
Franklin GOTHIC DEMI
Futura LIGHT
Futura LIGHT OBLIQUE
Futura BOOK
Futura MEDIUM
Futura MEDIUM OBLIQUE
Futura DEMI BOLD
Futura DEMI BOLD OBLIQUE
Futura BOLD
Futura BOLD OBLIQUE
Futura EXTRA BOLD
Futura EXTRA BOLD OBLIQUE
Futura MEDIUM COND.
Futura BOLD COND.
Futura BOLD COND. OBLIQUE
Futura EXTRA BOLD COND.
Futura EXTRA BOLD COND. OBLIQUE
GALLIA
Gamma BOOK
Gamma BOOK ITALIC
Gamma BOLD
Gamma BOLD ITALIC
Garamond LIGHT
Garamond LIGHT ITALIC
Garamond BOOK, ROMAN
Garamond BOOK ITAL.
Garamond BOLD
Garamond BOOK ITALIC
Garamond BOOK
Garamond BOOK ITALIC
Garamond BOOK COND.
Garamond BOOK COND. ITALIC
Garamond BOLD COND.
Garamond BOLD COND. ITALIC
Gill Sans LIGHT
Gill Sans LIGHT ITALIC
Gill Sans
Gill Sans ITALIC
Gill Sans BOLD
Gill Sans BOLD ITALIC
Gill Sans ULTRA BOLD
Gillies GOTHIC BOLD
GOLDRUSH
Gorilla
Goudy Sans BOLD
Goudy Sans BOLD ITALIC
Grizzly
Grotesque NO. 6
Grotesque
Grouch
Helvetica LIGHT
Helvetica LIGHT ITALIC
Helvetica BLACK
Helvetica REGULAR COND.
Helvetica BOLD COND.
Hobo
IVY LEAGUE
IVY LEAGUE OPEN
Kabel BOOK
Kabel MEDIUM
Kabel DEMI
Kabel BOLD
Kabel ULTRA
Kabel OUTLINE
Kabel CONTOUR
Kaufmann Script
Kaufmann Script
Korinna
Korinna KURSIV REGULAR
Korinna BOLD
Korinna KURSIV BOLD
Mixage BOOK
Mixage BOOK ITALIC
Mixage BOLD ITALIC
Mixage BLACK
Mixage BLACK ITALIC
Leawood BOOK
Leawood BOOK ITALIC
Leawood BOLD
Leawood BOLD ITALIC
Lubalin GRAPH EXTRA LIGHT
Lubalin GRAPH EXTRA LIGHT OBLIQUE
Lubalin GRAPH BOOK
Lubalin GRAPH BOOK OBLIQUE
Lubalin GRAPH MEDIUM
Lubalin GRAPH MEDIUM OBLIQUE
Lubalin GRAPH DEMI
Lubalin GRAPH DEMI OBLIQUE
Lubalin GRAPH BOLD
Lubalin GRAPH BOLD OBLIQUE
MACHINE
MACHINE BOLD
MAXIMUS
ABCDE MICROGRAMMA NORMAL
ABCDE MICROGRAMMA BOLD
MICROGRAMMA COND
ABCD MICROGRAMMA EXT.
ABCD MICROGRAM BOLD EXT.
Modern NO. 215 LIGHT
Modern NO. 215 BOLD
Modern NO. 216 BOLD ITALIC
Modern NO. 215 HEAVY
Modern NO. 215 HEAVY ITALIC
NEON
NEULAND
Nostalgia CASUAL SCRIPT
News Gothic
News Gothic BOLD
Newtext LIGHT
Newtext LIGHT ITALIC
Newtext BOOK
Newtext BOOK ITALIC
Newtext REGULAR
Newtext REGULAR ITALIC
Newtext DEMI
Newtext DEMI ITALIC
Novarese BOOK
Novarese BOOK ITALIC
Novarese BOLD
Novarese BOLD ITALIC
Olive ANTIQUE
Olive ANTIQUE ITALIC
Olive ANTIQUE BOLD
Olive ANTIQUE BLACK
Olive ANTIQUE NARROW
Olive ANTIQUE BLACK EXT.
Olive ANTIQUE BLACK EXT. ITALIC
Pacella BOOK
Pacella BOOK ITALIC
Pacella BOLD
Pacella BOLD ITALIC
Park Avenue
PEIGNOT LIGHT
PEIGNOT BOLD
Playbill
POINTILLE
Quorum* LIGHT
Quorum* BOOK
Quorum* BOLD
RELIEF
Reporter
Ronda LIGHT
Ronda
Ronda BOLD
Salto
SCOTFORD UNCIAL
Serif Gothic* REGULAR
Serif Gothic* BOLD
Serif Gothic* BLACK
Symbol BOOK
Symbol BOOK ITALIC
Symbol BOLD
Symbol BOLD ITALIC
Thor
ABC THUNDERBIRD
Tiffany LIGHT
Tiffany LIGHT ITALIC
Tiffany MEDIUM
Tiffany MEDIUM ITALIC
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Univers 45
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Univers 76
Univers 47
Univers 48
Univers 57
Univers 58
Univers 67
Univers 68
Univers 39
Univers 49
Upright Regular
Usherwood BOOK
Usherwood BOOK ITALIC
Usherwood BOLD
Usherwood BOLD ITALIC
Veljovic BOOK
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Veljovic BOLD ITALIC
Weidemann BOOK
Weidemann BOOK ITALIC
Weidemann BOLD
Weidemann BOLD ITALIC
Zapf LIGHT
Zapf LIGHT ITALIC
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Of course, the bottom line is image quality. I tested both products with a high-quality black-and-white camera using a variety of subjects and lighting setups. MacVision had a slight but definite edge nearly every time, with smoother transitions from light to dark areas. So if you're concerned about getting higher quality gray-scale images or extra image-processing functions, I'd recommend MacVision. But if your digitizing will be confined to dithered images that won't be displayed or printed in gray scale, ComputerEyes will do the job for considerably less money.
—Franklin Tessler

See* Where to Buy *or circle 771 (ComputerEyes) and 841 (MacVision) on reader service card.

ANATOOL 3.0

Computer-Aided Software Engineering

Pros: *Well designed, easy to use; functional components reasonably well integrated.* ***Cons:*** *As single-user product, limited to small or medium-size projects.*
Company: *Advanced Logical Software.*
Requires: *Mac Plus.* ***List price:*** *$925.*

In large programming projects, before a line of code is written, the software engineers begin by laying out the program's structure. Using data-flow diagrams, the engineers show what the program's subroutines and functions do and how they interact. Using a data dictionary, engineers specify what each data item is called, what it is composed of, and whether it is related to other data items. Anatool, a CASE (computer-aided software engineering) tool, helps you create and manage the data-flow diagram and data dictionary for such a project.

Structured Systems Analysis

Anatool conforms to a methodology called structured systems analysis (SSA). You begin by creating a data-flow diagram to describe the software you plan to create—a blueprint of your program. Anatool then reads the diagram and builds a data dictionary that lists and describes all the data items being passed around within it.

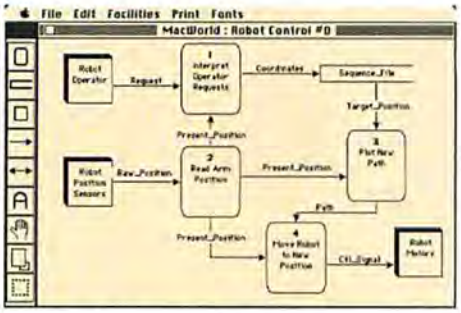
You can annotate this data dictionary, specifying exactly what each piece of data means and how it's to be used. Ultimately, the items in the data dictionary become the variables, parameters, and data structures used by your program, and the process boxes of the diagram become the program's procedures and functions.

Although the manual provides an introduction to SSA, anyone planning to become seriously involved in software architecture and design should also read *Structured Systems Analysis, Tools and Techniques,* by Gane and Sarson (Prentice-Hall, 1979), or *Structured Analysis and System Specification,* by Tom DeMarco (Yourdon Press, 1978).

Diagrams that Flow

Creating data-flow diagrams with Anatool is incredibly easy. You select the various boxes representing processes (subroutines), external entities (user inputs, printouts, etc.), and stores (files, variables, and arrays) from the palette and drag them onto the diagram. With the data-flow tool, you connect two boxes with an arrow by clicking on them in turn. Although Anatool automatically routes the data-flow arrow for you, you'll probably end up adjusting its path before you're finished.

Anatool's diagramming functions are easy to use, although they deviate from the Macintosh user interface. There are no scroll bars; you have to select the grabber hand, as in the early MacPaint. You must also select the data-flow tool every time you want to connect two boxes with an arrow. Even the selection marquee does not appear automatically when you drag in an empty space.



Robotic Arm Control Diagram
This data-flow diagram describes the control system for a simple two-axis robotic arm. The arm can move in or out radially and rotate on its base. The operator "teaches" the robot what positions it will visit and in what order. When the robot is placed in automatic mode, it will figure out where it is, where it is supposed to go, and how to get there.

The SSA methodology recommends that you have no more than 7 or 8 process boxes on a page, corresponding to 7 or 8 subroutines at any level within a program. Anatool version 3.0, however, permits you to draw up to 15 process boxes. It also allows you to diagram your program as deep as 8 subroutine levels before it forces you to write a *standard specification,* a verbal description of the deepest-level subroutines.

Structured English, often called pseudocode, is a kind of half-English, half-Pascal description of what a process does. Current English, on the other hand, is a regular, rambling description without any particular rules or keywords to worry about. Anatool reads current English and converts it into structured English, though the more structured your description, the more successful Anatool will be. Anatool then reads the structured English and checks it for consistency, which actually resembles the syntax check run by many compilers.

Just as the data-flow diagram shows how all the subroutines in the program talk to each other, the data dictionary lists all the variables, arrays, files, and parameters being passed around. When you call up the data dictionary from within the data-flow diagram, Anatool updates it to include any new data names.
(continues)

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Unfortunately, Anatool is weak in its implementation of the data dictionary. The main data-dictionary window presents you with a perplexing array of buttons, but no indication of what you should do next. And when you enter the description for a data item, you must return to the main data-dictionary window if you need to refer to another data item. There are also restrictions on the number of descriptions you can have for discrete data types and a requirement that you use either one-word names for data items, or you use a spacing character such as an underscore (for example, My_data_item).

If within the data dictionary you change the name of a data item, Anatool updates the data-flow diagram to refer to the item by its new name. The reverse, however, is not true. If you change the name of a data item in the diagram, a new entry appears in the dictionary in addition to the old name. Even though you use the data dictionary to keep track of how data items are used, as well as which processes use them, this information is not automatically provided by Anatool. You must return to the data-flow diagram, look for the data item yourself, and then return to the data dictionary and type in the information. An easy-to-reach cross-reference would be useful. Also, if you return to the diagram and change the name of a data item, a new entry will be created in the dictionary with the new name. You must redefine the item and remove the old name yourself.

A CASE for Potential

In a large project, a number of engineers can be developing several data-flow diagrams and their associated data dictionaries independently. Anatool version 3.0 can't merge data-flow diagrams or standard specifications together. Anatool MIX, a separate program shipped on the disk with Anatool, helps you merge data dictionaries together, but it is still a challenge to do this without tripping on identical data-item names.

In general, Anatool 3.0 is an excellent and easy-to-use tool for software architects, systems analysts, and software engineers. Its rather arbitrary limitations and its divergence from the accepted Macintosh standards are annoying but tolerable. Being a single-user product and lacking a comprehensive merge capability, it may be less desirable for large projects with numerous design and programming teams. But for most small and medium-size jobs, it fits well.—*Ken Takara*

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METCOM MODULA-2 1.02

Application Development Environment

Pros: *Easy to use; has source-level debugger; includes a better resource compiler than the standard RMaker utility; doesn't require hard disk.* ***Cons:*** *Initial release can't create DAs, XCMDs, and so forth; editor could use more bells and whistles.* ***Company:*** *Metropolis Computer Networks.* ***Requires:*** *Mac Plus; second disk drive.* ***List price:*** *$245.*

MetCom Modula-2, from Metropolis Computer Networks, is an integrated Macintosh Modula-2 application-development environment, which includes an editor, compiler, linker, source-level debugger, and embedded run-time environment. MetCom Modula-2 bucks the trend toward large packages that require a hard disk and more than 1 megabyte of RAM to do productive work and to use a source-level debugger. In fact, MetCom Modula-2 can even operate on a stock two-floppy SE or on a Plus with a second 800K drive. The run-time environment supports the development and execution of textbook-style programs as well as programs that take advantage of the Macintosh Toolbox (all five volumes of *Inside Macintosh*).

How It All Shapes Up

The compiler is fast, and the resulting code is competitive with that of other Macintosh development systems. Although the compiler is fast, the import phase (during which the compiler reads the interface of library modules and other MetCom modules) consumes most of the compiler's time. An option like MPW Pascal's $LOAD mechanism or LightspeedC's precompiled headers could speed this phase immensely. The Make Project menu command is useful; you just select Make Project and choose the main module of your program from the list presented. Make Project scans the main module's import list (and all indirect import lists from the imported modules) to create a module dependency list that the compiler uses to recompile only the necessary modules.

The major limitation of the current release is that you can only create applications (no HyperCard XCMDs, no DAs, no INITs). A somewhat important limitation is the lack of a facility for importing foreign libraries (for example, Pascal, Assembler, or C object files from MPW). While Niklaus Wirth (creator of both Pascal and Modula-2) doesn't specify based variables, he recommends them in his discussion of low-level language facilities.

MetCom's editor is a mixed bag. It does what it is supposed to do with a minimum of fuss and allows you to enter text and modify existing files. In fact, it is integrated nicely with the compiler. After you discover that a compilation contains errors, you can move from error to error within the source file via a single menu

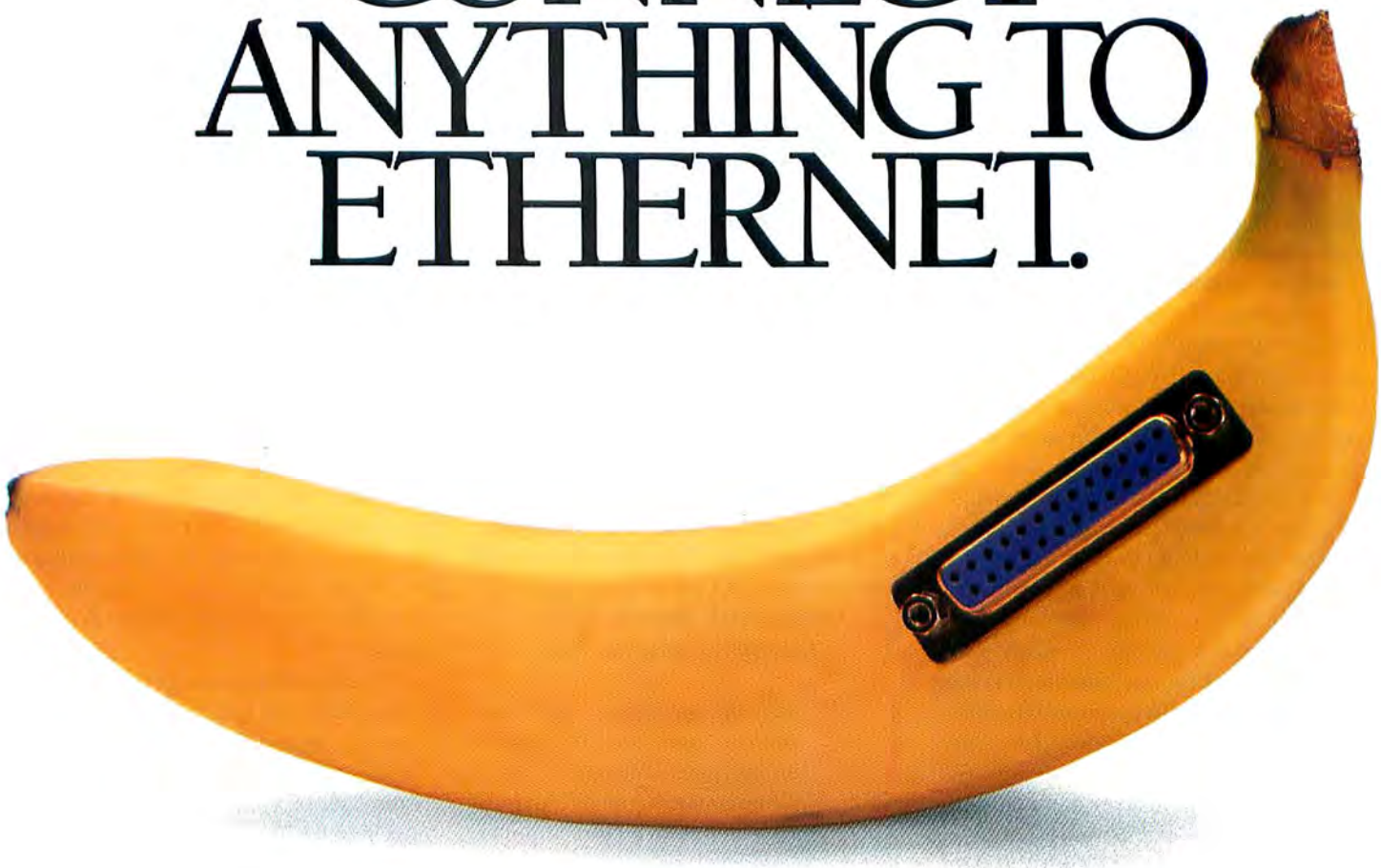
(continues)

A SPEED AND SIZE COMPARISON

	SemperSoft	MetCom
Sieve of Eratosthenes (10 iterations)	6.1	6.5
Radix sort (10,000 random integers)	9.7	8.5
Ackerman's function (500 iterations)	27.8	37.4
Integer (100,000 iterations each: assignment, addition, subtraction, multiplication, division, complex expression evaluation)	16.0	15.5
Matrix manipulation	5.8	6.5

Comparison of code-execution times between MetCom Modula-2 and SemperSoft Modula-2 (all timings took place on a Mac Plus with a DataFrame 20XP hard disk).

CONNECT ANYTHING TO ETHERNET.



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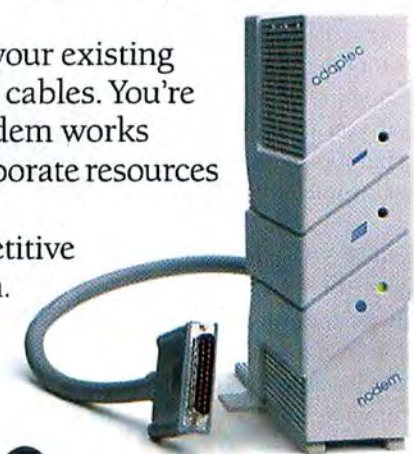

adaptec

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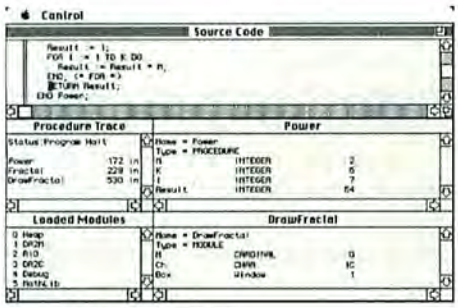
selection (or keystroke). Unfortunately, the editor lacks most of the enhancements that other systems offer, such as key equivalents for go to top or bottom of file commands, markers, wild-card searches, and a Find capability.

One of MetCom's biggest selling points is the Examiner (the source-level debugging facility that allows you to identify where the bugs are and helps you figure out how to fix them). The Examiner presents you with five windows: Procedure Trace, Source Code, Loaded Modules, Procedure Data Structures, and Module Data Structures (see "Source-Level Debugging"). To trace an error, you use the Procedure Trace window, which shows the calling chain of procedures; clicking



Source-Level Debugging

You can examine the status of a program in the MetCom Examiner. Here the program is about to execute a Return statement from the function procedure, Power, in the module DrawFractal.

on anything in the chain brings up the corresponding source code in the Source Code window. The Source Code window shows the source code and highlights the buggy instruction that caused you to enter the Examiner. The Loaded Modules window gives you the names and addresses of all loaded modules (this can be handy if you use a debugger such as Macsbug or TMON, as well). Clicking on any of the module names for which source code is available displays the instruction leading to the current error. The Procedure Data Structures window displays the status and values of the current procedure's local variables. The Module Data Structures window displays the state and values of the current module's variables.

Metropolis has licensed a shareware rez/derez-like utility called ResTools for inclusion with the product. While there are minor (occasionally annoying) differences in the syntax, it is generally compatible with source from rez (Apple's MPW tool for compiling resources). This facilitates conversion of examples from Apple and other sources for use with MetCom Modula-2. Non-MPW development systems have traditionally licensed a utility called RMaker from Apple to allow compilation of text resource descriptions into resource files. RMaker has a number of strange quirks: it's nonextensible, it's merely tolerant of (rather than compatible with) HFS, and it's touchy about white space (blanks and tabs). These quirks, combined with poor error reporting and an inability to decompile existing resources into a textual description, make RMaker vastly inferior to the rez/derez tools provided with MPW.

The documentation is useful and conveniently formatted. It includes indexlike appendixes that allow you to locate where routine, constant, type, or variable is declared. Although the appendixes aren't as handy as the autoimport option of SemperSoft Modula-2, they are a big improvement over what most Modula-2 vendors (both on and off the Macintosh) provide. I found MetCom's technical support knowledgeable and pleasant. The package includes numerous example programs; however, I was somewhat disappointed to find that the majority of them were standard examples and did not show off programming the Macintosh in Modula-2.

MetCom Modula-2 is a good product, particularly for those with limited hardware budgets (such as university computer labs). It is slightly more expensive than a lot of the competition, but site licenses and similar options are available. If you want a straightforward, integrated Macintosh Modula-2 development system rather than an MPW compiler, or if you want a source-level debugging facility, I would consider MetCom Modula-2 the clear choice over either the TDI or MacMeth products. Metropolis seems committed to upgrading and supporting its product as well as taking user feedback into account. —*Dennis Cohen*

See* Where to Buy *or circle 851 on reader service card.

COLLEAGUE 1.1

Business Organization Tools

Pros: *Stores large amounts of data; excellent reporting and sorting functions.* ***Cons:*** *Somewhat cumbersome input; slow.* ***Company:*** *Colleague Business Software.* ***Requires:*** *Mac Plus; hard disk.* ***List price:*** *$695.*

THE HYPERWORKS ORGANIZER 1.0

Business Organization Tools

Pros: *Easy to use; modules are well integrated.* ***Cons:*** *Too few modules; not as full featured as other available applications, such as Focal Point II.* ***Company:*** *Timeworks.* ***Requires:*** *Mac Plus; second disk drive. Hard disk recommended. Requires HyperCard.* ***List price:*** *$99.95.*

Colleague and The HyperWorks Organizer are business organizational tools that help keep track of appointments, activities, and projects. While they have many functional similarities, they differ in the type of business each works best with. Colleague, with its powerful search and sorting functions, is optimized for handling thousands of clients and services. Businesses such as direct-sales organizations, photography studios, and insurance agencies can use Colleague to keep track of weekly customer, prospect, and vendor interactions. The HyperWorks Organizer, on the other hand, with its more direct input and project-management charts and tables, is better suited for companies that need to more closely manage a smaller number of clients and projects.

Colleague

Colleague has five modules. The Calendar module helps you keep track of date-related activities, such as appointments and phone calls; the Client module holds information about clients and vendors; the Job Ticket module stores invoices, bids, and purchase orders; the Checkbook module monitors checkbook registers and prints checks; and the powerful Reports

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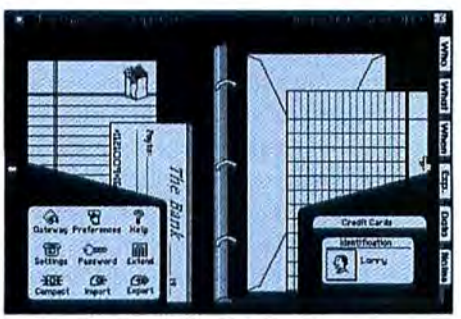
module provides such things as sales reports, invoices, mailing labels, supplier schedules, accounts-receivable summaries, and form letters.

The Client module's main window has fields for general information such as name, address, and company name. There is also a read-only field that contains the customer's account balance, which is actually stored in the Job Ticket module. The Client window also has three scrollable fields: the Keyword field lets you input one or more keywords for each client; the Request field lets you note client requests for information; and the Members field lets you list your contacts in the client organization. Each of these fields, as well as most other data in Colleague, can be searched using all logical operators and connectors such as greater than, AND, and NOT. For example, you can search to get a listing of all clients who requested information about a specific product or (if you input the client's date of birth as a keyword) who are over a certain age.

The Job Ticket window displays information about products or services that you buy or sell. If you type the first few letters of a vendor or client's name in a search-and-display field, the program looks up and enters the name that matches those initial letters or, if more than one name matches, it displays a click-and-enter list of names that begin with those letters. The Job Ticket window also has a Product section where you can store a list of all your products or services along with their cost and retail price. When a customer places an order, you key in the first few letters of the product name, and the program fills in the complete name, along with its cost and price. Then, if you check the completed invoice box, Colleague applies the totals to the client's account.

All of Colleague's modules make more use of point-and-click entry and search-and-display fields than direct keyboard input. While this makes Colleague excellent for managing large files, it makes it difficult to use for short-term, impromptu activities. To enter a one-time appointment, you must first start at the Calendar window and go through two windows to get to the Appointment screen. If the person's name has the same initial letters as one of your present clients (for example, he's Harry Black and you have as a client Harry Blackstone and Co.), the program will look up and input the name already in the file rather than the name you want to enter. In that case, you must fill out a Client screen for this acquaintance. Even if you are allowed to enter the acquaintance's name in the Appointment screen, you won't be able to key in his or her telephone number or address because those fields in the Appointment screen are read-only and can be entered only in the Client screen. The Type of Appointment field in the Appointment screen is a point-and-click list, so even if you will never play pool again, you will have to enter play pool in the Choices for Type window.



Inside The HyperWorks Organizer's Front Cover

HyperWorks Organizer lets you access any module by clicking on tabs lining the Inside Front Cover screen: the Checkbook graphic takes you to bank information, the Credit Card gets you credit card data, and the Grocery Bag notebook brings up a shopping list. You can even choose one of five pictures for the ID card.

Colleague's Splash Screen

Though not a HyperCard application, Colleague has a HyperCard-like interface, with most modules accessible by clicking on icons (the Calendar pops up whenever you first open the program). Unfortunately, Colleague is also comparably slow.

Colleague does an excellent job of managing the big picture, but it probably won't tempt you to throw away your appointment book or check register.

The HyperWorks Organizer

The HyperWorks Organizer is less rigid, but because of the limitations of HyperCard, it can't take on large lists of clients and products the way Colleague can. It has six modules: the Who module contains information about clients; the What module contains data about projects; the When module holds appointment information; the Expense module tracks expenses and client account balances; the Data module offers almanaclike information such as air mileage between United States cities; and the Notes module keeps the more general information under various headings.

The Who module stores contact information such as name and address, and records all activities related to the contact. For example, you can post expenses to any account in the Expense module—from the Who module—simply by starting the contact card's timer when you place a call to that account. At any time, you can display a list of all calls to a given contact. The Action field helps you keep track of meetings, telephone calls, and the like. If you know the day of an appointment but not the date, you can select the day of the week from the menu and the program will input the actual date for you. The proposed action is then posted on the To-Do list in the When module. If the action is not checked off to signify completion by the due date, a Past Due notice is posted on the Contact card. By clicking on icons on the Contact card, you will get either a summary of the last action or a history of all past actions for any contact.

The Project module has three main scrollable fields: Goals, Resources, and Tasks. Each project can have one or more goals, and each goal can have one or more tasks and resources. Project tasks can have projected and actual start dates, end dates, and costs. In order to manage the project, you can view the tasks and resources either in chart form along a time line, or in table form by date or by task.

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The Expense module lets you input or post all your expenses and categorize them by account name and according to whether they are personal, business, or reimbursable. You can then see a history of current accounts, selected groups of accounts, or the total of all entries. You can also use all of HyperCard's reporting features to print results or invoices.

The HyperWorks Organizer has wonderful graphics and works smoothly, and its modules provide a good basis for a small business to keep track of activities. The integration of its sections is similar to that of Focal Point II, but The HyperWorks Organizer does not have as many modules. Its project-tracking capability is convenient for small jobs, but it is a toy compared to MacProject II. Its calendar doesn't have the alarms and sophisticated search functions found in an appointment program like Rendezvous. On the other hand, using HyperWorks Organizer requires few if any structural changes in your business organization, and it is easier to learn as well as less expensive than any of the other applications. The HyperWorks Organizer will not save a business that is drowning in a flood of paper, but it can provide a helping hand for those beginning to flounder a bit.

—Lawrence Stevens

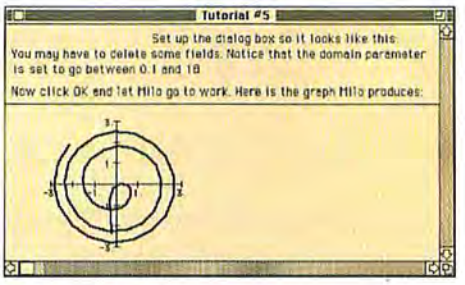
See Where to Buy or circle 769 (Colleague) and 808 (The HyperWorks Organizer) on reader service card.

MILO 1.0

Symbolic Mathematics Program

Pros: *Uses standard symbols; covers most undergraduate math.* ***Cons:*** *No help facility; nonintuitive operation.* ***Company:*** *Paracomp.* ***Requires:*** *512KE.* ***List price:*** *$249.95.*

Milo's claim to be "the first intelligent piece of paper for mathematics" is very nearly true. It is possible in Milo to set up problems in standard math notation and then direct the solution of the problems by applying a series of rules. The catch is that Milo's piece of paper is only as intelligent as you are, since in most cases you'll be called on to supply the appropriate rules. Both in price and design, Milo is an excellent offering for the undergraduate science/engineering market.



Automated Curlicues

With a minimum of fuss, Milo automatically graphs any expression you hand it, picking appropriate axis values. Although it only works in two dimensions, the program's ability to plot parametric expressions makes it easy to analyze projections of 3-D curves. This is the plot of x = sin(t) log(t) y = cos(t) log(t).

Contrast this with the other math-facility programs for the Mac. Borland's Eureka, for example, requires that you enter problems in BASIC-like notation, and the program proceeds to solve problems numerically according to built-in algorithms. Eureka can't represent math notation or solve equations symbolically, but it provides fast numerical and graphical results for engineering and physics. Mathematica also uses BASIC-like statements rather than math symbols, but it offers a huge set of rules and a programming language for symbolic and numerical mathematics.

Looks Good on Paper

One of the major advantages of Milo is that despite its small built-in set of rules for attacking equations, the equations are properly represented on the screen. You can select equations or blocks of equations and then cut and paste them as graphics into word processors. This means that if you own Milo you won't need a symbol-layout program such as Expressionist from Allan Bonadio Associates or MathType from Design Science unless you want to do professional math typesetting. It also means, however, that you should plan on spending several days mastering Milo's arbitrary keystroke combinations, or familiarizing yourself with the long—but easier-to-remember—hierarchical menus. (In fairness to Milo, no other program offers a significantly better way of entering the necessary notation.)

The Works

Besides symbols, Milo also supports strings as variables; you can use *kinetic_energy* as a variable name, for example. Once you have entered a mathematical expression, you can call on Milo's facilities for manipulating the expression or you can transform it according to rules you select yourself. Under the Simp (for simplify) menu, Milo offers a promising array of commands: Multiply, Add Fractions, Number Crunch, Factor, Solve For, Distribute, and Evaluate (for integrals, derivatives, sums/products, and substitutions), among others.

These commands don't always do what you might expect, however; you usually get results that will probably strike you as intermediate steps toward a solution, rather than an automated computer solution. (A help facility, even one offering a few examples for each command, would greatly enhance the program without seriously affecting compactness.) Selecting the variable x in the expression $0 = x^2 + x + 1$ and choosing Solve For produces the result $x = -x^2 - 1$ rather than the pair of complex numbers you would ordinarily think of as a solution. Likewise, Number Crunch, Distribute, and Evaluate often have to be called several times before you get to a final answer. The strong point of Milo's Simp commands is the manipulation of series and products rather than solving equations. This is because Milo doesn't make many assumptions on its own.

Most computations are intended to be performed by Enter Rule/Apply Rule procedures in which you select—either from rules you have typed in yourself or from windows of rule templates—a symbolic transformation of a problem. For the quadratic equation noted above, you could enter the standard solution in terms of *a*, *b*, and *c* coefficients as two rules and then apply them in sequence. For an integral, you enter a general indefinite integral from a table as the rule (simple tables are included with the program, large tables are due soon), and when Milo spots the

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similarity between an integral you select for solution and the one you identified as a rule, a rapid symbolic integration occurs. If Milo doesn't see the application of the rule, nothing happens.

Curiously, this is the program's great strength. Milo will solve a symbolic integral for you, in detail and with substitutions, if you can identify the appropriate corresponding integral in a handbook. Milo will also solve any symbolic problem, integral or not, as long as you can specify in abstract a version of the solution. For example, you can define abstruse special functions in terms of simpler functions to any level of complexity and rely on Milo to accept these definitions as rules for solving a problem. This is how, in a mere 180K, Milo can hope to tackle the same kinds of problems as the megaprogram Mathematica: you build (and save) rule sets adapted to your particular needs, while the core of the program itself consists of only a small set of utilities and rule-recognition schemes. To assist you in your search for a solution to a given problem, Milo provides an autoscaling 2-D graphing facility (see "Automated Curlicues") that accommodates all standard and parametric plots.

Summation

"It is unworthy of great men that they should spend long hours laboring like slaves over calculations," said the great mathematician Leonhard Euler, who had done exactly that for most of his life. It's probably unworthy of college freshmen as well, and they could use more help than Euler. Milo is a well-designed, relatively inexpensive program that has the forgivable "drawback" of requiring intelligent judgment for effective use. With practice and some skill it can be used to facilitate symbolic and numerical computation at any level of complexity—and it fits comfortably on the type of Macintosh available to most students. If you are a satisfied Mathematica user you probably won't want to switch, but if you are currently solving calculus problems with pencil and paper, you should get your own copy of Milo as soon as possible.
—Charles Seiter

See Where to Buy or circle 854 on reader service card.

ARCHITEXT 1.03

Hypertext Authoring and Viewing Software

Pros: *Maps of nodes make navigation easy; links can be defined graphically; built-in tools simplify subdividing information into nodes; unlimited distribution of ArchiText Viewer for viewing documents.*
Cons: *Window interface when viewing nodes' contents is too busy; no support for external commands or devices.*
Company: *BrainPower.* ***Requires:*** *Mac Plus. Hard disk recommended.* ***List price:*** *$349.95.*

GUIDE 2.0

Hypertext Authoring and Viewing Software

Pros: *Cursor serves as visual cue for expected action; buttons provide pop-up windows as well as links to other documents; external commands can be added.*
Cons: *Linear layout inhibits authoring of hypertext document; no viewer provided for free distribution of documents.* ***Company:*** *OWL International.*
Requires: *Mac 512K. Hard disk recommended.*
List price: *$199.95.*

Apple's introduction of HyperCard has helped popularize the term *hypertext* among Macintosh users. However, two other programs, ArchiText and Guide, make use of a hypertextlike organization on the Mac and more closely resemble the accepted definition of hypertext than does HyperCard. If you're interested in a true hypertextlike means of navigating through text and graphics, you should take a look at ArchiText and Guide.

ArchiText's Architecture

ArchiText uses graphic views (called maps) to display links between nodes of information, which can contain text and/or graphics. You navigate through an ArchiText document by double-clicking nodes on a map or selecting nodes from a scrolling list.

To create an ArchiText document, you need to create nodes of information either from imported files or from ArchiText files. Unfortunately, you can only import text-only files; graphics can be imported only through the Clipboard. Once you've entered data into a series of nodes, you create a map that displays these nodes.

The map window has a tool palette for linking nodes, once they're on the map, by letting you define either explicit or implicit links between them. Explicit links imply a distinct, well-defined relationship between two nodes and are symbolized by a two-headed arrow on the map. If you have a group of nodes that are all related to each other and you don't want to restrict the links between them, you can create explicit links by drawing a box (called a frame) around all of the related nodes. If you decide that some nodes contain too much information and should be divided into a series of nodes, there is a tool for splitting nodes either by paragraphs or by user-defined character strings.

ArchiText's AutoLink command lets you create standard link patterns for groups of nodes. For large maps, you can minimize the number of links criss-crossing all over the display by using connectors that lead to other parts of the map.

From Architect to Navigator

You view a completed ArchiText document by navigating through it, starting with a map of part of the document. Double-clicking on a node in the map automatically opens a window displaying

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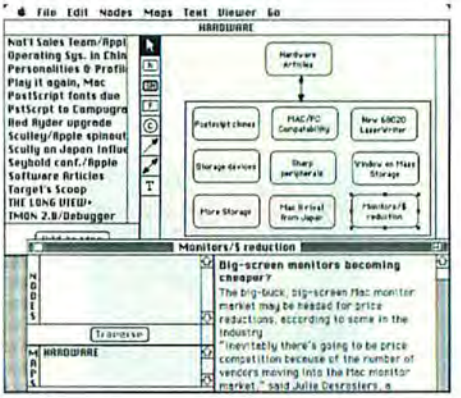

Node-work
Two windows are open in ArchiText. The rear window shows a map with a line from a node entitled Hardware Articles to a frame (box) containing nine other nodes. Other maps are listed at left in the same window. The front window displays the contents of the Monitors/$ reduction node, which has been selected in the Nodes window.

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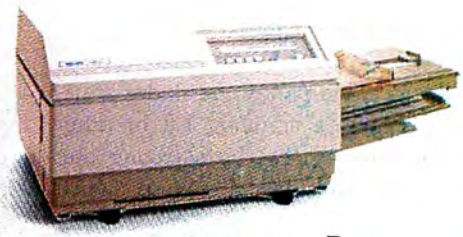

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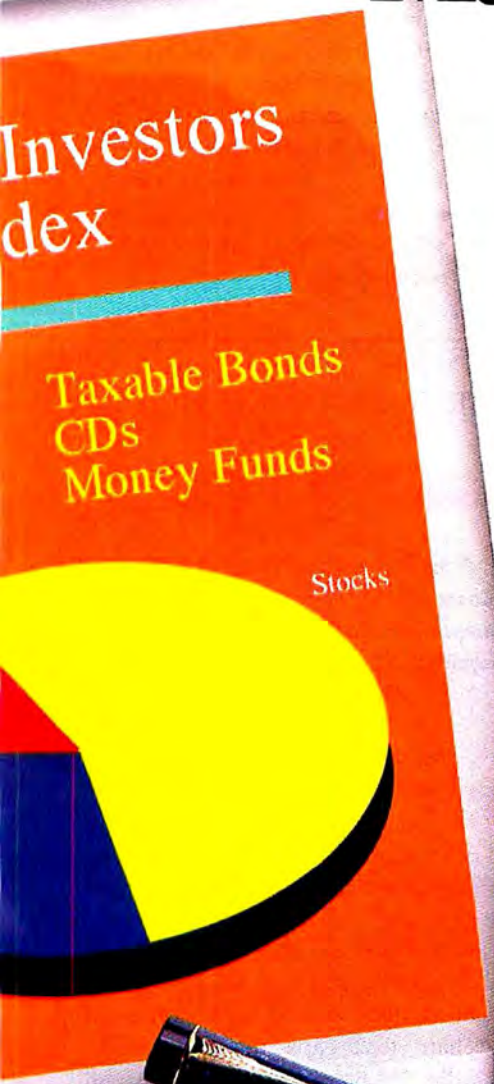

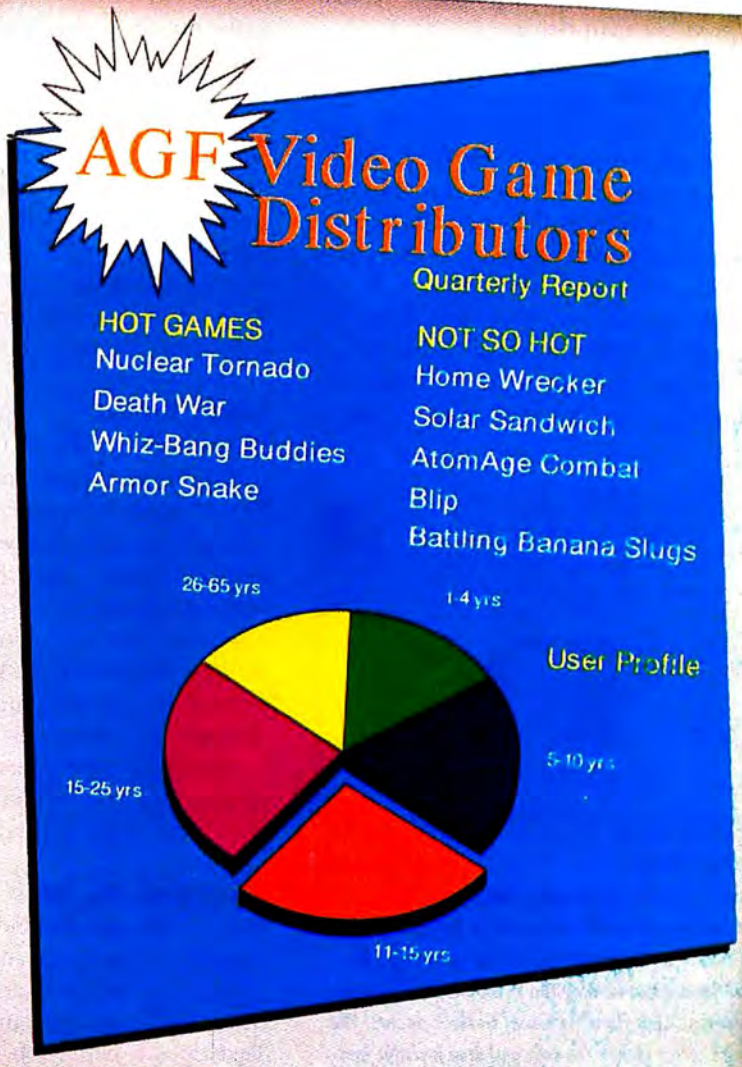

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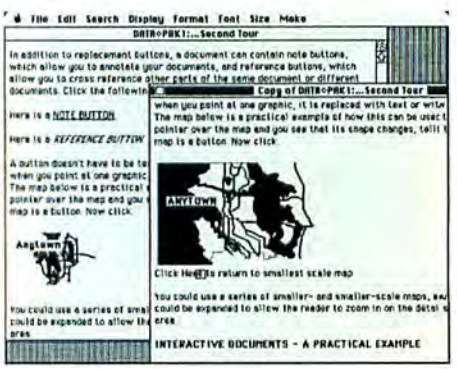
the information included in that node (see "Node-work"). The node's window also includes two panes: the nodes pane, which contains a scrolling list of other nodes you can access by selecting one from the list, and the maps pane, which shows other maps.

When you select Recent in the Go menu, the program displays a hierarchical list of past nodes and maps that you've visited. And, should your screen become cluttered with open windows, you can find the window you want in a hierarchical menu attached to the Open command in the Go menu. ArchiText also lets you move directly to any node or map by choosing a nodes ID in the Go menu. Since ArchiText assigns these ID numbers automatically, you have to know the proper ID number in advance; this option would be much easier to use if you could type in the node or map name.

Becoming a Guide

Guide documents look like MacWrite files at first glance. In fact, the first step in creating a Guide document is to add text and/or graphics in the linear fashion of any word processor (paragraph after paragraph, graphic after sentence, and so on). You can then select any portion of the text or graphics to be converted to a button—the selected text or graphics is hidden by the program and a text or graphics button is displayed in its place. These buttons, and their links to other text and graphics, are Guide's way of letting you create hypertext links. As a reader of a Guide document, you'll see the cursor change to different symbols as you move your cursor over different parts of the document. These symbols are a cue that the text or graphics is a button. There are Replacement, Reference, Note, and Inquiry buttons. Replacement buttons substitute text or graphics for the object that's defined as the button (see "Button, Button"). For example, you can create a table of contents in which each entry is a Replacement button that expands to show the text and graphics of the section represented. Reference buttons are designed for cross-referencing other parts of the document, and Note buttons are a simple way of creating pop-up windows. Inquiries are used to make buttons mutually exclusive and can be used to lead you to different parts of the document.



Button, Button

These two copies of the same Guide document illustrate how a button (Anytown in the rear window) can lead to an enlarged view of the same area. The small square surrounding the letter e in the sentence beginning "Click Here" is one of Guide's cursors. The square cursor makes the enlarged area invisible and the original button reappear.

Because Guide doesn't have a map view of a document's structure, you have to be careful in structuring your document. Short of using the Find command, there is no easy way of finding a block of text that you created earlier. In this regard, ArchiText's node concept simplifies document construction.

Tracking the Guide

Guide uses visual cues to help you navigate through a document. Each type of button has a different cursor. At first, all the different cursors may take getting used to, but it doesn't take long to learn to use them efficiently.

Guide also tracks your last 32 button actions. Click on the Backtrack icon above a window's scroll bar, and you move back through your document one step at a time. You can also move directly to the top level of your document's hierarchy by using a command in the Display menu.

So That Others May See

One of the ideas behind hypertext is the creation of an information database that others can navigate according to their own train of thought. In this case, ArchiText does a better job than Guide. The ArchiText Viewer application, which can be freely distributed, is bundled with ArchiText. Users of the Viewer can navigate through an ArchiText document, but cannot make changes. No similar tool comes with Guide. However, if you're interested in distributing copies of a Guide document, OWL International offers the Guide Envelope System, with which you can make 1000 read-only copies of your document for $200.

Each program offers you a reasonable way of creating and navigating through hypertext documents. I preferred ArchiText's structure of maps and node windows when trying to locate information. Guide acts more like a linear document when you're creating a structure for presenting information, so it doesn't feel like hypertext. But if you need added external programming capability to access such peripherals as a laser disk or a CD ROM, then you should use Guide.

—Dave Kosiur

See Where to Buy or circle 756 (ArchiText) and 804 (Guide) on reader service card.

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Pros: *Fast; reliable; easy to administrate.*
Cons: *Intended only for large-scale networks.*
Company: *Northern Telecom/Memory Systems.*
Requires: *Mac Plus; System 6.0 or later version.*
List price: *$14,300.*

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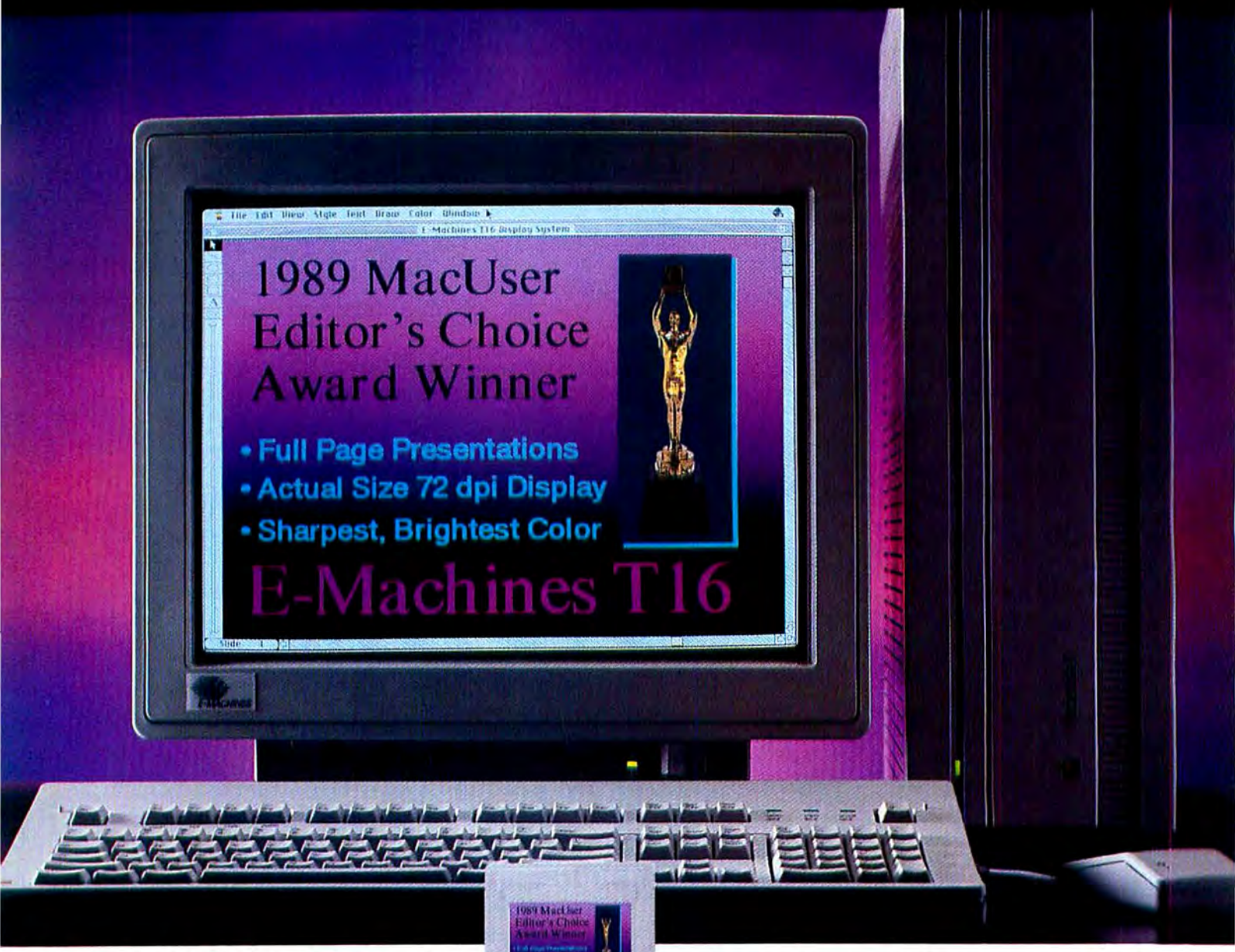

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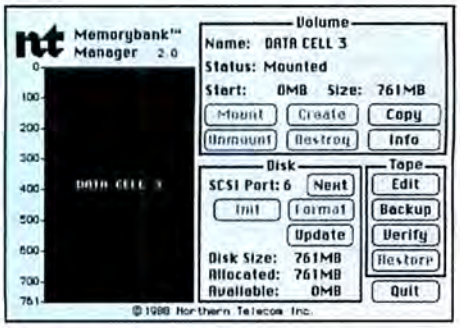
The Only 8-inch Winchester on the Block

To equal the storage capacity that the Memorybank offers in a one-disk/one-cabinet configuration, most Winchester drives in the microcomputer market use 5¼-inch or 3½-inch platters bundled into two hard disks. Northern Telecom manufactures and uses the older, but tried and true, 8-inch Winchester platter, which is comparable with what you'll find in Northern Telecom's phone switches or in products for the Sun workstation market today. The Memorybank 761MB has 7 platters and 12 read-write heads, and its average positioning time (access plus settling time) is 17.5 milliseconds. This speed makes it competitive with—if not faster than—the smaller platter drives.

Unlike most drives of this capacity, which are generally found only in the mainframe environment, the Memorybank requires no routine maintenance or field adjustments, no warm-up time, no specific computer-room temperature, and less than a quarter of the space of your average CDC disk pack. And unlike many desktop hard disks, the Memorybank's servo reliability (a servo mechanism increases precision in read-write head positioning), error correction, and mapping schemes offer a high level of data protection. The Memorybank also has extensive internal start-up and ongoing background self-tests, which constantly monitor things like voltage levels, drive speed, clock rates, and SCSI controller electronics. If the drive detects a single error, it immediately disables writing and automatically positions and locks the heads to the landing zone to doubly ensure data integrity. To top it off, the hard disk and tape drives are very



Management Central

Memorybank Manager 2.0's main configuration screen is informative and easy to use.

DRAKE SOKEY

Northern Telecom's Memorybank SS400/MA761E

quiet (below 62dBa), and the Memorybank is mounted on wheels so you can move it around easily.

Memorybank Manager 2.0

The 2.0 version of Memorybank's software is almost as impressive as the hardware, and it's compatible with AppleShare, TOPS, and MacServe networks. If you run Memorybank Manager as a concurrent application under AppleShare, you can also run configuration, backup, and restore functions while the network is up and running. Although Northern Telecom doesn't recommend running backups during hours of heavy usage because of LocalTalk's slow transfer rate, Memorybank Manager not only allows you to do so, but provides an announcement system to warn users of an impending backup.

Setting up and partitioning the drive is simple. It's obvious this software was written for the Mac and not ported over from another operating environment. One simple screen displays the drive's status (see "Management Central"), and you only need a few subscreens to create backup sets and run the backup and restore utilities. Northern Telecom has also included an update button with routines to install fixes or enhancements to the software without damaging your hard-disk setup.

You can choose between volume or file backup. Image (volume) backup transfers at the astounding rate of 10MB per minute. File backup is significantly slower, averaging about 2MB per minute—which is still about twice as fast as most 40MB to 120MB cartridge tape drives. Unlike the $15 to $40 you pay for cartridge tapes, the tape drive uses a standard Exabyte or Sony 8mm VCR tape you can buy in your local video store for about $10—and it holds 2.3GB.

There's a trade-off for all this speed: the streaming tape drive doesn't give you random access to your data. Because there is no directory, you can't restore just one file. Neither can you append a tape; you must overwrite it. To change your backup set parameters, you must define a whole new set; you can't modify an existing one.

You can back up as much as 2.3GB of data, selected from any SCSI device hanging off the same server on the network. You can restore backup sets to any SCSI device, so you don't have to put things back where you found them. Because of AppleShare's limitations, Memorybank Manager cannot back up individual user stations. One way of sneaking around these limitations and netting a two-level backup is to use Network DiskFit, marketed by SuperMac, to back up each individual station's hard disk to a particular volume on the Memorybank. This allows you to restore single files from the Memorybank to individual users.

For a second level of backup protection, the network administrator can include this volume in its streaming tape backup (however, this would not provide random access to selected files). Although this is one way to back up hard drives over a network, you should limit the number of volumes on the Memorybank to ten.

Competitive Price per Megabyte

With this much data, a scheduling option for running unattended backups is a must. It's there, but the screen needs some work to make it a bit more Mac-intuitive. After three tries I hit on the right combination of boxes to click, and it worked just fine.

The price may seem steep, but it comes down to less than $19 per megabyte, which is certainly competitive with what you would pay for a standard desktop 40MB SCSI drive. If you need this amount of storage, the price is reasonable and the performance very respectable. —*Nancy Canning*

See Where to Buy *or circle 850 on reader service card.*

The Story Of Apple® & Eve.™

In the beginning, there was an Apple. & a lot of software. Great stuff to use. Great stuff for pirates to copy free.

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Introducing EVE for the Apple–the software developer's key to a secure return on development investment.

EVE protects Macintosh software from piracy–with a simple but virtually foolproof concept: The software won't run unless the EVE hardware key is plugged in. And only those who purchased the software have a key that works with the program.

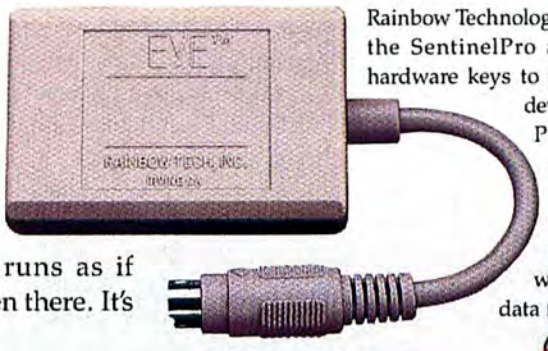
To developers, EVE's implementation is simple. Key codes are imbedded in the software which require a correct response from EVE any time the program is accessed. Without EVE, the software doesn't run.

And to users, EVE is totally transparent. The software runs as if EVE wasn't even there. It's that simple.

KEY FEATURES:

• For the Macintosh SE and II • Developer implemented • Completely transparent to the user • Permits unlimited backup copies • Seven programmable security locks • Up to seven programs per key • Multi-level password-based access • Installs via any Mac ADB connector • Compact and easy to install

EVE. The perfect companion to Mac software. For additional information, call Rainbow Technologies. European inquiries can be conveniently made to Rainbow Technologies Ltd, United Kingdom.



Rainbow Technologies also provides the SentinelPro and Sentinel-C hardware keys to protect software developed for IBM PCs, PS/2s and compatibles, and the Atari ST. And the DataSentry for PC users who want to protect data files.

RAINBOW TECHNOLOGIES

18011-A Mitchell South, Irvine, CA 92714 • (714) 261-0228 • TELEX: 386078 • FAX: (714) 261-0260
Rainbow Technologies, Ltd., Shirley Lodge, 470 London Rd., Slough, Berkshire, SL3 8QY, U.K., Tel: 0753-41512 Fax: 0753-43610

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Circle 106 on reader service card

BIGTHESAURUS 1.0

Thesaurus Desk Accessory

Pros: *Large word list; smooth operation; user-configurable, multiwindow interface.* ***Cons:*** *Does not accept user entries.* ***Company:*** *Deneba Software.* ***Requires:*** *512KE.* ***List price:*** *$99.95.*

A dictionary takes a word out of context to define it; a thesaurus places a word in context by supplying related terms. Deneba's BigThesaurus desk accessory—the most complete Macintosh glossary of synonyms; antonyms; and related, compared, and contrasted words fills two voluminous (537K and 270K) volumes and contains over 100,000 root words. It's an invaluable addition to your reference library.

You can search a word by manually entering it into the BigThesaurus lookup box or by highlighting the word in your document. Search results appear in less than a second. A successful search presents a window containing the search word; its part of speech (color coded) with definition; and a set of synonyms, antonyms, and compared, related, and contrasted words. You can highlight any of these and instruct BigThesaurus to continue its quest. To replace a highlighted entry, you double-click on an alternative search term. You can backtrack to any previous selection through the pop-up Find box (see "Search History Revealed").

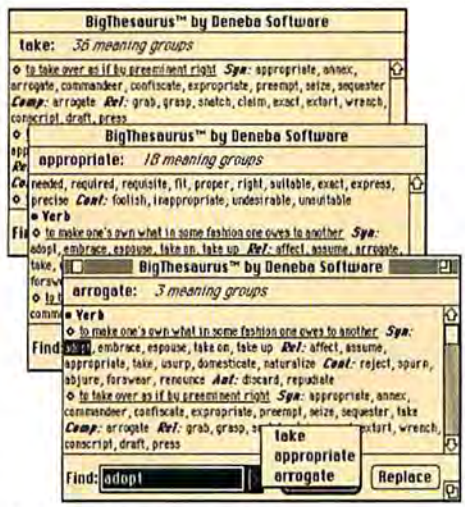
BigThesaurus's searches, which can result in a total of over 1.4 million "hits," can return many shades of meaning. Searching the word *big* with the meaning "having a relatively great upward extension," BigThesaurus returns, for example, a synonym (*high*); a comparison (*lofty*); a related term (*aerial*); a contrasted term (*squat*); and an antonym (*low*) (see "The Merriam-Webster Approach").

Customizing Options

BigThesaurus lets you assign Lookup, Replace, and Find keyboard commands; eliminate definitions and/or nonsynonyms from its word list; resize thesaurus windows; and even change the font size of the thesaurus entries. These preference settings enable you to make BigThesaurus a reference source that complements your work style. Even with definitions and nonsynonyms removed, BigThesaurus is impressive.

Software versus Hardcover

Webster's Collegiate Thesaurus and *Roget's International Thesaurus*, today's most widely accepted thesauruses, each look at words differently. *Merriam-Webster's* meaning-based approach, with its definitions and segregated shades of meaning, is a general-purpose reference source. *Roget's* groups words according to idea categories, provides only synonyms, and requires that you look up subtle shades of meaning in a dictionary.



Search History Revealed

Clicking on the Find box discloses a history of previous cross-references.

The Merriam-Webster Approach

BigThesaurus returns many shades of meaning.

BigThesaurus is a selection from *Webster's Collegiate Thesaurus*. Its word list does not contain idiomatic equivalents (for example, *go into raptures over* or *take delight in* as alternatives to *admire*) or word usage illustrations from classical and contemporary writers.

Not a Dictionary

Although you can search only single words, BigThesaurus does return word groups when appropriate.

BigThesaurus refers verb inflections back to their root word. If you enter *jumped,* for example, BigThesaurus will search the word *jump*. Occasionally this produces some strange results, as when BigThesaurus translates the word *took* into *too*. More commonly, it means that you must double-check BigThesaurus' replacement word.

The program does not let you enter new words into the dictionary. This is disconcerting to someone who wants to track colloquialisms (say, *couch potato*). According to Deneba, the technology exists, but due to licensing agreements with Merriam-Webster, Deneba cannot allow the user to modify the database in any way.

Smooth Operator

I experienced no problems installing, accessing, or using this DA; it is well designed and thoughtfully implemented. Deneba is to be commended for putting the right application in the right place. Against a head wind of spelling checkers (and now thesauruses) being offered by word processing, presentation, and page-layout programs, Deneba continues to produce high-quality reference resources.

First Choice

BigThesaurus offers a simple, fast, and precise way to cross-reference words. Documentation is clear and to the point, and Deneba also has a toll-free support line. The DA is a worthy complement to my *Roget's International Thesaurus* and will probably be the first place I look when I need to illuminate an unwieldy idiom.—*Joost Romeu*

See Where to Buy or circle 761 on reader service card.

Bill's experiencing deja vu.

He *hates* deja vu.

APC's 110SE uninterruptible power supply for the Macintosh™ assures that you won't waste time recovering from the effects of power loss.

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OPEN IT 1.0

Scrapbook Alternative

Pros: *Easily accessible; permits sharing text and graphics between applications and between users; permits manipulation of text and graphics without original application.* ***Cons:*** *Does not support PostScript images.* ***Company:*** *TenPoint0.* ***Requires:*** *Mac Plus.* ***List price:*** *$89.95.*

The Macintosh's built-in Clipboard and Scrapbook are metaphors for storing and moving text and graphics from one application to another; but they have some shortcomings: you have only a single Scrapbook, and you can only copy entire pages from the Clipboard to an application.

Open It is a desk accessory that improves on the Scrapbook's and Clipboard's capabilities while adding handy features that simplify file sharing. Users of Solutions' SuperGlue and SmartScrap & The Clipper will find a similarity in function. But, to be fair, Open It has some features not found in Solutions' products—it can open longer lists of files and manipulate Clipboard images before pasting them into a document.

What's the Point?

Open It is a difficult product to explain because it does many different things. It's a file-sharing utility that allows you to save a document to disk rather than print it on paper. The resulting disk file can then be shared electronically over a server or by modem. To view and print the file you need only the Open It desk accessory—not the application itself. For example, you could review an Excel spreadsheet or PageMaker document without the Excel or PageMaker application.

TenPoint0 has placed a less sophisticated version of Open It in the public domain (CompuServe, GEnie, and the TenPoint0 bulletin board) for users who only need to view an Open It file.

Along with its file-sharing capabilities, Open It is meant to replace the Scrapbook itself. Instead of being limited to a single scrapbook, Open It permits you to create and open multiple scrapbooks. This feature is useful for dividing text and graphics into separate categories and then creating individual scrapbooks for each category.

A Quick Start

Open It comes as two separate utilities. Print It, the printer utility, saves a file to disk, while Open It reads the disk file.

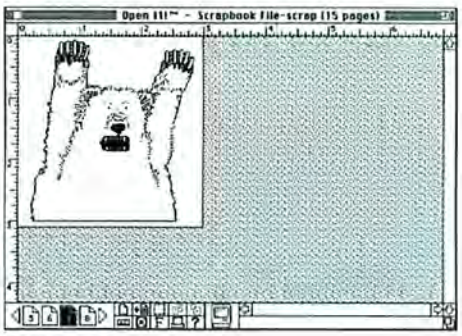
Print It is a printer resource identical in purpose to other printer resources in a System Folder, such as the LaserWriter and ImageWriter. It is also installed like a standard printer resource. To "print" a file to disk, you open the Chooser and click on the Print It icon. Then you proceed to print your document using the application's normal print command. Instead of printing to paper, however, Print It saves your document as a disk file. Once a document is saved to disk with the Print It resource, you use the Open It desk accessory to view the file or to selectively copy from the file and paste into another application.

You install Open It as you would any desk accessory. In addition to opening its own Print It files, Open It can also open MacPaint, PICT, Glue, and Scrapbook files. The advantage is that you can be in one application, say a word processor, and open a file in another format. You can then select and copy what you need, and paste the copied information into your document without leaving the word processor.

The Open It window includes a set of tools you can access with the mouse and a complement of menu commands. Once you have opened a file with Open It, you have a variety of options for viewing and manipulating the information in the file. For example, you can zoom from a full-size view to a thumbnail view of a portion of the page or scale an image from 1 to 1000 percent before pasting it into your document. The Open It window also includes a ruler for checking on the placement of text and graphics elements. Programmers will appreciate Open It's Open Resources command, which displays icons, cursors, and text in any application's resource file. This is useful, especially if you program using HyperCard, because it enables you to copy icons from other applications without having to quit HyperCard.

Thumbnail

The Thumbnail view permits you to see miniature pages of a scrapbook. By clicking on a page, the page will zoom to full size.



Full Size View

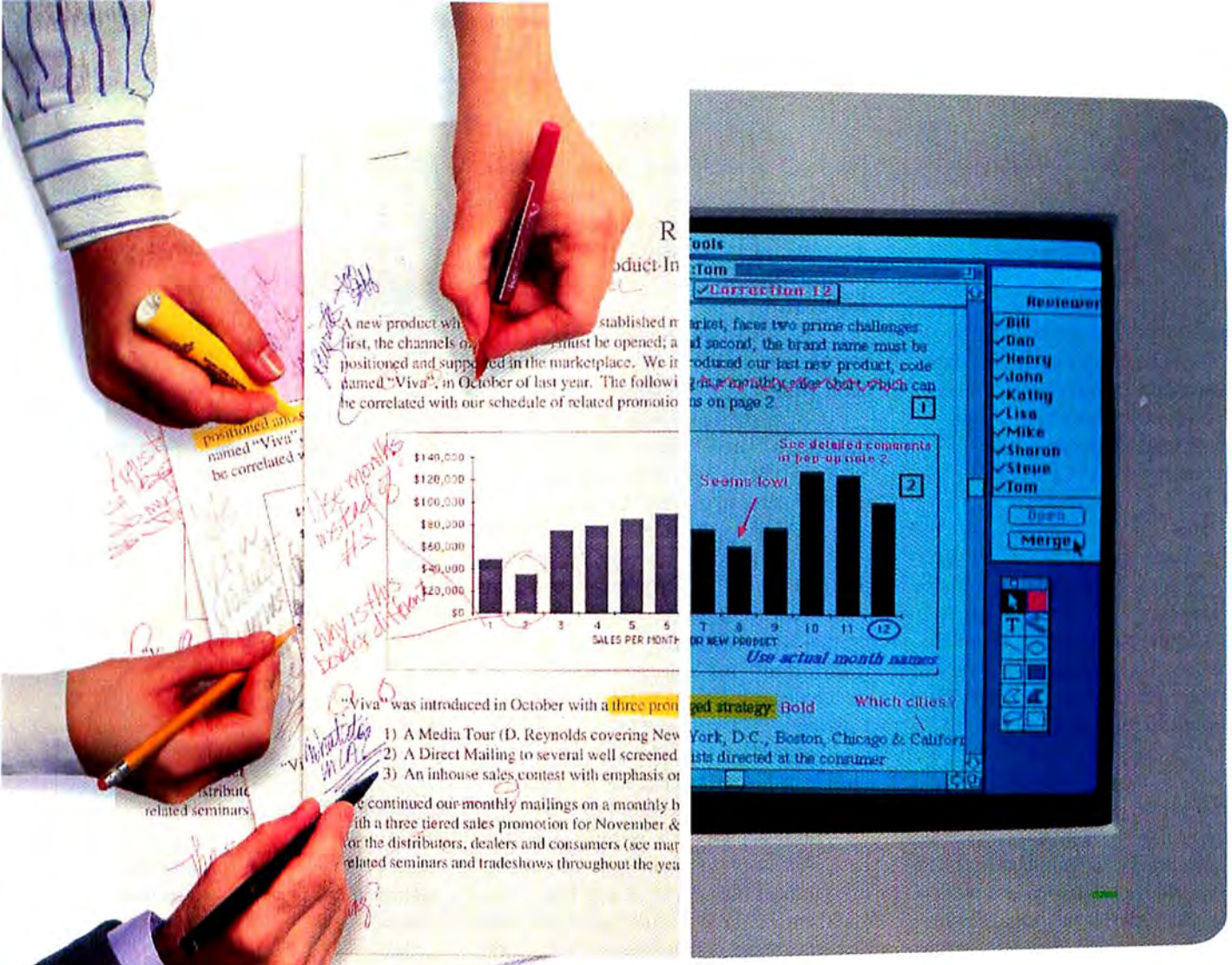
From this palette you can perform many commands, such as printing and scaling the graphics to the Clipboard.

As versatile as Open It is in handling many print-to-disk tasks, it does have difficulty with applications that do not strictly adhere to the Macintosh printing protocols or drawing programs that are PostScript-based, such as Adobe Illustrator, Cricket Draw, and FreeHand. Open It saves bitmapped images rather than PostScript-generated images. The documentation explains many of the compatibility problems and offers possible solutions. Changing the font of a print-to-disk file can also be a problem. While you can substitute fonts, Open It does not permit you to change line spacing or rewrap text. This severely limits the the feature's usefulness for all but the simplest font substitutions.

Open It makes it possible to easily share files and to organize text and graphics into separate scrapbooks, thereby overcoming some of the Scrapbook's and Clipboard's inherent limitations. But before you buy, check out SuperGlue or SmartScrap & The Clipper as well.

—Keith Thompson

See Where to Buy *or circle 876 on reader service card.*



Make Your Mark, Together

Introducing MarkUp™, Workgroup Editing & Review Software

It's ironic that documents created with hi-tech efficiency revert to archaic methods for review: lots of paper, red pencils, scribbles, mail delays and wasted time. Now there's real improvement for group editing, review and approval — MarkUp.

Here's how it works: print an image of a Macintosh document to disk from any application with MarkUp Document Creator. Publish it electronically to a workgroup for review.

Group members don't even need the creating application, just MarkUp. Reviewers work simultaneously — on a network or by transferring files — making comments on transparent overlays of the MarkUp document.

MarkUp provides tools to rewrite, annotate, highlight, strike out, correct, manage and approve documents of all types. It even keeps a journal and status of editing activity.

When review is completed, use MarkUp's powerful merge feature to combine a group's comments and print the annotated document as a basis to rework the original. Better yet, open the original document next to the MarkUp document with MultiFinder and copy changes directly.

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Circle 94 on reader service card

WINDOW SHOPPING

by Lawrence Stevens

Three of the four packages reviewed this month are either tutorials or reference programs. The fourth provides an icon-based directory of all your floppy or hard disks.

RON CHAN

Family Care 1.05

Family Care ($99 from Lundin Laboratories) is a medical reference program for parents. The menu bar contains several categories: Accidents, General, Skin Problems, and Newborn. Each menu lists symptoms like fever, vomiting, eye problems, skin injuries, chemical burns, cradle cap, and eczema. After you select a symptom from the menu, the program displays a series of screens, each with a yes-or-no question such as "Is it difficult or impossible to bend your child's neck forward?" A negative answer can lead to another question or to an advice screen. A positive answer almost always leads to an advice screen. The advice screen contains a short paragraph that might suggest, in part, "Increase your child's intake of fluids," or "Mild first- and second-degree heat burns may be treated by washing the area with a gentle skin cleanser." If the program assesses the problem to be a potential emergency, the computer sounds, and a message advises you to take your child to the hospital within either 30 or 60 minutes, depending on the program's evaluation of the seriousness of the situation.

Family Care's advice seems consistent with other family medical reference books, and the question-and-answer screens make the data easy to get at. But while the company calls Family Care a diagnostic expert system, it's really little more than a family reference book on a disk. True medical expert systems consider a large number of usually very specific symptoms (amount of sputum, blood count, and so on) to arrive at a diagnosis. Family Care usually considers one or two general symptoms.

Personally, when my son got sick as a baby, I wouldn't have wanted to have to boot up my Mac—possibly while trying to balance a squirming, screaming child on my lap—to read my medical reference book. Nor would I want to depend on the reliability of the Mac and the power company to get medical information.

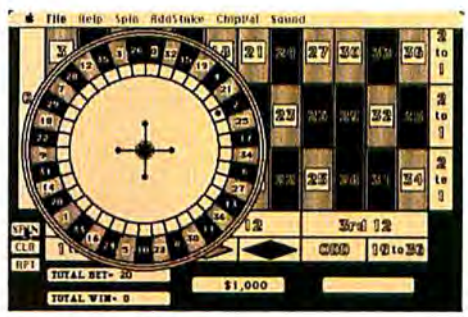
Casino Master

If you are any kind of casino gambler—novice, advanced, or prospective—the five programs included in Centron Software's Casino Master ($79, color version $89) can help increase the enjoyment and profitability of your gambling. If you're a casual gambler who travels to Las Vegas or Atlantic City every year or so and spends most of your time with the slot machines because you're unfamiliar with the other games, this program will broaden your horizons. Using Casino master you can learn to play baccarat, craps, blackjack, roulette, and casino-style poker. The program comes with five booklets—one for each game—that explain the rules and wagering techniques. The booklets also describe some rudimentary betting strategies and sometimes suggest more advanced reference books. Once you have an understanding of a particular game, you can practice with Casino Master's computer version that—as far as I can tell—replicates the real game.

At the beginning of each session, you choose the size of your initial stake, which can be increased at any time. The program keeps track of your total winnings and losses and the size of your stake for each session, as well as your cumulative totals (you can reset the cumulative figure back to zero), so you won't fall prey to the gambler's tendency to remember winning streaks and forget losing ones.

The more serious gambler can use this program to test strategies before playing with real money. Some of the games also

(continues)



No-Risk Gambling

Roulette Master is one of the five programs packaged in Casino Master. To place bets you click anywhere on the table, then input the amount of the bet via the keyboard. When you click the Spin button, the roulette wheel appears and the ball spins. After you've watched the wheel spin a few times, you'll probably want to turn the spin off. The program then gives the result of the spin immediately after the Spin button is clicked.

provide help in learning how to increase your chances of winning. For example, the Advice window in Blackjack Ace shows the recommended play based on the dealer's face card, the DrawProb window in PokerMaster displays the probability of drawing specific hands based on the initial deal, and the HouseAdv window in CrapsMaster lists the house advantage in percentages for all possible bets.

For most people the thrill of casino gambling lies in winning and losing real money. Casino Master is really more of an educational program. And it is a good one.

Mail Dex

For individuals or small companies who need to store lists of names and print envelopes or labels, Mail Dex is like Baby Bear's bed, just right. Mission Accomplished Software hasn't given it powerful features such as a sorting capability or advanced search with Boolean logic, but the program is small (16K), inexpensive ($49.95), and easy-to-use (it's a desk accessory). If all you want is to replicate a card file or print unsorted labels, it has just about everything you'll need.

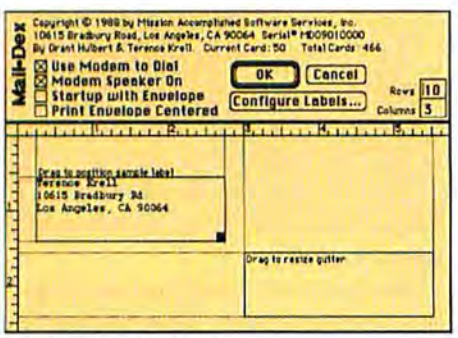
You can type lists into Mail Dex of such things as names and addresses, books in your library, and software packages. You can store up to 2500 records in one Mail Dex file, and you can create as many different files as you want. The Mail Dex files reside in your System Folder; file names appear in the Mail Dex DA menu.

You can locate individual records by typing a find criterion and clicking on the Find button. If the criterion matches more than one record, subsequent clicking on the Find button will walk you through the records. Anything below the fifth line of a record can be used as sorting criteria but will not be printed, so you can use that area to place one or more category codes to let you find, say, all senior citizens or all Bob Dylan recordings.

You can print all records in a file or only those records which meet the most recent find criterion. You can output to any size label or envelope. If you print an envelope, Mail Dex can also print a return address and a message. Mail Dex will also dial any number (through your modem or automatic dialer) if you triple-click on the number or select it and choose Dial Number from the menu.

A separate program that comes with the DA is Mail Dex Translator, which enables you to import or export tab-delineated files. When you import, the screen shows the first record in the way it will appear, line by line, in the Mail Dex screen. You can then move or combine lines. Any changes made in the translator screen will affect the way the DA displays and prints records.

That's basically it: stores, finds, prints, dials. If you need advanced features you'll have to look elsewhere. But for a basic product, Mail Dex does the job nicely.

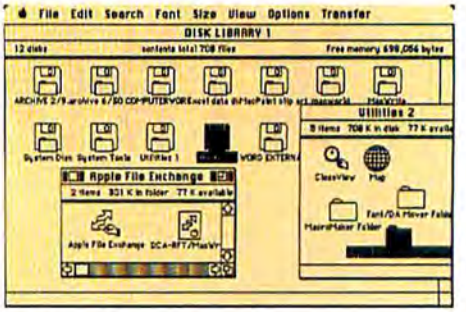


Mail Dex Prints Labels

Mail Dex allows you to print an unlimited number of label sizes. You size the label by moving the lines on the screen. You then specify the rows and columns in the boxes at the top of the screen.

Directory 3.0

If you use a lot of disks, it's worth sending to Seagull Engineering of Sweden for this disk directory program ($49 plus $12 postage). Directory catalogs disks, hard and soft, and then places the disk icons in a window. You can view the entire directory or selected disks or folders by Icon, Small Icon, or Name. The icons look and act just like those on the Finder. Click on a disk icon, and it zooms out to display its contents—folders, applications, documents—all represented by their familiar icons. You can continue to open folders by clicking on them. Select an icon and choose Get Info from the Directory menu, and the familiar Info window appears. You can select the font size and style and, if you have MacinTalk in your System Folder, you can have the Mac's voice automatically vocalize the name of any icon or menu command you select (a fun feature but one of dubious utility).



All Your Disks on One Desktop

Directory displays all your disks in one of its files. This window acts much like the Mac's Finder. You can open disks, explore folders, and use Get Info. You can also view your files by Icon, Small Icon, or Name.

If you use floppy disks as a backup, or as an adjunct to a hard disk system, Directory will save you from having to insert disk after disk to find a particular document or application. Directory also has a Find function that can save you from burrowing through folders.

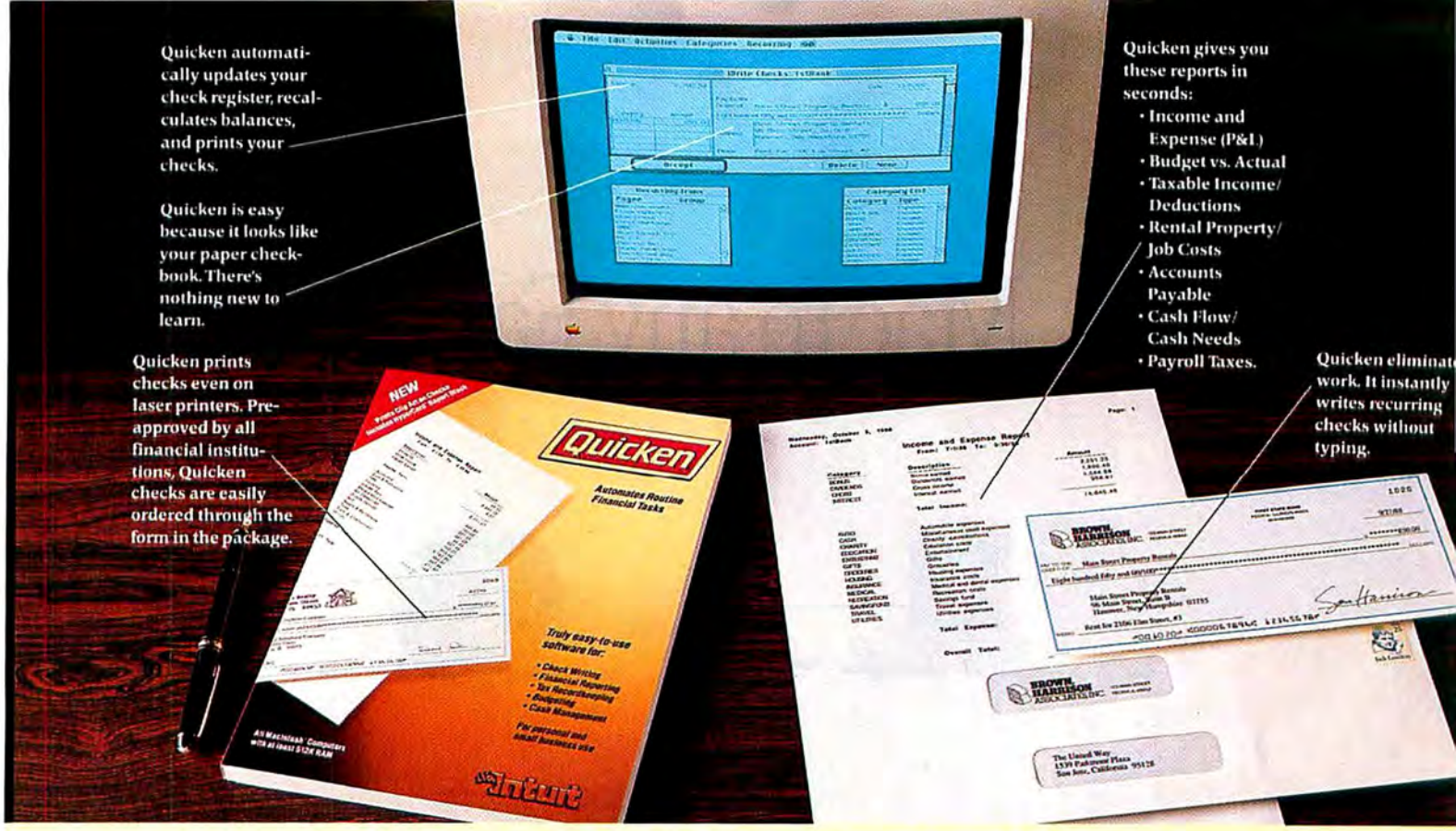
Directory enables you to create multiple directories so you can categorize your disks and store, say, all your financial disks in one directory and all disks that contain graphics in another. Or you can have a separate directory for each year.

You can also produce a hard-copy directory of your disks. You can print a listing, including folders and subfolders, of all the disks in a directory or only selected disks or folders. You can also place the directories of disks or folders onto the Clipboard using Directory's Append feature, which allows you to add new Clipboard items without replacing previous ones.

Logging a disk onto Directory is easy: you just insert it in any disk drive. If the inserted disk is, or seems to be, an updated version of a previously logged disk, Directory will ask if you want to replace the previous disk with the new one.

The nicest thing about Directory, as opposed to similar programs I have seen, is its similarity to the Mac's directory, the Finder, which is what Mac users feel most comfortable with. M

See Where to Buy or circle 793 (Family Care), 766 (Casino Master), 843 (Mail Dex), and 782 (Directory) on reader service card.



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Quicken is the absolute fastest, easiest way to do your personal or small business finances. It saves you hours of time while perfectly organizing your finances. With Quicken, you'll always know exactly how much money you have and where it's going.

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...an all-around excellent product. It is one of the best implementations of the Macintosh user interface that we've seen; it's very fast even when running from floppy disk.

—David Beaver, **MacWeek**

Quicken is a great program....Its combination of an outstanding implementation of the Mac interface, sophisticated keyword-searching techniques, and a readable, well-designed manual make it the industry standard. ⭐⭐⭐⭐⭐

—Ken Landis, **MacUser**

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No other financial software provides more flexibility to handle the wide range of personal or business needs. Quicken is for service and manufacturing businesses, doctors, consultants, designers, retailers, as well as for households. Quicken is ideal for anyone who wants relief from bookkeeping hassles.

Specifications:
Software Compatibility: Exports data in SYLK format for use in spreadsheets like Excel.® Exports data to HyperCard.™
Hardware Compatibility: All Macintosh with 512K RAM. All printers, including laser printers. Also available for IBM and compatibles, Apple IIe, IIc, IIcPlus, and IIGS
Capacity: Unlimited number of bank accounts. Unlimited number of transactions. Unlimited number of income/expense categories. Maximum amounts to $9,999,999.99.
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Circle 107 on reader service card

NEW PRODUCTS

Edited by
Mary Margaret Lewis

This section covers Macintosh products formally announced but not yet evaluated by Macworld. All prices are suggested retail. Please call vendors for information on reliability.

HARDWARE

AdCom2-1 Intelligent Advanced Communication Controller

Communication controller for the Mac II that combines with Frontier's Super-X.25 communication software to provide connection to X.25 networks and the Defense Data Network. Compatible with CCITT recommendations. $1495. Frontier Technologies Corporation, 414/964-8689.

Artisan 1025 Pen Plotter

E-size pen plotter that produces drawings on cut-sheet paper or film. Rotating turret houses up to eight pens; built-in optical sensors determine pen type; plotter automatically recaps pens after use. Comes with 32-character LCD control panel. $6395. CalComp, 714/821-2142.

Cache Box

Disk cache controller that connects any host CPU to one or more SCSI disk drives. Real-time statistics show cache performance. Has 2MB cache-buffer minimum, upgradable to 15MB. $3990 and up depending on configuration. Delphi Data, 714/354-2020.

Dash 30 Workstation

Stand-alone workstation that runs Mac II software at processing speed three times that of a Mac II. Contains 180MB hard disk, Mac-style 800K floppy drive, 4MB RAM with virtual memory, and five open NuBus slots. 4MB min. memory. $15,000. Sixty Eight Thousand, 408/626-1711.

DataPak II

Series of 45MB removable hard disks for the Macintosh II. Comes in a variety of configurations; includes power center for external devices. $1999.95. Mass Micro Systems, 408/522-1200.

ExpandaCrate

ExpandaCrate

45MB hard disk removable cartridge subsystem. Compatible with Mac Plus, SE, II, and IIx; comes with cables, documentation, and utility software. $1525 (includes one cartridge); additional cartridges $127. Crate Technology, 818/766-4001.

Expanse II/SE30

Eight-slot NuBus expansion chassis for the Mac SE/30 that has a Mac SE/30 Direct Slot interface card and cable assembly. $2295. Second Wave, 512/343-9661.

Expanse II/SE30

480 GS PC Viewer

Overhead projector viewer for presentations created on a Mac or IBM PC–compatible. Displays in blue and yellow or in eight shades of gray. Can be upgraded with memory module and remote control. $1595. In Focus Systems, 503/692-4968.

HL-8E Laser Printer

Laser printer that generates multiple originals of plots and section drawings at 8 pages per minute. $2895. Brother International, 201/981-0300.

Neotech Image Grabber

Gray-scale-image–capture board for Mac II and IIx. Supports posterizing, flashing, and a variety of file formats for saving images. Can be accessed directly from Letraset's ImageStudio and Silicon Beach Software's Digital Darkroom. $1499. Advent Computer Products, 619/942-8456.

110SE Uninterruptible Power Supply

Full sine-wave uninterruptible power supply designed for the Mac 512K, SE, and Plus. Protects from power disturbances such as blackouts and surges. Battery has 20-minute backup run-time. Front panel displays visual confirmation of overload, low battery, and line-power fault conditions. $399. American Power Conversion, 800/443-4519.

Pen Plotters for the 18 Series

Pen Plotters for the 18 Series

Pen plotters for Schlumberger's 18 series. Includes SmartBuffer plot-buffering system; produces drawing with pen

(continues)

speed of up to 85 cm/s when used with Sort Manager vector software. Model 1824 $4790; model 1825 $6290. Schlumberger Technologies, 313/995-6000.

Pronto SCSI Host Adapter

SCSI host adapter that works with any internal or external SCSI device, including hard disks, tape drives, and optical disks. $745. Golden Triangle Computers, 619/279-2100.

TurboFloppy

TurboFloppy

Floppy disk drive that boots from 1.44MB high-density floppy disk drives. Reads Mac and IBM high-density format disks. Compatible with Mac Plus and later models. $499 (without cable); cable $29. Peripheral Land, 415/657-2211.

Viking 21

21-inch color monitor for the Mac II. Comes with square, flat screen to increase display area and reduce glare. Has front-panel controls for power, brightness, contrast, and degaussing, and tilt-and-swivel base. Displays 256 colors with a dot pitch of 0.31mm and 72 dpi resolution. $3795. Moniterm, 612/935-4151.

SOFTWARE

A4

Business management and accounting software written in 4th Dimension for network users. Lets you customize menus, track sales leads, share multiuser calendar and memo pad. 2MB min. memory. Closed source-code version $1000; license to source code to modify application $2000. Softek Design, 303/526-0606.

ArcheTyper

Database development system and application shell for use with 4th Dimension. Modular design with preconfigured online Help facility and control loops for adding, modifying, and displaying records. 1MB min. memory. $125. Laser Digital, 800/338-4259.

ArchiCad

Two- and three-dimensional architectural CAD package for design-development drawings and construction documents. Use it to create floor plans, elevations, perspectives, color-

ArchiCad

shaded renderings, sections, bills of materials, 2-D and 3-D libraries; outputs to plotter. 2MB min. memory. $3995. GraphiSoft, 415/266-8720.

Atelier

Integrated software package for architects and designers. Contains modules for architectural and interior analysis, as well as for financial and business management. Can be used in conjunction with CAD software packages that do

(continues)

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numeric extraction. 1MB min. memory; hard disk recommended. $585. Artel Software, 401/274-6154.

AutoSave II

Periodically invokes the Save command from the File menu. Save frequency can be set from 1 to 99 minutes. 512K min. memory. $49.95. Magic Software, 402/291-0670.

BirdSongs

Plays digitized bird songs while another application runs. High-fidelity songs last one to two seconds each and play at user-selected intervals. 512KE min. memory. $45; each additional 800K disk $15. Corrales Software, 505/897-4024.

The Bone Box

HyperCard-based software to help medical students learn advanced terminology of the human skeletal system. Contains 65 drawings, including overviews of the skeletal system and multiple views of bones, and more than 280 associated terms. 1MB min. memory. $495. New Visions Software, 919/228-8979.

Casino Master

Integrated package of blackjack, craps, roulette, poker, and baccarat with game table displays, mouse-controlled betting, and advice windows. Players can switch from game to game. Games come with internal storage of win/loss statistics, bankroll, and rules options. 512K min. memory. $79. Centron Software, 407/392-3678, 800/848-2424.

ColorKit

ColorKit

Works with Data Translation's frame-grabber board, QuickCapture for the Mac II , to capture, display, and store 24-bit color images from RGB video cameras and still-video devices. Uses standard Mac interface. 1MB min. memory. $295. Data Translation, 508/481-8620.

Crossbow-6800

Assembly-language software that combines assembly, editing, testing, and online reference into one program for code development. 1MB min. memory. $295. Onset Computer, 508/563-2267.

Different Drummer

Drum rhythm composition software that uses sounds from synthesizers, digital samplers, and drum machines via MIDI to enable users to play digitized sounds through the Macintosh. Has 35 time signatures, iconic system of arranging pattern sequences, and nested song loops. Supports multiple MIDI setups. $99.95. Primera Software, 415/525-3000.

Different Drummer

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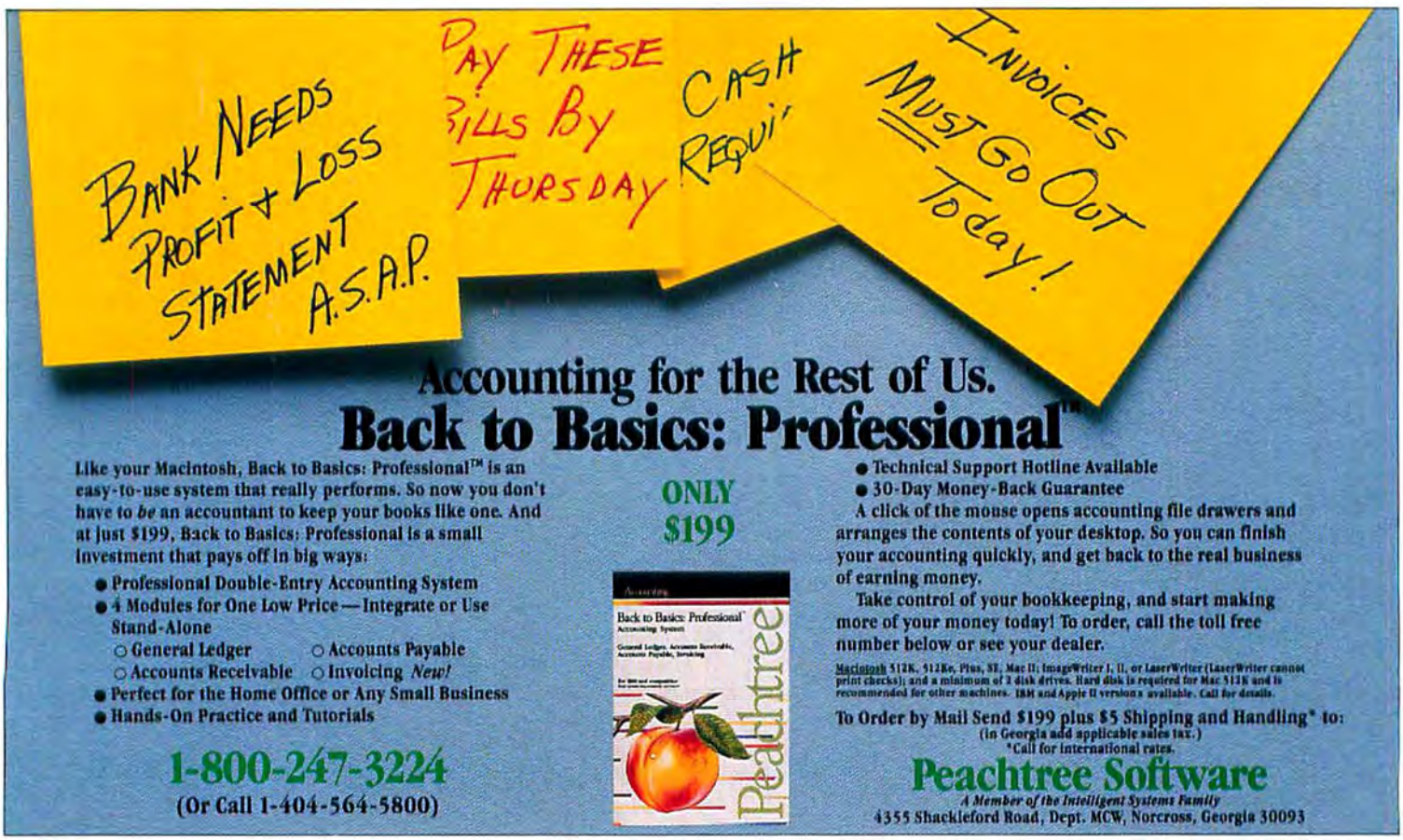

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Commercial Architectural	RM-4	RM-42

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The QMS ColorScript™ 100. The world's first color PostScript printer. Now more affordable.

When the QMS ColorScript 100 was introduced, it gave desktop publishers, graphic artists and designers what they had been waiting for—color printing for Adobe PostScript® applications. Now, Pantone, Inc. has certified that our printer is PANTONE®* Color Capable.

QMS and Pantone developed process color combinations for the ColorScript 100 which very closely simulate all colors in the PANTONE MATCHING SYSTEM 747XR, except for metallics and fluorescents. So the color you want is the color you get.

Even commercial printing proofs and in-house color separations can be produced with your QMS ColorScript 100. For both

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flat and four-color process printing. For a fraction of the time and cost of conventional methods.

The printer has the advantage of a 68020-based Atlas controller running at 16 MHz, so you can see your results faster. You can print an 8½"x11" page in just under one minute. An 11"x17" page in just under two. And the quality is excellent. The ColorScript 100 uses a thermal transfer process that produces true 300x300-dot-per-inch resolution.

New Model 20—more affordable and upgradable

The original ColorScript 100 is the Model 30, with 8 megabytes of memory, a 20-MB hard disk built in, and the ability to print up to 11"x17" pages.

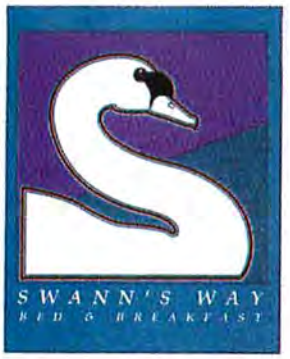
The new QMS ColorScript 100 Model 20 is more affordable. It has 4 MB of memory and the ability to handle letter-size (8½"x11")/A4-size paper. It provides the same high-quality output as the Model 30, and can be fully upgraded to a Model 30 when your needs expand.

Compatibility is built in

Both models of the ColorScript 100 connect with Macintosh®, IBM®, Compaq® and other compatible PC's, along with minicomputers, workstations and mainframes. So your whole network can output in beautiful, accurate color. Using any of dozens of color-compatible applications.

The ColorScript 100 is yet another solution from QMS. Solutions that have made us a leader in imaging technology.

For more information on the QMS ColorScript 100, including a list of compatible software and information on financing, call 1-800-631-2692, ext. 222.



Pictured are just some of the ways designers are using the QMS ColorScript 100. The creative director at one design firm notes: "We're doing comps that used to take hours in minutes. The quality is fantastic." A computer design system manager in the Midwest says: "Our clients are getting more options, in less time, at lower costs."

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Heavy duty 10' steel cable (7 x 19) secures and locks computer, printer, other equipment, up to 4 components. The unique MacKablit system incudes 2 brackets that snap into existing slots on the Macintosh keyboard and computer. Additional hardware included for other Mac peripherals (disk drive, printers). The unique MacKablit system utilizes existing security slots on the keyboard and computer and existing screws in other peripheral equipment. The system includes 2 brackets for the security slots plus unique Kablit fasteners for peripherals. Cable passes through Kablit fasteners, preventing removal of screws.

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DirectServe
Self-contained file server for the AppleTalk network. Emulates AppleShare; compatible with all existing and future software written for AppleShare. System RAM is expandable to 4MB. 1MB min. memory. $1299. Jasmine Technologies, 415/282-1111.

DynaCADD
Two-dimensional module programming shell using CADDTalk programming language and Tools interface. Designs and details drawings in 2-D or 3-D; reads and writes the industry's standard file formats. 1MB min. memory; requires hard disk and math coprocessor. $1995. Ditek International, 416/479-1990.

ExpressWrite
Letter-writing desk accessory for writing or merging letters while running another application. ExpressWrite Stationery feature creates default standard document with reusable contents, style, and page settings. 512KE min. memory. $99.95. Exodus Software, 513/522-0011.

Family Care Software
Diagnostic expert system and knowledge base that asks a series of questions about medical symptoms, then gives recommendations for medical care, home treatment, and medications. For newborns through teenagers. 512K min. memory. $99 plus $5 s/h. Lundin Laboratories, 800/426-8426.

FastTrack Schedule
Project-management software that depicts bar charts with a variety of time units. Beginning and end points of bars may be user defined. Produces color graphs as standard or wall charts. 1MB min. memory. $195. AEC Management Systems, 301/428-3694.

FastTrack Schedule

Global Trespass
You have recently stumbled upon a mysterious international detective organization dedicated to the pursuit and capture of the world's most diabolical criminals. After learning a secret (the world of crime is ruled by ten secret societies) you join the detective organization. 512K min. memory. $19.95. James R. Harvey, 312/920-8013, 312/823-8547.

Global Trespass

GrailQuest
Game of wizards, demons, and magic set in the time of King Arthur and the knights of the Round Table. You lead a young hero on a perilous quest to recover the holy grail. Interactive digitized graphics and sound. 512K min. memory. $29.95. Artworx Software, 716/385-6120, 800/828-6573.

GraphiCalc
HyperTalk-based calculator for desktop publishing and design. Calculates photo/

illustration sizing and cropping, accepts nondecimal input. Automatically adjusts to different measurement systems and notation forms without the use of lookup tables. 1MB min. memory. $29.95. ProGraphics, 607/277-0916.

Igor

Graphing and data-analysis program for scientists, mathematicians, and engineers who experiment with numeric data. Includes numerical evaluation of arbitrary mathematical expressions. Data arrays consist of real or complex numbers and can contain any number of points. 1MB min. memory. $195. WaveMetrics, 503/635-8849.

Image Analyst

Image Analyst

Software for scientific users that extracts quantitative data from video images. Lets you configure image processing and measurement routines on the Mac without using programming. 4MB min. memory. $2000. Automatix, 508/667-7900.

Kanji PageMaker

Kanji version of Aldus PageMaker 2.0 that accommodates Japanese text, paper sizes, and units of measure. Includes Japanese menus and screen messages. 1MB min. memory. $995. Distributed by Qualitas Trading Company. Aldus, 415/848-8080.

LetterBase

Expandable business-letter and document database for HyperCard. Prints letters and documents directly from the database with margin formatting and text style support. Print may be merged with Address Stack. Includes online letter-writing guide with forms of address, punctuation, and state abbreviations. 1MB min. memory. $99.95. Aardvark Development Labs, 713/872-8085.

LetterPress CD-ROM

Font CD ROM application that provides more than 600 licensed laser PostScript typefaces. User selects fonts for customized disk from Image Club catalog. 1MB min. memory. CD with entire font library $4999. Prices vary for individual typeface selections. Image Club Graphics, 403/250-1969.

LoanLease Library

Software for recording and managing leases or loans that can be used in conjunction with AmPack Plus loan amortization software. Tracks loans and lease payments/receipts as they are made. 512K min. mem-ory. $69.95. Softflair, 414/797-4490.

Mac'N Med II

Medical office system that allows the user to enter patient information and post charges and payments on an open-item basis. Prints insurance forms according to Medicare and Blue Cross requirements. Generates patient financial statements and deposit slips. 1MB min. memory.

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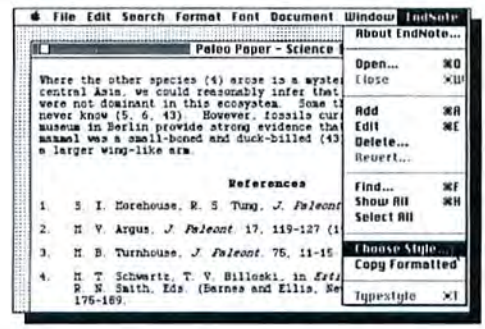

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$599.95. Somerville Associates 302/678-2131.

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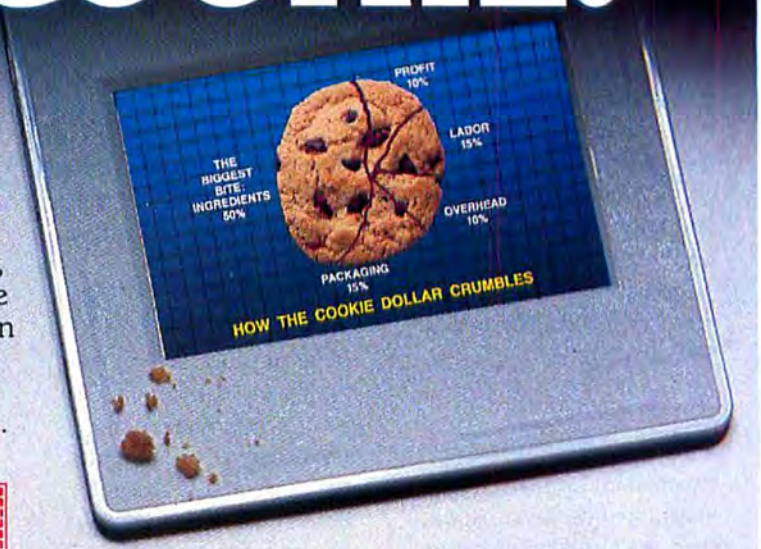

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BOOKS & VIDEOS

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The Macintosh Bible

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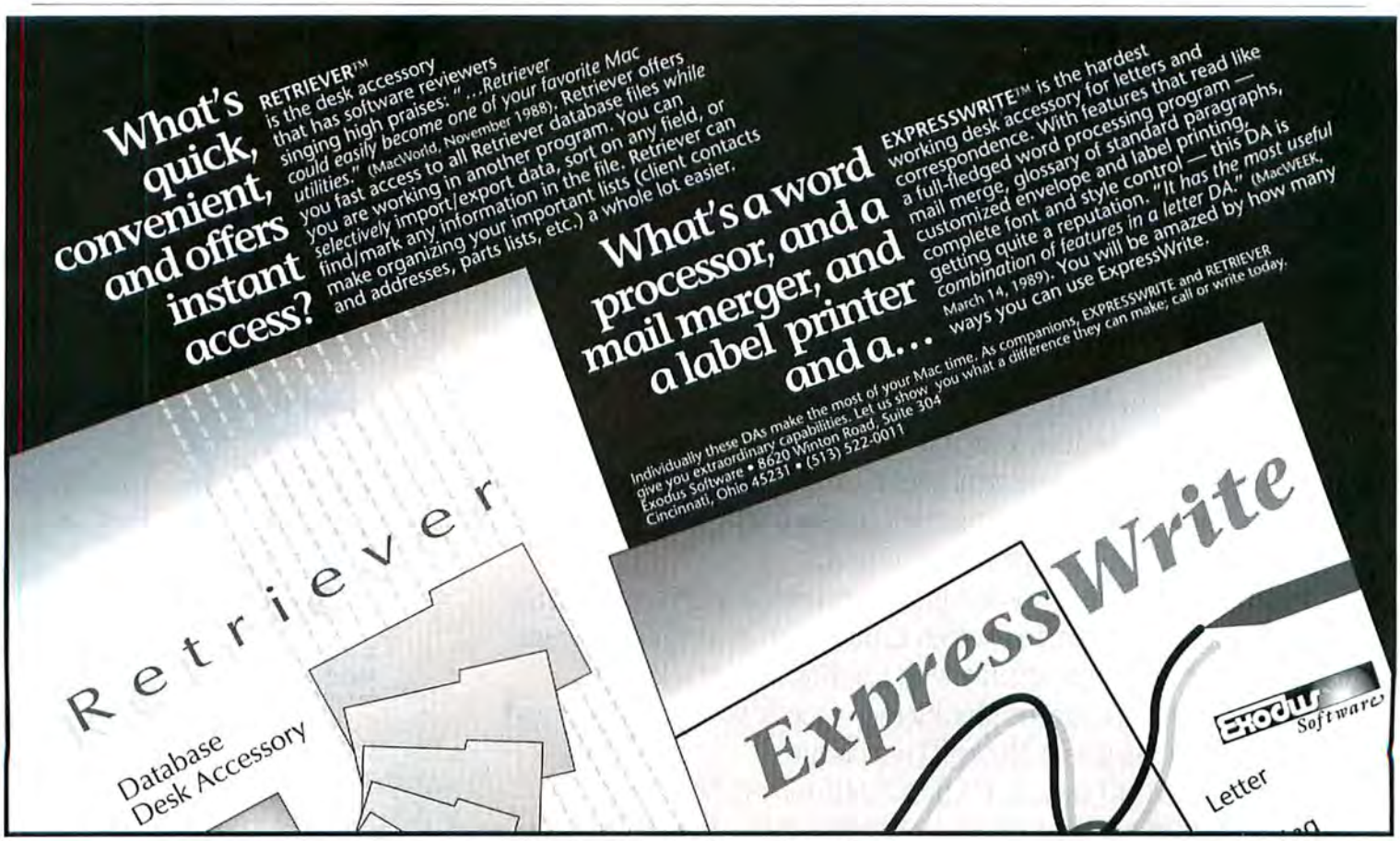

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Those who buy MultiScreen on price alone are only seeing half the picture.

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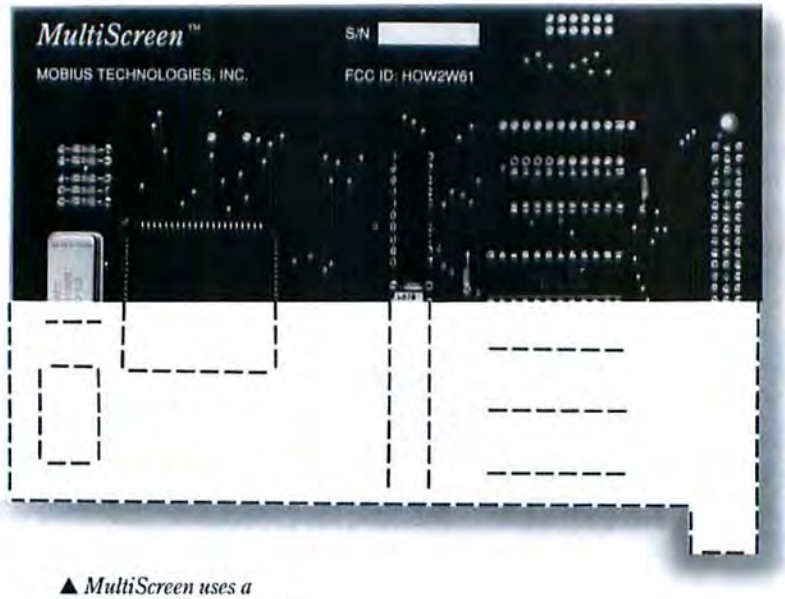

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Circle 471 on reader service card

Quick Tips

Fast redrawing in Illustrator 88, RAM virus detection, and more

by Lon Poole

The Chicago font contains the Command-key symbol (⌘) and three other special characters. You can type them by using the Control key on either of Apple's two standard ADB (Apple Desktop Bus) keyboards for the Mac SE or Mac II, as I've mentioned before. In most application programs, you press Control-Q to type ⌘, Control-R to type ✓, Control-S to type ◆, and Control-T to type . In MacWrite and the other applications that don't recognize those combination keystrokes, Marshall Goldberg of Berkeley, California, suggests using the Key Caps desk accessory (which comes with the Macintosh) to generate the special characters. With MacWrite open, for example, choose Key Caps from the Apple menu and press the combination of keys that generates the symbol you want. Then select the symbol in the Key Caps window, copy, click on insertion point in the MacWrite document, paste, and voilà . . . you get a square box. Select the box and change it to Chicago font to get the special character you want.

ANOTHER TWO-SIDED APPROACH

When Claudia Hill of São Paulo, Brazil, wants to print on both sides of the page, she doesn't use either of the methods presented here earlier (in the September 1988 and February 1989 issues). Instead, she capitalizes on the ability that SuperMac's SuperSpool print spooler software gives her to work while she prints. First she chooses Print from the File menu and requests that only page 1 be printed. A few seconds later, the Mac has spooled the page to disk and printing commences in the background. She then chooses Print again and indicates that only page 3 be printed. She continues printing the odd-numbered pages one at a time in sequence until she reaches the end of the document. Then she goes ahead with another task. When printing finishes, she turns the paper over and prints the even-numbered pages one at a time in sequence. This method works equally well on an ImageWriter with continuous paper, an ImageWriter with a cut-sheet feeder, or a LaserWriter using spooler software such as SuperMac's SuperLaserSpool or Apple's Print Monitor.

THIN LINE

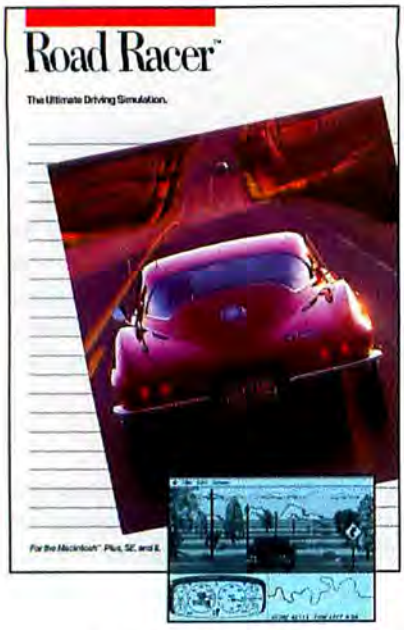
Forget my excessively clever suggestion in last April's column about creating lines thinner than 1 point in MacDraw II. You don't need to partly cover a too-thick black line with a white line to create a thin black line, as you do in earlier versions of MacDraw. Instead, simply use the Pens command in the Pen menu (as described in the MacDraw II manual). Malcolm Dickinson of Winnetka, Illinois, kindly brought this ghastly blunder to my attention.

STRANGE SCALING

Q I've been using a Mac Plus for two years without serious incident. But about two months ago, three of my applications began showing jagged screen fonts instead of Geneva 9, as shown in "Wrong Font." I verified that the fonts were in the System file on my hard disk, and then I replaced all the fonts using System Tools and other master disks. That didn't help, so I backed up the hard disk's System Folder and replaced it with the System Folder from the System Tools disk. The problem still exists. Can you tell me how to make my screen right?
Craig Leake
Potomac, Maryland

A Try unplugging your Mac and removing its battery for five or ten minutes. (You can't remove the battery from a Mac SE or Mac II; instead press ⌘-Option-Shift while choosing the Control Panel.) After restarting, you'll have to adjust the time, date, and possibly other settings in the Control Panel desk accessory. This procedure resets a small amount of memory, called parameter RAM, that's part of the battery-powered clock chip. The parameter RAM preserves various settings when the Macintosh is off so that they'll still be

(continues)



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Wrong Font

If an application displays text in the wrong font—particularly Chicago instead of Geneva—the Mac's parameter RAM probably needs resetting. Here, HyperCard displays button icon names in 9-point Chicago (scaled down from Chicago 12). What appear to be icon names in the correct font are actually instances of paint text that were typed onto the card picture using the Text painting tool.

present at the next system start-up. One setting determines which font the Mac uses as the application font; usually it's Geneva. Most applications use the application font by default. If parameter RAM somehow becomes scrambled, it may specify a nonexistent font instead of Geneva. Unable to find the nonexistent font, the Mac substitutes Chicago. It must scale down Chicago 12, the only available size of Chicago, to get the 9-point size the application wants.

WHO'S GOT THE MEMORY?

Q After installing System 6.0.2 on my 1MB Mac SE's 30MB hard disk, I can no longer use the painting tools in HyperCard (version 1.0.1). When I try, a message says there is not enough memory. According to the About the Finder command, the new System and Finder together take 622K out of the available 1024K.

I can work around this problem by restarting my Mac using the System Tools floppy disk that came with the computer (System 4.1 and Finder 5.5). The floppy disk icon appears in the upper-left corner of the desktop and the hard disk icon appears below it. But now, the Apple menu lists only the few desk accessories on the floppy disk, not the larger number on the hard disk. However, I can still open HyperCard from the hard disk and use all the tools. Once I've done this, the Apple menu lists all the hard disk's desk accessories, and when I quit HyperCard, the hard disk icon appears in the upper-left corner of the desktop. I can even eject the floppy disk that I used to start up the Mac. What's happening? Is it harmful to proceed this way?

Glynn T. Faircloth
Fort Pierce, Florida

A Your hard disk is probably set to start up with the Control Panel's RAM Cache option on and set at a high number, or to start up with MultiFinder active, or both. MultiFinder must be inactive to use all HyperCard features on a Mac with less than 2MB of RAM. You can temporarily inactivate MultiFinder by restarting the Mac and holding down the ⌘ key from the time you see the Welcome to Macintosh message until the Finder's menu titles appear. If you want MultiFinder to remain inactive, use the Set Startup command in the Finder's Special menu to set the Finder option, and then restart.

Before you open HyperCard, the Control Panel's RAM Cache option should be off. It wastes RAM if it's on, because HyperCard has its own cache.

You're able to use HyperCard after starting from the System Tools floppy because System 4.1 has no MultiFinder option. When you open HyperCard from the hard disk, the Mac automatically switches to the System Folder on the hard disk, and the hard disk becomes the start-up disk. Switching start-up disks in this manner is called switch launching and is standard procedure. After switching, the new start-up disk's System Folder determines which desk accessories, fonts, Control Panel devices, and Chooser devices are available. Switching start-up disks does not affect the RAM Cache setting, the MultiFinder setting, or the presence of options controlled by startup documents (INITs) such as MacroMaker.

Incidentally, HyperCard version 1.2.2 (which has been available for some time) has several important new features and works better in low-memory situations. You should be able to get it at no charge by taking your original HyperCard disk to an authorized Apple dealer.

(continues)

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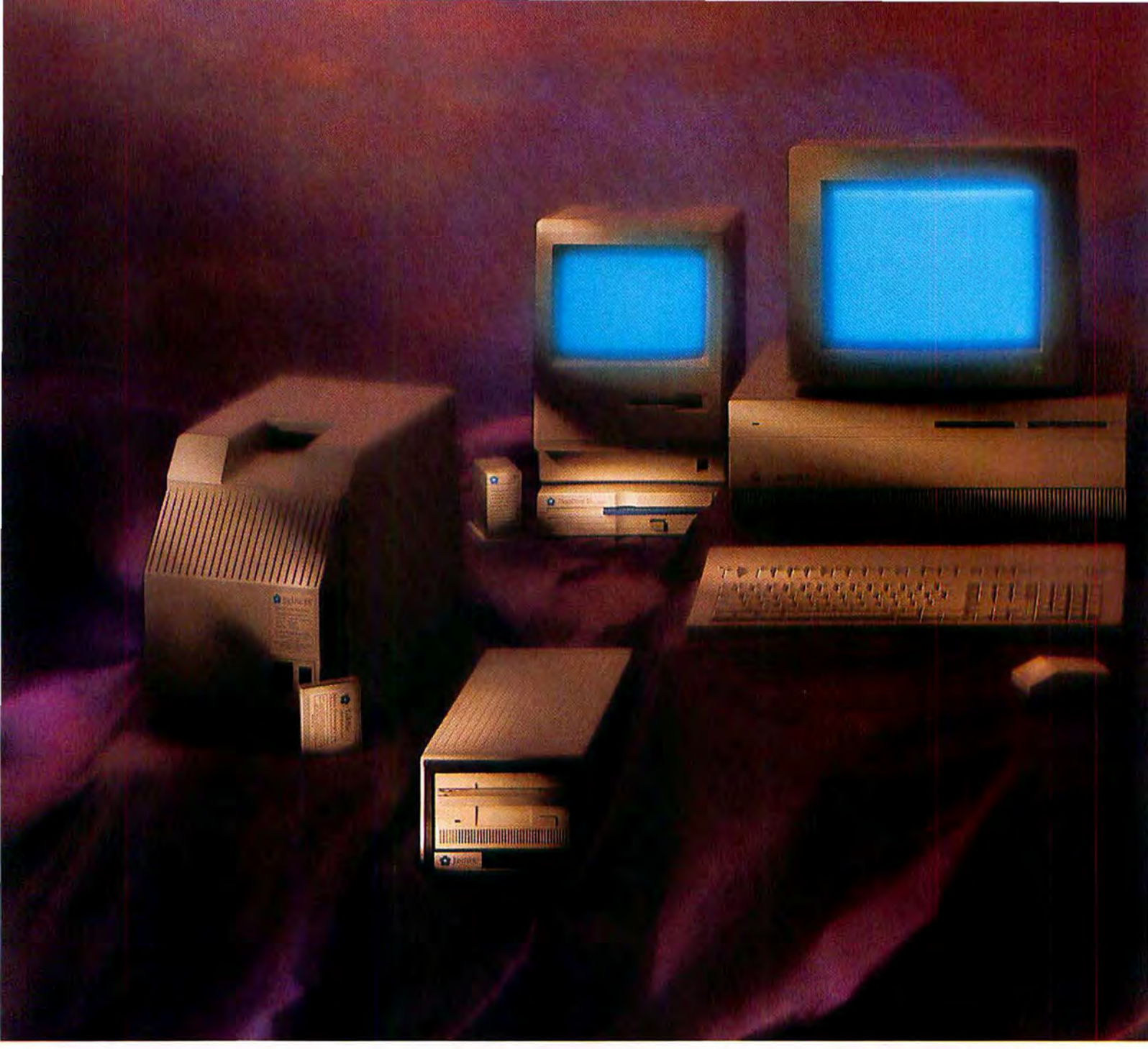

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MACROMAKER FAKEOUT

TIP: You can't use Apple's MacroMaker utility to make macros for some actions, such as choosing Print from MacWrite's File menu. As long as the Print dialog box is still displayed, you cannot use the MacroMaker menu to stop recording a macro. You must first dismiss the dialog box by clicking either its OK button or its Cancel button.

You can often work around this limitation by recording a macro of choosing an inactive (dimmed) menu item. In MacWrite, for example, close the document window(s) to inactivate the Print command. Then start recording a macro, go through the motions of choosing the Print command, stop recording, and save the macro. Nothing will be printed. But if you press the appropriate keys to play back the macro while a document is open, the Print command will be active and the macro will choose it.

Evan J. Romer
Windsor, New York

RAM RX

TIP: For ultrasanitary virus detection, put Apple's Virus Rx virus checker on a RAM disk and make it the start-up disk. It will check disks as quickly as you can feed them into the drive. Any viruses that turn up can't permanently infect Virus Rx or the System, because they vanish when you turn off the Mac.

Bill Dennison
San Francisco, California

The shareware utility RamDisk+ (version 2.08 or later) creates a RAM disk on a Mac Plus, an SE, or a Mac II. Get it from user groups such as BCS Mac (617/625-7080) or BMUG (415/549-2684), or send $20 and a disk to the author: Roger D. Bates, Rte. 1, Box 865, Hillsboro, OR 97124.

BACKGROUND CHECK

TIP: HyperCard 1.2 and earlier versions offer no easy way to put an identical check box on several cards, such that the check box gets highlighted independently on each card. You can put check-box buttons on the background and set their highlights for each card according to hidden background fields (which can have different values on every card), but that's pretty slow in operation. Putting duplicate check-box buttons on every card is too clumsy. I came up with a simple method that uses background fields instead of buttons.

Start by creating a new field and drag any of its corners toward the opposite corner until the field is as small as possible. (The smallest field is the same size as a check box.) Double-click on the field and a Field Info dialog box appears. Select the Rectangle and Lock Text options. Click the Font button and set the field's text font and text size to Geneva 9. Double-click the field again, click on the Script button, and type the following simple script:

```
on mouseUp
  if target is empty
  then put " •" into target
  else put empty into target
end mouseUp
```

(To type the black dot in the script, press Option-8.)

The script alternates the check-box field's state—checked (not empty) or not (empty)—each time the field is clicked.

You can make more check-box fields by copying and pasting or by dragging with the Field tool while pressing the Option key. I type labels for these check boxes using the Text tool.

Miguel Muñoz
Pasadena, California

Check Field
To make check boxes that can have different settings on every card in a HyperCard stack, use background fields instead of background buttons. Each field requires a script to display and erase the check mark (or other character) in response to clicking the field.

A black dot makes the check box look too much like a radio button for my tastes, so I replaced the dot in the script with a check mark (press Option-V to type it) and set the field's text style to bold, as shown in "Check Field." I couldn't find an alternate character, such

as an x, that would make the check box look believably like a standard check-box button.

I recommend you type labels for the check boxes in temporary fields. Don't use the text tool to type the labels as paint text because it's difficult to edit paint text, align it, and change its font, size, and style. When the labels look the way you want, you can convert them from field text to background paint text, making them appear on all cards. Here's how to convert a field to background paint text: copy the text from the field; choose the lasso or any other painting tool; make sure you're editing the background (check the Background command in the Edit menu); and paste the text. Because you chose a painting tool, HyperCard converts the field text to paint text when you paste. Immediately after pasting, you can change line breaks in the paint text by dragging the selected text from a corner while pressing the ⌘ key. Delete the temporary fields after you have converted them to paint text.

SLOW ON THE DRAW

TIP: You don't have to waste time waiting for Illustrator 88 to redraw a complex graphic each time you zoom in or out one power of magnification. Instead, move the image out of view by dragging the scroll box to the bottom of the scroll bar, do your zooming, and then drag the scroll box back to its former position. This technique is especially helpful in Preview Illustration view.

Mario D. Martinez
Houston, Texas

This same idea helps immensely when you're using Illustrator with MultiFinder. Whenever you move, resize, open, or close any window that covers an Illustrator window, Illustrator redraws its graphic. You can also accelerate redrawing before zooming or scrolling and before switching to a different application, by choosing Template Only or Artwork Only from the View menu. ■

. . . . . .

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Where in the World is Carmen SanDiego?	27.	**Niles & Associates** End Note	82.
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A.E.C. FastTrack Schedule	115.	**Power Up** Fast Forms	89.
Ashton Tate Full Impact	249.	**Pro Plus** WallStreet Investor V3.0	469.
BrainPower ArchiText	175.	**Satori Software**	
Chang Laboratories C.A.T.	229.	Bulk Mailer 3.2	78.
MacCalc	85.	Bulk Mailer Plus	189.
Claris MacProject II	379.	**Select Micro Systems, Inc.**	
Smartform Designer	309.	Exstatix	215.
Individual 101 Macros For Excel	37.	MapMaker	215.
Mainstay Capture	39.	**SoftView** MacInUse	42.
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Meta Software MetaDesign	199.	**Synex** Mac Envelope 4.0	55.
Micro Planning International		Mac Invoice	29.
Micro Planner 6.0	325.	**Systat**	
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Microsoft Excel 1.5	255.	Fastat	165.

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Simply Accounting by Bedford Software

Simply Accounting, for small to medium size businesses, is sophisticated enough to please CPA's but simple enough to allow accounting and computer neophytes the power of a full accounting program. Includes general ledger, accounts payable, accounts receivable, payroll (50 state and federal tax schedules built-in), inventory and jobcost. It received a 7.9 rating from Infoworld and four mice from MacUser. ..... **$219.**

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Electronic Arts Thunder! II	52.	Sensible Grammar or BookEnds	53.
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Beyond Inc. Menu Fonts 2	28.	Read-It! O.C.R. Personal	109.
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Copy II Mac *(Includes MacTools)*	20.	**PCPC** HFS Back-Up 3.0	54.
PC Tools Deluxe Mac	42.	**SuperMac Software**	
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The ***Cutting Edge 800K*** floppy disk drive takes advantage of the newest technology to offer high speed, low noise, high reliability in a compact, stylish case. The *Cutting Edge 800K* floppy drive is compatible with all new ROM Macs including the Mac SE and Mac II. The *Cutting Edge 800K* would make an attractive addition to many Macs. ..... **$175.**

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Insigna SoftPC	249.
Software Ventures	
Microphone II v3.0	***Special*** 219.
Solutions, International	
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CE Software Calendar Maker 3.1	27.
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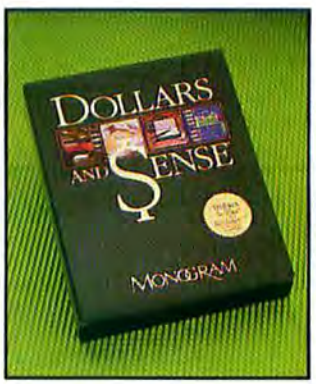

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SuperCard	135.
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Super 3D 2.0	325.
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Pixel Paint 2.0	199.
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Borland Turbo Pascal	68.	HyperTools 1 or 2	58.
Bright Star Technology		**Symantec** Lightspeed C	165.
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Consulair		Just Enough Pascal	49.
Mac 68000 Dev. System	57.	**TENpointO** FocalPoint II	119.
Hyper Press Script Expert	49.	**T.M.L.**	
Manx Aztec C	65.	TML Pascal II V3.0	115.
Aztec C + SDB	99.	TML Source Code Library II	42.
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Microsoft Quick Basic	69.	ZBasic 5.0	99.

StickyBusiness/DiskFinder/ myDiskLabeler by W&M

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Bulk *(Sony)* 3½" SS/DD Disks *(10)*	14.	Sony 3½" DS/DD Disks *(box of 10)*	16.
Sony 3½" SS/DD Disks *(box of 10)*	16.	Fuji 3½" DS/DD Disks *(box of 10)*	17.
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BASF 3½" DS/DD *(box of 10)*	17.	Verbatim 3½" DS/DD Disks *(box of 10)*	17.
Bulk *(Sony)* 3½" DS/DD *(10)*	17.	3M 3½" DS/DD Disks *(box of 10)*	20.

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WORD PROCESSORS & DESKTOP PUBLISHING

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Allan Bonadio Associates		Microsoft Word 4.0	255.
Expressionist 2.0	79.	**Paragon Concepts** Nisus	189.
Aldus Corporation		**Preferred Publishers**	
Aldus Persuasion	385.	Vantage	***Special*** 59.
PageMaker 3.0	389.	**Quark, Inc.**	
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Broderbund		**Symantec** More II	255.
DTP Advisor	47.	**Symmetry** Acta Advantage	65.
Caere Omnipage	559.	**T/Maker Company**	
Design Science		WriteNow V2.0	109.
Math Type 2.0	99.	**U.S. MicroLabs** Font Sizer	79.
Emerald City Smart Art	***Special*** 95.	**Word Perfect Corporation**	
Letraset		Word Perfect	179.
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Ready, Set, Go! 4.5	275.	QuickLetter	75.

Muzzle by Ergotron

The ***Muzzle*** prevents data tampering, application theft and virus infection. The ***Mac II Muzzle*** locks the CPU cover protecting the internal hard drive/memory and expansion boards while the power cover prevents unauthorized use. The ***Mac SE Muzzle*** secures either or both floppy drives while the power cover prevents unauthorized use. ..... **$62.**

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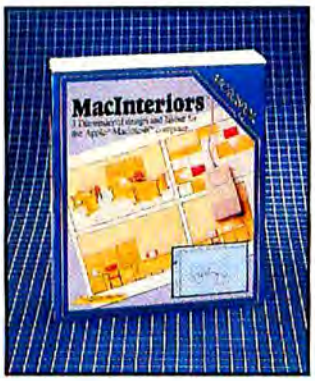

MacInteriors by Micro Spot

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MAC-101 ADB Keyboard/Platinum *(Mac SE & Mac II)*	***Special*** 145.	System Saver SE	52.
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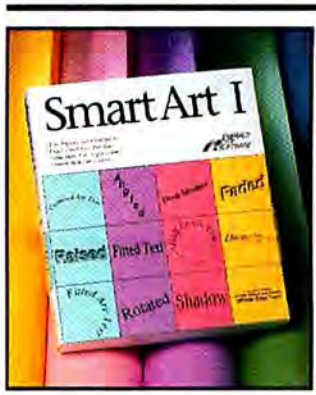

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Getting Started with Desktop Presentations

Out to win friends and influence people? Presentation software can help.

by Jim Heid

Now and then, everyone dons a Willie Loman outfit and becomes a salesperson. Some sell products, others sell ideas and concepts. Whatever the wares, the steps are the same: you gather your facts, shine your shoes, and present your argument.

The Mac won't shine your shoes, but it can help with the rest of the process. *Desktop presentation* software can help you refine your ideas and create presentation aids such as slides, overhead transparencies, and audience handouts. The whole process smacks of desktop publishing, and indeed, there are many parallels between publishing and presenting, but there are also significant differences. This month, we take you on a tour of the world of presentation graphics software and hardware.

PRESENT OR PERISH

Desktop publishing implies a permanence to your work: you're preparing documents that will be printed and kept—at least for a while. With presentation graphics, however, your efforts are more transitory: each visual is seen just briefly, then it's gone. Because of their fleeting nature, it's important to create visuals with impact

and to plan your presentation so that your message sinks in.

Another key difference between desktop publishing and presentation graphics lies in the output media. With desktop publishing, your efforts rest on paper. With presentation graphics, your results are usually projected onto a screen, the most common types of output media being 35mm slides and overhead transparencies. The Mac itself is another medium: using hardware I'll discuss later, you can project Mac screen images onto a large screen.

Combining text and graphics is something all Mac word processors and publishing programs do with ease. So do you really need a presentation program? The truth is, if you make only one or two presentations a year, you can probably get by with a word processor or publishing program, or even with a drawing program such as MacDraw II. But if presentations are a regular part of your job, you'll come to rely on the specialized features of a presentation program.

SOFTWARE TO PRESENT BY

Word processors and publishing programs are generalists; presentation programs are specialists: their text-editing and graphics-manipulation features are geared specifically toward producing presentation materials. Toward that end, most presentation programs play three primary roles: they help you develop and refine your ideas, create visuals, and structure and deliver your pitch. (For a comparison of the top programs, see "Picking the Best Presenter," *Macworld*, May 1989.)

When you're first developing a presentation, you need to organize and reorganize your ideas on the fly. Built-in *outlining* features, found in More II and Aldus Persuasion, help you do just that. If you use a presentation program that lacks built-in outlining, team it with Symmetry's Acta outliner desk accessory (included with Cricket Presents), or do your brainstorming with a word processor that has outlining features.

Presentation programs encroach on word processing territory in other ways. Many provide search-and-replace commands for making wholesale changes to your text. And because typos can turn a presentation into an embarrassment, you'll

(continues)

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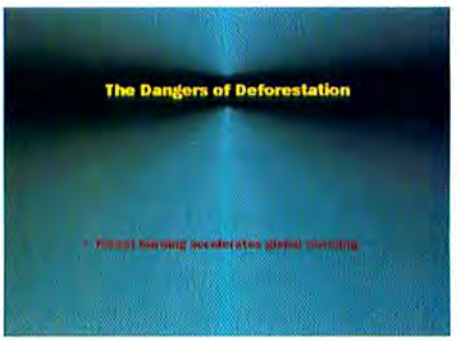
find spelling checkers in PowerPoint, StandOut, Cricket Presents, Persuasion, More II, and MacDraw II version 1.1. But remember, spelling checkers aren't usage checkers. They don't know "capital" from "capitol" or "its" from "it's," so keep your dictionary handy.

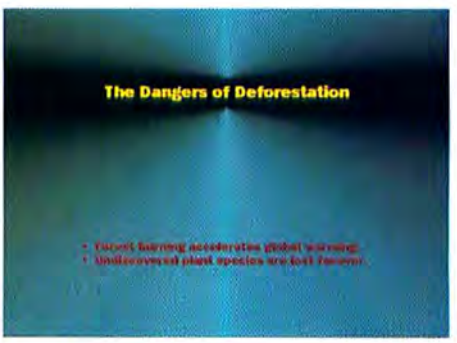
VISUAL COMPONENTS

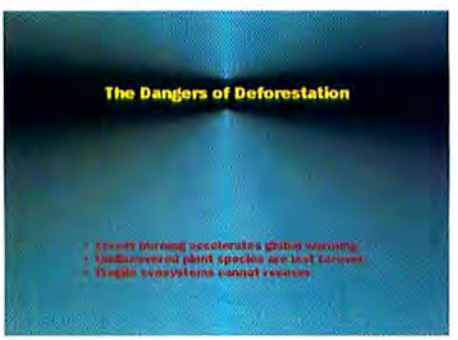
After you've refined your ideas, you're ready to produce visuals, which can contain three basic elements:

Text Usually short passages, often organized as *bullet charts* for fast reading (see "Bullet Charts"). More II, Persuasion, and Cricket Presents let you turn outlines into bullet charts with one command or mouse click. Many programs also let you specify that the bulleted items in a list should appear one at a time on consecutive visuals, a technique called a *build*. By using builds, you can make your case and discuss it point by point.

Graphics A picture is often worth a thousand bullets. Graphs can visually depict trends or market shares, organization charts can spell out the corporate pecking order, and diagrams and drawings can illustrate complex concepts. Cricket Presents, Persuasion, and StandOut all provide built-in graphing features that let you create graphs from numerical data that you type in or import from a spreadsheet (see "Built-In Graphing"). Other programs let you import graphs created in other applications, such as Excel or Cricket Graph, but that isn't as convenient. More II and Persuasion can automatically generate organization charts based on the indent levels in an outline. All presentation programs have drawing tools for making diagrams, and most can also import images created with a scanner or a drawing program.







Bullet Charts

***Bullet charts present information in short phrases, organized in bulleted list form. Many presentation programs let you specify that the bulleted items in a list appear one at a time on consecutive visuals, as shown here. This technique is called a* build.**

Built-In Graphing

Persuasion, Cricket Presents, and StandOut provide built-in graphing features that let you create graphs from numerical data that you type in or import from a spreadsheet. Shown here, a three-dimensional bar chart created in Persuasion.

Backgrounds On printed documents, text and graphics generally appear against the white background of paper. But presentation visuals are usually projected on a white screen in a darkened room, and in that setting dark text against a white background is hard on the eyes. It's better to use white or brightly colored text against

(continues)

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MACazine
March 1989 / page 52

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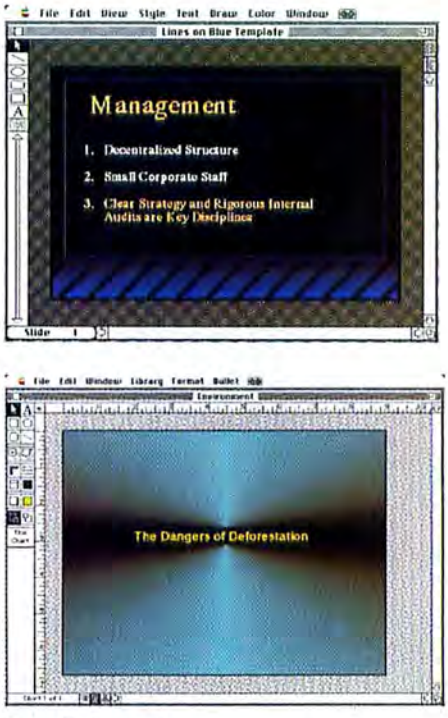
a dark background. All presentation programs let you specify such schemes. Many also provide special background effects that give visuals an elegant, professional look (see "Fancy Backgrounds").



Fancy Backgrounds
A sampling of elegant backgrounds from PowerPoint (top) and More II (bottom).

For assembling these components, presentation programs provide drawing and layout features that let you position text, create boxes and borders, paste graphics created in other applications, and draw various shapes. Most also provide on-screen rulers and alignment guides for precise positioning.

True, these features are all found in publishing and drawing programs. But presentation programs put a different spin on many of them. For example, publishing programs don't know overheads from slides, but presentation programs provide page-setup options for both. Thus, instead of having to calculate the proper dimensions for a slide or overhead and then type them into a Page Setup dialog box, you simply choose your output medium from a dialog box.

A presentation is more effective if its visuals are designed with care. Well-designed visuals use a consistent background and color scheme, and have a uniform layout to give the viewer's eye familiar points of reference. One way to achieve this continuity is to repeat a company logo or graphic on each visual. Most presentation programs let you store such repetitive elements on a *master page.*

For typographic consistency, many programs also provide word processor–like *style sheet* features that let you store and recall text formats. Cricket Presents, Persuasion, StandOut, More II, PowerPoint, and MacDraw II version 1.1 let you create *templates* to store your formatting preferences for future use. The aforementioned programs also include an assortment of attractive predesigned templates.

Most presentation programs let you assign descriptive titles to each visual in a presentation, so you can tell at a glance what the slide or transparency contains. You can also use these names to sort and organize the visuals using your program's sorting features.

SORTING AND SHOWING

What ultimately separates presentation programs from their publishing and drawing kinfolk are features that let you sort and arrange visuals and present them using the Mac's screen.

People who work with slides often use an illuminated stand called a *slide sorter* to view and organize their images. On-screen slide sorters—provided by PowerPoint, Cricket Presents, StandOut, and Persuasion—perform the same role by displaying numerous slides reduced to fit within a window (see "Sorting Slides").

Within the slide sorter window, you can change the sequence of slides in your presentation simply by dragging them to different positions. The slide sorter windows in PowerPoint, Cricket Presents, and StandOut also let you cut or copy slides to the Clipboard for pasting elsewhere in the same presentation or into a different one altogether. Most programs also provide *title sorters* that display only the slides' titles.

Finally, presentation programs provide *slide show* features to help you ex-

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Sorting Slides
PowerPoint, Cricket Presents, StandOut, and Persuasion (shown here) provide on-screen slide sorters, which display numerous slides reduced to fit within a window. You can reorganize the sequence of the presentation visuals by dragging them within the sorter window.

hibit your visuals. Choose your program's Slide Show command, and the Mac becomes a projector, displaying each visual on the screen without the menu bar and tool palettes. In slide-show mode, the mouse becomes a remote control: click it to advance to the next visual. Cricket Presents, More II, MacBriefer, and StandOut also let you use visual effects such as a *wipe*, which causes one visual to "push" the previous one off the screen.

OUTPUT ALTERNATIVES

Now we come to the output: once you've created your visuals, how do you screen them for your audience? I've just mentioned the Mac-as-slide-projector technique. With this route, however, you'll probably need some additional hardware—unless you can convince a roomful of people to crowd around your Mac.

One option for Mac II and SE/30 owners is a 19-inch color monitor like those offered by SuperMac, RasterOps, Radius, and others. If you can spare about $8000, you might consider Mitsubishi's gargantuan XC-3710SS, whose 37-inch color video screen is guaranteed to get noticed (see "Attack of the Giant Monitor," *Reviews, Macworld*, October 1988).

But giant monitors weigh—and cost—a great deal. And in a large room even a 37-inch screen can seem small. If you can live without color, a more practical solution may be a *projection panel* or *pad*, which works with an overhead projector. You attach the panel to your Mac and then lay the panel on the projector as though it were a transparency. The Mac creates a video image on the panel's liquid crystal display (LCD) screen, and the projector shows the image on the room screen. One projection panel—In Focus Systems' PC Viewer—doesn't require your Mac to tag along. PC Viewer contains a megabyte of memory that, according to In Focus, can store up to 75 visuals.

Another way to project a video image—this time in full color—is by using a *video projector* such as Kodak's LC500. The $3495 LC500 looks like a slide projector and, according to Kodak, projects images up to 12 feet wide. Unlike some bulky video projectors, the LC500 is portable (weighing about 13 pounds) and doesn't require tricky setup and color-convergence adjustments.

The biggest drawback to most video-oriented presentation hardware is that you need to lug your Mac along. When portability, color, and economy are important, overhead transparencies and slides are better alternatives.

OVERHEADS AND SLIDES

If you're like me, you probably slept through a few overheads in high school. Ah, but old Mr. Crusty didn't have the output options we enjoy today. By combining a laser printer with *transparency film* such as 3M Type 154 Transparency Film, you can produce overheads that would impress even Mr. Crusty. Need color? Use one of the new breed of affordable color printers, such as Hewlett-Packard's PaintJet or Tektronix's ColorQuick (see "Printing a Rainbow," *Macworld*, January 1989, and *Macworld News*, June 1989).

Overhead transparencies are eminently portable—dozens of them will fit in a binder—and overhead projectors are almost as ubiquitous as photocopiers. But overheads have drawbacks, too. You must manually flip from one transparency to the next, and that can make an otherwise sophisticated presentation seem amateurish—especially if the projector's fan blows half your visuals off the table. (Don't laugh, it's happened.) What's more, over-

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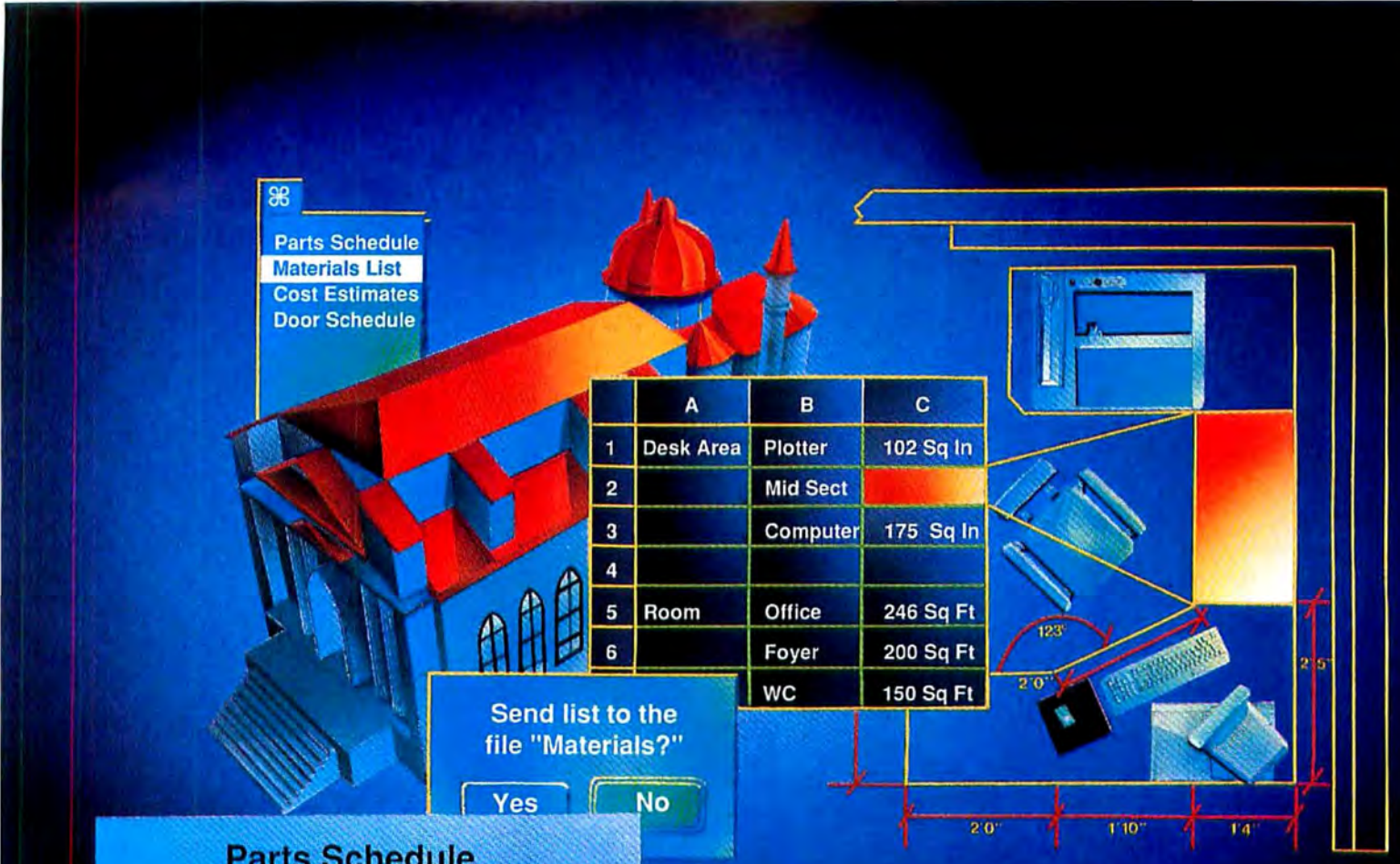

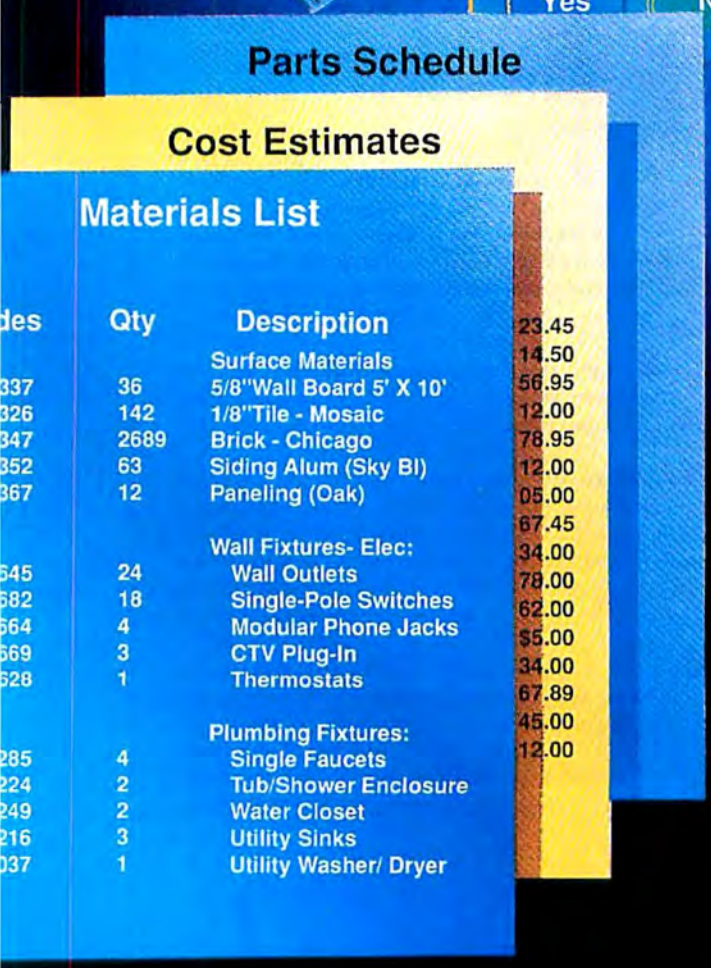

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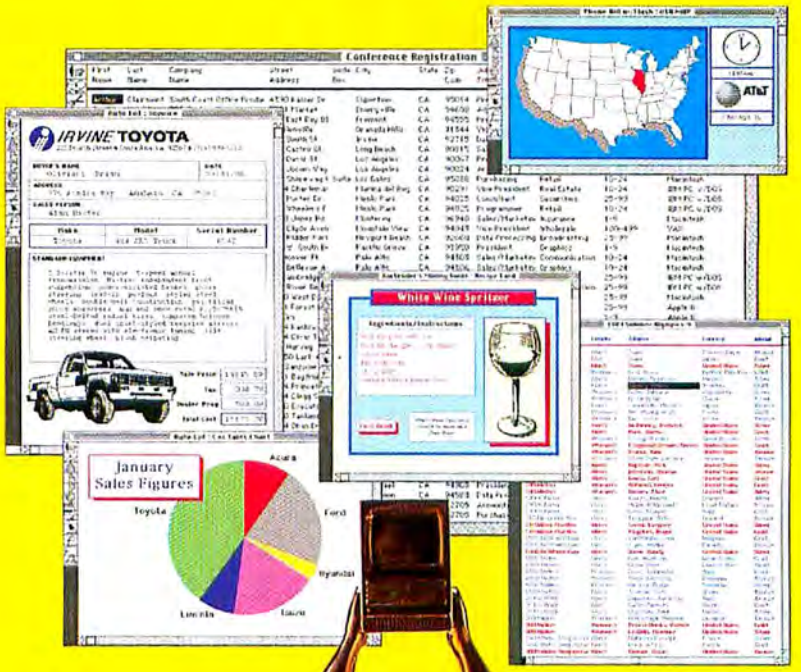

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heads can scratch and smudge, and the colors produced by inexpensive color printers can't approach the vividness of the ultimate presentation output medium—the color slide.

Slides are portable, too, and you can carry them in a tray, where they're always properly sequenced and ready to show. Slides are also inexpensive to duplicate, so it's easy to prepare duplicate sets as backups or for colleagues.

Slides also have the greatest dazzle potential. By combining two or more slide projectors under the control of a *dissolve unit*, you can create impressive presentations containing fancy visual effects such as dissolves and animation. And slides give you the vivid colors that only film can provide.

To create slides with a presentation program, you need a *film recorder*, a special kind of printer that provides images not on paper, but on film. (For more information on film recorders, see "From Screen to Slide," in this issue.) Most film recorders contain a camera aimed at a video tube. Sandwiched between those components is a wheel containing red, green, and blue filters. The film recorder paints an image on the video tube, making separate passes for red, green, and blue light—three primary colors for video with which it can create a palette of over 16 million hues. A complete exposure usually takes a few minutes.

Not only do film recorders provide spectacular color, they offer tack-sharp resolution—usually in the ballpark of 4000 horizontal lines per slide. By comparison, a Mac II's screen display contains 480 horizontal lines; commercial television has 525-line resolution.

Alas, hardware with talents like these isn't cheap. Film recorder prices generally start at about $6000. A less expensive alternative is to use a slide-service bureau. You send a disk to the bureau or transmit your visuals via modem, and your slides arrive from one to several days later, depending on the turnaround time you are willing to pay for. Service bureaus also provide other types of output, such as high-resolution overhead transparencies and color prints.

Most publishers of presentation software have cooperative arrangements with nationwide slide-service bureaus. Included with the software is a *driver* for the type of film recorder the bureau uses. You copy the driver into your System Folder, and use the Chooser desk accessory to select it prior to creating your visuals. Most publishers also include a special communications program that uses straightforward dialog boxes to automate communications with the service bureau.

PRESENTATION VARIATIONS

Most presentation programs are geared toward brainstorming and producing visuals, but some specialized ones also deserve mention. Programs such as Visual Information's Dimensions Presenter (still in development at this writing) and Dynaware's DynaPerspective allow you to create three-dimensional animated presentations. For example, architects can use these programs to take clients on simulated walk-throughs of their designs, and

(continues)

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industrial designers or interior decorators can allow clients to view their proposals from literally any angle. MacroMind Director can produce animated presentations that incorporate sound effects and music. I'll be looking at these and other animation-oriented programs in a future column.

Then there's HyperCard. As a presentation program, Apple's software toolkit has serious limitations, including no color and a fixed window size. But it does provide a selection of visual effects and it can play back recorded sounds. And by combining its built-in programming language with on-screen buttons, you can create dynamic presentations that people can use and navigate through on their own. (For more details, see "Getting Started with HyperCard," *Macworld*, May 1989.)

Before I began researching this column, I was somewhat skeptical of presentation software. The entire category struck me as being one created by software companies looking for another way to sell programs that provide drawing and layout features. But once I had worked with the programs a little and had seen what they're capable of, I thought of all the meetings I've snoozed through—where monotonal voices droned on and on in conference rooms, curing insomnia. Some interesting visuals and better planning certainly would have enlivened those proceedings.

It's true that a presentation program can spawn droves of uninteresting visuals when placed in the hands of a graphics philistine. And it's true that a presentation program's brainstorming features won't help someone suffering from a mental drought. But it's also true that every day thousands of people stand up and try to sell their ideas and products to others. That's hard work, and if I were in that position, I'm sure I would want all the help I could get. ■

See *Where to Buy* for contact information.

Jim Heid is a Macworld *contributing editor who focuses each month on a different aspect of Mac fundamentals.*

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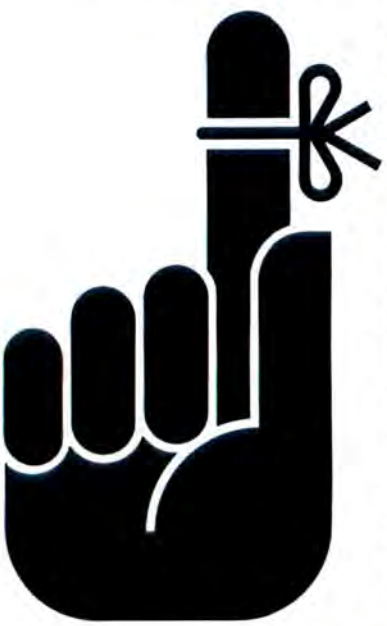

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How To Triple The Speed Of Your Mac For Under $250

by Randall D. Smith, Founder of MacAcademy™

A few years ago I wanted to be a better golfer so I went out and bought the same clubs that Jack Nicklaus uses. Today we play exactly the same clubs... he's still great and I'm still terrible.

Last month I bought a Porsche 911 Turbo. I now have one of the fastest, most powerful cars in the world. As I was reading through the manual I came across a statement that suddenly made me realize the error of my thinking. The manual basically said that *the only weakness this car has is the driver.* In other words, no matter how good the equipment, the key element is still the operator!

As you read through the Mac magazines you'll realize that the same delusion exists among Mac users. People believe that to dramatically increase the productivity of the Mac they simply need to buy bigger, better, and faster hardware and software. If you don't believe me take a look at all the ads in this magazine for the newest Macs, fastest hard drives, and the latest in accelerator boards.

Usually the difference is a matter of milliseconds. Imagine the person who passes up a Mac Plus and spends an extra $4,000 to get the fastest Motorola processor, spends another thousand on an accelerator board, two thousand on a huge hard drive, and now spends two hours trying to figure out how to do a mail merge on Microsoft Word!

If you want to save **hours** instead of **milliseconds**, invest your money *in training the user instead of upgrading the equipment.* Training is the wisest and least expensive investment you can make in your Mac.

If you have a *hardware and software surplus, but a training deficit,* I'd like to invite you to attend MacAcademy. Over 2,000 companies have found MacAcademy to be the low cost solution to their training needs. MacAcademy is a full two day Macintosh training course that costs only $249. MacAcademy offers both basic and advanced training on the Mac, Microsoft Excel, Works, and Word. Also included is training for Aldus PageMaker, Claris HyperCard and FileMaker II.

After spending two days with our unique, all-star, teaching staff you will dramatically increase your productivity and cut your learning curve in half. Your work will be done faster, more professionally, and you'll feel 10 times more confident with your machine. One MacAcademy graduate recently wrote us that if he had to choose between a MacAcademy trained employee on terrible equipment or a non-MacAcademy trained employee on the latest equipment he'd choose the MacAcademy trained employee any day. He'd get more work done in less time.

Here are a few comments from people who attended MacAcademy in Boston on March 20th:

"This has been the most productive two days I have ever spent. Well worth the price, very cost effective, the most knowledge per dollar I've seen. Quality instructors who understand and respond to the needs of the attendees."
K. Hemeon, Norwell, MA.

"I felt all classes contained excellent material. All the instructors maintained a level of patience and support which surpassed all of Macintosh's user friendly features."
D. Quinn, Seabrook, N.H.

"Bravo! What a fantastic learning experience! I really think that 2 days at MacAcademy should entitle every graduate a week's vacation to absorb! Thank you. Thank you."
C. Bancroft, Plymouth, MA.

"This is my second venture at MacAcademy and I again feel it was well worth the money. I have 10 of your video training tapes which I also find extremely helpful."
C. Allen, Framingham, MA.

Over the past year and a half MacAcademy has been presented in over 22 cities to over 14,000 Macintosh users. Our satisfied corporate graduates include General Electric, TRW, NASA, Citibank, Federal Express, HBO, the U.S. Army, Navy, Marines, and Air Force, nearly every branch of the U.S. government, nearly every large university in America, and thousands of corporations both large and small . Each company put their trust in our company by investing $249 per employee and enrolling in MacAcademy. We at MacAcademy take that trust very seriously. On a scale of 1 to 5 our attendees consistently rate us a 4.6. Our goal is nothing less than 5! I invite you to plan now to attend the next MacAcademy in your area. If you want references please call us...we literally have thousands.

Like any other successful program MacAcademy has recently seen its share of "clones". There are those out there who have attempted to copy our format, our brochure, even our price. What they can not copy is our quality.

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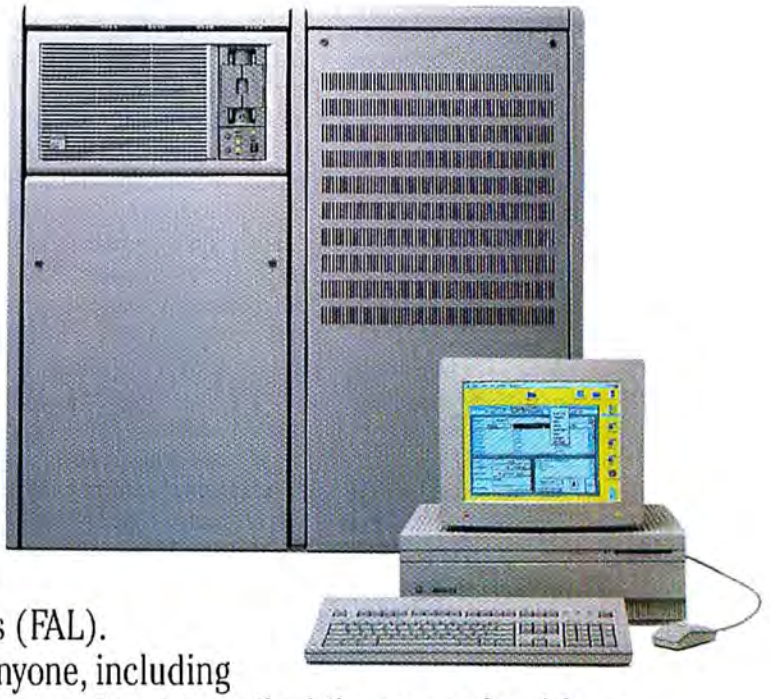

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Insights on AppleShare

Getting more bang for the buck

by Dave Kosiur

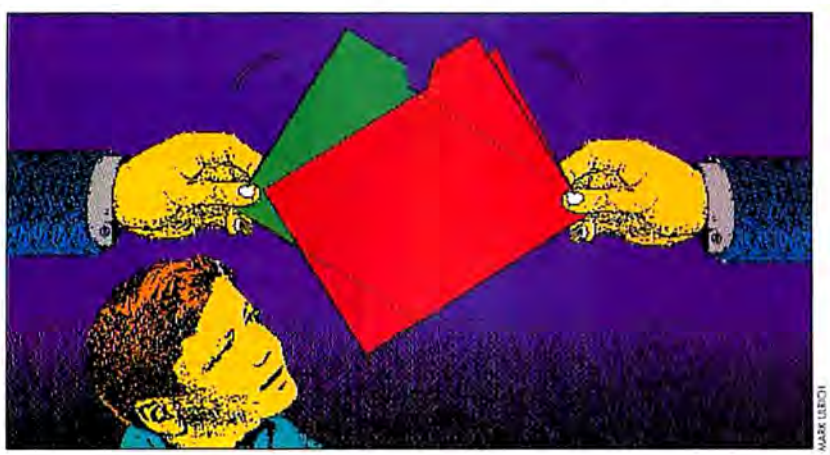
Although it's common to use Apple's LocalTalk network to connect Macs and LaserWriters, sharing resources is not the only reason to link computers. Sharing information is another powerful incentive for establishing networks. And file servers such as AppleShare are a popular way for networked users to trade files and pass messages.

Apple's AppleShare server software is designed to be installed on a Mac with one or more hard disks. AppleShare falls in the class of what's called dedicated servers, meaning that the Mac is used mainly for file-service functions and therefore cannot be used as a regular workstation. Thanks to AppleShare's support of background tasks, however, you can use the Mac server to run another network-related program, such as a print spooler for a laser printer or an electronic mail package.

SHARING AND SECURITY

As a file server, AppleShare provides two basic functions to networked users: file sharing, which includes ways to control simultaneous use of the same files; and file security, which controls who may access what file.

AppleShare allows developers to control a user's access to files at the file level, the record level, and the byte level. What this means to users is most evident in databases and similar programs. A multiuser database, which allows many users to work on the same file, will incorporate some form of record locking to prevent two users from altering the contents of a database record at the same time. In the past, many database vendors had to write their own code to deal with these problems. Now they can use the locking mechanisms provided by AppleShare, as spelled out in Apple's AppleTalk Filing Protocol (AFP). As other developers provide AFP-compliant servers on other computers, a program originally written to work on AppleShare will also work on these other AFP servers.



File security is often more important to server users than file locking. Apple takes a slightly different approach to file security than other server manufacturers because Apple bases its security on access to folders, not to the files themselves. Thus the owner of a folder on the AppleShare server determines who can see and/or change the contents.

MINIMIZING COST

Because AppleShare requires a dedicated Mac for the job of file server, the cost of an AppleShare network often seems high. Compared to other hardware/software solutions, such as 3Com's 3+ software on a 3S400 server or Novell's Netware on an Intel 80286- or 80386-based server, that's not the case. Furthermore, there are ways to maximize the bang for your buck.

First, getting maximum performance usually requires using a Mac II or similar machine with a fast hard disk as the server. You can disconnect the monitor once you've started the server, but you still need a monitor for rerunning the administrator program on the server. A better way of dealing with a Mac II server is to create a "headless" server, eliminating the keyboard and monitor entirely. You can do this by using Farallon's Timbuktu, a remote-control program that enables you to use another Mac on the network as the "monitor" for setting up the Mac II AppleShare server. Timbuktu costs much less than a monitor.

MORE SERVER OPTIONS

If you have a spare PC lying around, you can turn it into an AFP-compliant network server using DayStar Digital's FS/100 soft-

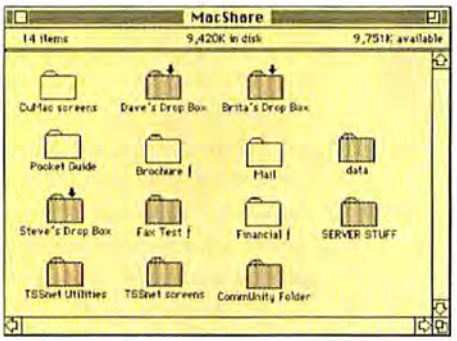
(continues)

ware/hardware package, which works with IBM PC ATs and clones. Or you can use either MacLAN Connect from Miramar Systems or Dayna Communications' DaynaNet to do the same thing.

Another option is Jasmine's DirectServe, basically an AFP-compliant server in a box. DirectServe includes a 68010 microprocessor (which is similar to the processor in the Mac Plus and Mac SE) and AppleShare 2.0 in ROM. You simply plug one or more SCSI-based hard disks into the box and the server's ready to go.

BACKGROUND TASKS

Another way of diluting the cost of an AppleShare server is to install a background task on the same Macintosh. Some good candidates are Apple's Laser Print Spooler, which can spool print jobs for up to three networked LaserWriters and ImageWriters on a Mac Plus or SE, or electronic mail. Programs like CE Software's QuickMail allow you to connect a modem to the server and let dial-in users send mail to or receive mail from the mail server in the background.



A View of AppleShare

This is a typical AppleShare server window as it would appear on your desktop. Plain folders are unprotected and can be opened, viewed, and modified by anyone. Plain folders with marked tabs are owned by you; you can modify the access privileges for such folders. Dimmed folders with arrows are drop folders; you cannot open these folders and view the contents, but you can add files or folders. Dimmed folders without an arrow are inaccessible to you.

MIXING IT UP WITH THE IBM PC

I've mentioned that you can turn a PC AT into an AFP-compliant server. You can also hook PCs into a LocalTalk network to use an AppleShare server. To do so requires a LocalTalk interface card for each PC. Plenty of vendors now offer such cards, including Apple, TOPS, Tandy, Everex, and Hercules. Installing the card and its drivers just links you to the LocalTalk network. To get to the AppleShare server, you'll need to buy Apple's AppleShare PC software for your PC.

EXCHANGING FILES

All text files are not created equal. Mac text files (such as those created by MacWrite) do not include line feeds to indicate the end of a line but use only carriage returns. On the other hand, MS-DOS text files contain both carriage returns and line feeds. However, the AppleShare PC software includes conversion utilities that add line feeds when a Mac text file is copied to an MS-DOS computer, and remove line feeds when MS-DOS files are copied to Macs.

Files from some programs available for both Macs and PCs, such as Microsoft Word and Aldus PageMaker, can automatically be shared between Mac and PC

(continues)

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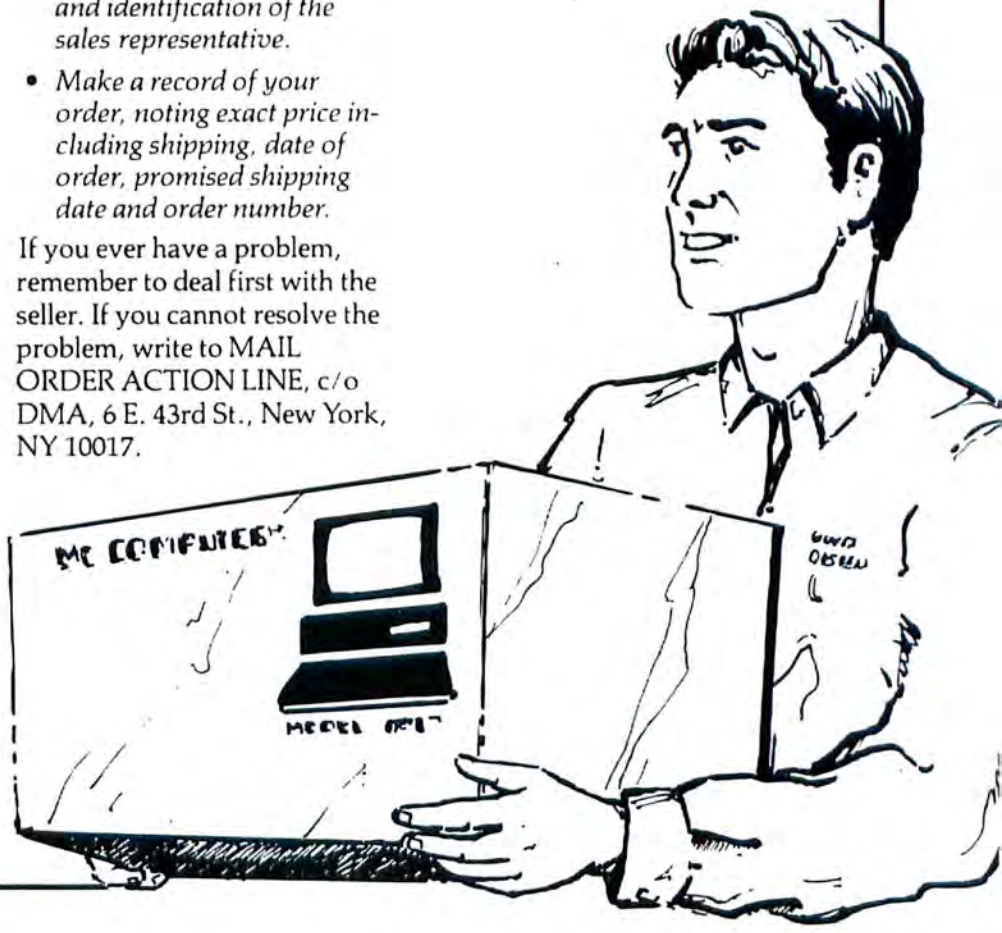

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users when the files are on an AppleShare server. If you're working with other program files, especially graphics files, you may find it necessary to run a conversion program, such as DataViz's MacLink Plus, before you can use a PC file on the Mac.

WHAT'S IN A NAME?

AppleShare was written to handle both Macintosh and MS-DOS file names. There's a significant difference between the two: Mac file names can be 32 characters long with very few limitations on the allowable characters, while MS-DOS file names can have at most 8 characters with an optional 3-character extension (MS-DOS's way of giving you a hint as to the type of file). Apple developed a particular algorithm to convert Mac file names for use by MS-DOS machines.

This conversion algorithm uses the first 8 characters of the Mac file name. This means that AppleShare users must take some care in naming Mac files that will be shared with PC users. To avoid confusion, the names of all shared Mac files must contain some differences in the first 8 characters. (For example, to PC users, files named InvoiceJune and InvoiceJuly would look identical.)

With the introduction of AppleShare 2.0, Apple added support for Apple II and Apple II O.S., its ProDOS operating system. This means an Apple II user cannot access a volume or its contents unless the volume and every folder each has a valid ProDOS name—up to 15 characters, including letters, numbers, and periods.

MINIMIZING FRAGMENTATION

If you're planning to use a hard disk that was previously attached to a workstation, reinitialize the disk before you attach it to the server for the best performance. If you need the files that were originally on the disk, back them up and restore them after the reinitialization. That will minimize file fragmentation and enable disk access to proceed more quickly.

STANDARD SERVERS

AppleShare lets you attach up to seven disks as server volumes via the SCSI port. If you use more than one server disk, try to use disks from only one manufacturer. This frees up a bit of RAM to the server software, improving its performance—usually each vendor's disk has to load its own driver into RAM, so multiple vendors mean multiple drivers.

BACKUP SAVVY

It's always a wise move to back up the server volumes on a regular basis. With AppleShare 2.0, if you have a removable cartridge device attached to the server, you can use the Copy Volume command to copy a volume to the cartridge. You must process the cartridge with the AppleShare administrator program for the cartridge to be recognized by AppleShare. Caution: the Copy Volume command does not copy the Server folder to another volume—use your standard backup program for that operation.

As with a local hard disk, the server's disks become fragmented as files are added and deleted. This means that the disk's read-write heads have to travel around more of the disk to get all of a file. If your AppleShare volumes seem to be getting slower, back them up (making sure the backups can be read), reinitialize, and restore the disks. To save yourself headaches, be sure that the backup software you use retains each folder's access privileges—many don't. Some that do include SuperMac's Network DiskFit and Personal Computer Peripherals Corporation's HFS Backup 3.0.

CONSIDERATION

Remember, you're working with a shared desktop that looks the same to all AppleShare users. If your workstation is a Mac with a large monitor, don't move any of AppleShare's windows too far away from the upper-left corner of the screen. If you move them too far to the right and leave the server, users with Mac Pluses or SEs won't see those windows when they log on to AppleShare. ■

See *Where to Buy* for contact information.

Dave Kosiur, a Macworld *contributing editor, is the publisher of* Connections, *an international newsletter concerned with Macintosh networking.*

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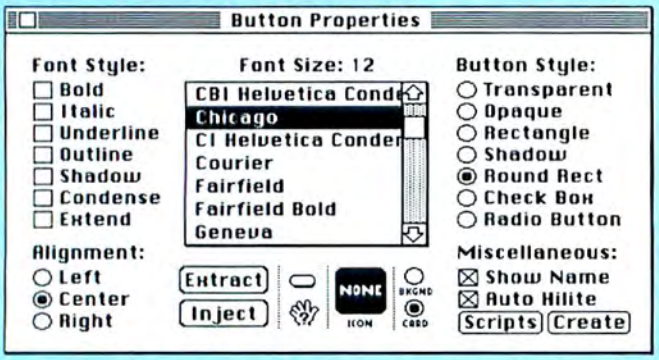

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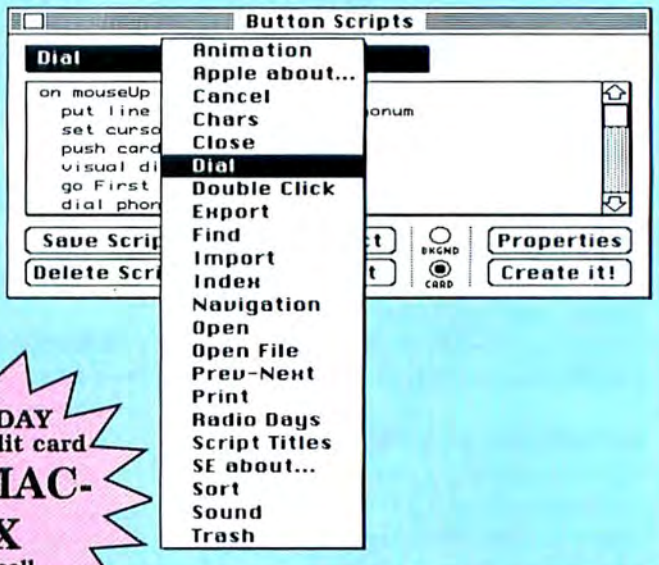

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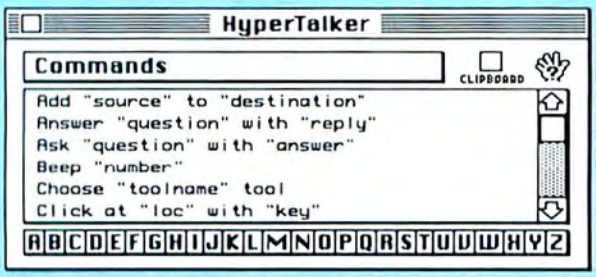

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UPDATES

This list brings you the highlights of software updates recently received but not yet tested. The first price is the upgrade cost for registered owners; the second is the current list price.

AppleFax version 1.2 upgrades the firmware and software. The ROM corrects the majority of PBX and fax incompatibilities. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014; 408/996-1010. Free (bundled with AppleFax modem).

ArchiText version 2.0 imports Microsoft Word 3.0, WordPerfect 1.0, and MacWrite 4.6 files. Lets you work with Microsoft Word, WordPerfect, or MacWrite files on disk without converting them to ArchiText format. Combines operations, imports and splits text into more manageable units, and exports through multiple open windows. BrainPower, 30497 Canwood St., #207, Agoura Hills, CA 91301; 800/345-0159, 818/707-1712 in CA. Free; $349.95 new.

Colleague version 1.2 expands accounting features. Includes Client Fund to track expenses drawn against an advance or retainer, lets you post single payment against an entire batch of client invoices, and provides optional graphing for income and expense reports. Colleague, 10000 Research Blvd., #210, Austin, TX 78759; 512/345-9964. Free upgrades for first year, $99 for continued support; $495 new.

Finale version 1.2 is primarily a maintenance upgrade that improves slurs and crescendos. Coda Music Software, 1401 E. 79th St., Bloomington, MN 55425-1126; 612/854-1288. Free; $1000 new.

Hybase version 1.1 contains toolkit that has been redesigned for easier use. Lets developers trap user errors and take action. Import and export facility lets you import from ASCII DBF (FoxBase and dBase Mac formats) and SYLK files into the database. Transfers information from all HyperCard fields to matching database records with single command. Answer Software, 20045 Stevens Creek Blvd., Cupertino, CA 95014; 408/253-7515. Free; $149 new.

Icon-It version 1.2 supports hierarchical menus, uses a start-up icon, contains more than 100 templates. Olduvai, 7520 Red Rd., Ste. A, South Miami, FL 33143; 305/665-4665. $15 plus s/h if originally purchased before January 31, 1989; otherwise free; $79 new.

Imagewriter LQ Print Driver version 2.0 improves print quality in the upper and lower areas of the page. Reduces noise level, and adds a HyperCard stack and Quick Setup Guide to instruct users on how to set up the printer. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014; 408/996-1010. Free if ImageWriter LQ printer purchased between August 11, 1987, and March 7, 1989; otherwise $1399 with ImageWriter LQ printer.

MapGrafix version 2.0 adds spatial-analysis functions such as Feature and Polygon, distance searches, polygon building, and polygon overlay. Adds support for Houston Instruments plotters and EPS. Includes MapLink, a utility program that lets users translate existing digital files to and from Map-

(continues)

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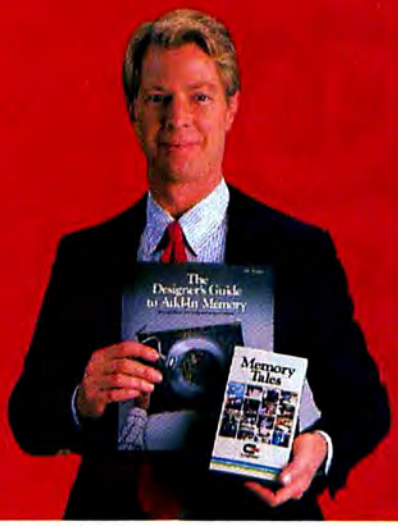

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Grafix. Supports DLG3 (U.S. Geological Survey Digital Line Graph) and DXF (AutoCad) file formats. ComGrafix, 616 E St., Clearwater, FL 34616. 813/443-6807. Free; $8500 new.

MaxPage version 1.2 provides all text boxes with any size or style of font. Lets you add MacPaint pictures to a background along with PICT files. Font sizes may be between 2 and 126 points. Imported PICT or MacPaint graphics can now be reduced as well as enlarged. Applied Systems and Technologies, 227 M Hallenbeck Rd., Cleveland, NY 13042; 315/675-8584. Free; $89 new.

QuickMail version 2.0 is now a standalone application, based on store-and-forward technology. Lets you directly create new messages and replies. Performs QuickSend and QuickConference with hotkey options, has an optional large-font display in the main screen, lets you copy and paste addresses and set time and date for delayed mail. Mail log can be turned on or off by each user, messages can be retrieved after they've been sent, and additional ⌘-key equivalents have been added. Includes QuickRemote version 2.0, which lets networked users access QuickMail by modem. CE Software, 1854 Fuller Rd., P.O. Box 65580, West Des Moines, IA 50265; 515/224-1995. Full package with manual $75; $35 if you have 2nd edition manual; 10-pack $399.95; 5-pack $269.95.

SoftPC Mac version 1.3 supports the FDHD drive on the Mac SE/30, Mac II, and Mac IIcx. Runs under MultiFinder with a minimum of 2MB memory, and lets you cut and paste between the PC and Mac environments. Program runs in the background. Insignia Solutions, 787 Lucerne Dr., Sunnyvale, CA 94086; 408/446-2228. Free if originally purchased after November 1, 1988, otherwise $49.95; $399 new.

Strategic Conquest Plus version 2.0 removes copy protection, adds color, optimizes for Macintosh 68030 processors. Also fixes bugs found in earlier versions. PBI Software, 1155A Chess Dr., Unit I, Foster City, CA 94404; 415/349-8765. $15 if you have version 1.3 or later; $25 if you have earlier versions; $59.95 new.

The NightWatch version 1.03 is compatible with Apple System version 6.0.2 and is designed to recognize future versions of the system/machine environment. Also works more efficiently with all hard disks. Kent Marsh Ltd., 1200 Post Oak Blvd., Ste. 210, Houston, TX 77056; 713/623-8618, 800/325-3587. Contact Kent Marsh for update policy; $149.95 new.

WorksPlus Spell version 2.0 has Smart Spelling feature which eliminates repetition by remembering the words you've already looked up. Checks spelling as fast as 350 words per second. Checks for duplicate words; allows you to look at the words you've added to the personal dictionary; lets you check spelling as you type. Lundeen & Associates, P.O. Box 30038, Oakland, CA 94604; 415/769-7701. Free if originally purchased after August 1,1988; automatic upgrade if purchased after December 7, 1988; $15 if purchased prior to August 1, 1988; $79.95 new.

To have products listed in this section, send upgraded software, an outline of major changes since the previous release, upgrade price, suggested retail price, company name, mailing address, and phone number to Updates, Macworld, *501 Second St., San Francisco, CA 94107.*

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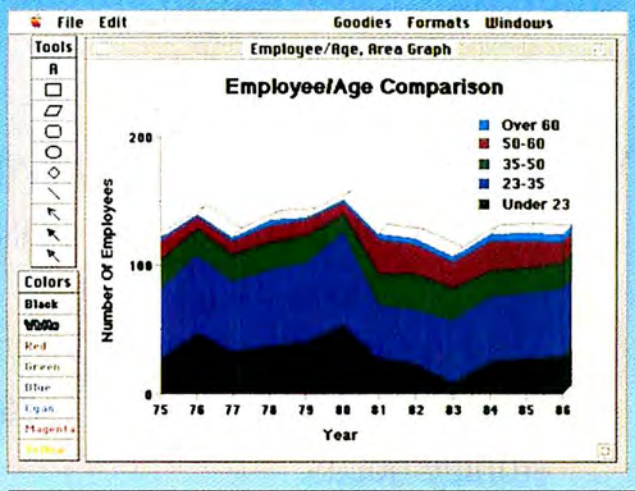

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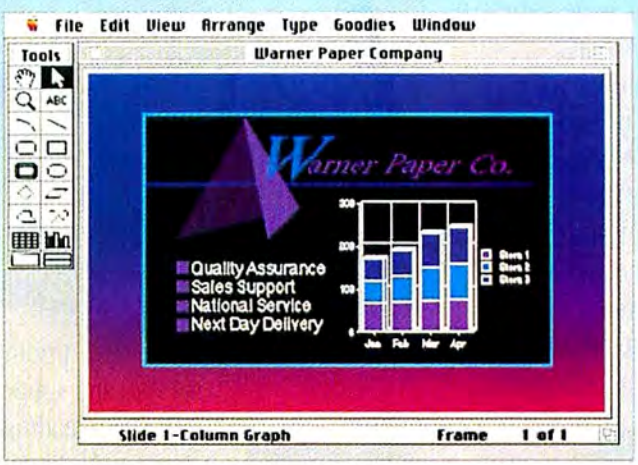

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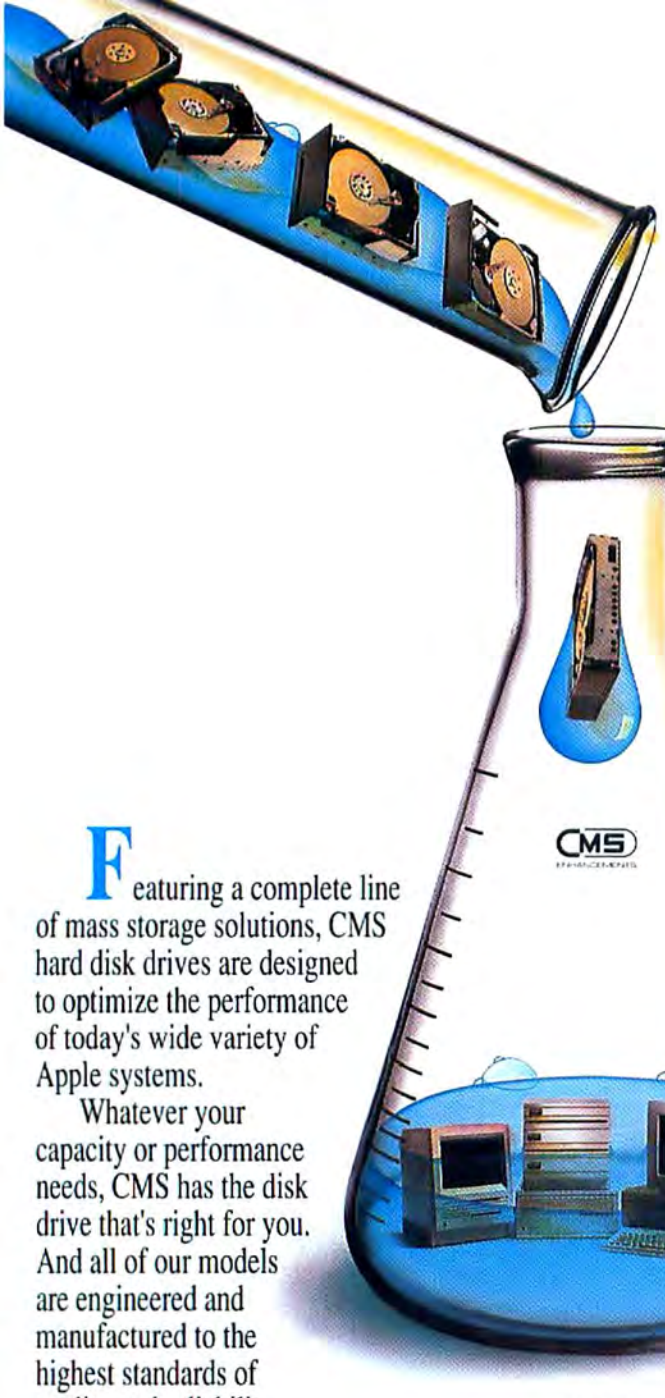

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752 **ACM2 series** Strawberry Tree Computers, Inc., 160 S. Wolfe Rd., Sunnyvale, CA 94086; 408/736-8800.

753 **Acta** Symmetry Corp., 761 E. University Dr., Ste. C, Mesa, AZ 85203; 602/844-2199, 800/624-2485.

754 **Aldus Persuasion** Aldus Corp., 411 First Ave. S, Seattle, WA 98104; 206/622-5500.

755 **Anatool** Advanced Logical Software, Inc., 9903 Santa Monica Blvd., #108, Beverly Hills, CA 90212; 213/659-5157.

756 **ArchiText** BrainPower, Inc., 30497 Canwood, #201, Agoura Hills, CA 91301; 818/884-6911.

757 **Arcnet 260/11** Standard Microsystems, Inc., 35 Marcus Blvd., Hauppauge, NY 11788; 516/273-3100; 800/992-4762.

758 **AST-ICP, AST-RM4** AST Research, Inc., 2121 Alton Ave., Irvine, CA 92714-4992; 714/863-1333.

759 **AX/9600 Plus, AX/9624c** Microcom, Inc., 500 River Ridge Dr., Norwood, MA 02062; 617/551-1000, 800/822-8224.

Reader Service

B

760 **Barneyscan** Barneyscan, Inc., 1198 10th St., Berkeley, CA 94710; 415/524-6648.

* **Bernoulli series** Iomega Corp., 1821 West 4000 South, Roy, UT 84067; 801/778-1000, 800/777-6654.

761 **BigThesaurus** Deneba Software, 3305 N.W. 74th Ave., Miami, FL 33122; 305/594-6965, 800/622-6827.

762 **BMX VM** Data Race, Inc., 12758 Cimarron Path, #108, San Antonio, TX 78249; 512/692-3909.

763 **BroadTalk Adaptor** Cactus Computer, 1120 Metro Crest Dr., Carrollton, TX 75006; 214/416-0525.

764 **BusLink** Flavors Technology, Inc., 3 Northern Blvd., Amherst, NH 03031; 603-672-3340.

C

765 **CalComp Drawing Board** CalComp Inc., 2411 W. La Palma Ave., Anaheim, CA 92801; 714/821-2000, 800/225-2667.

766 **Casino Master** Centron Software, Inc., 7718 LaMirada Dr., Boca Raton, FL 33433; 407/392-3678.

767 **ChromaScan** Imagenesis, Inc., 901 N.E. Loop 410, #630, San Antonio, TX 78209; 512/824-1746.

768 **Cirrus 45** La Cie, Ltd., 16285 S.W. 85th, #306, Tigard, OR 97224; 503/684-0143.

* **Colby WORM** Colby System Corp., 4723 N. Warren Ave., Fresno, CA 93705; 209/222-4985.

769 **Colleague** Colleague Business Software, Inc., 1807 W. Barker Ln., Ste. L, Austin, TX 78758; 512/836-4389.

770 **ColorQuick** Tektronix, Inc., P.O. Box 1000, Mailstop 63-447, Wilsonville, OR 97070; 800/835-6100.

Reader Service

* **CommCard** SuperMac Technology, 295 N. Bernardo Ave., Mountain View, CA 94043; 415/964-8884.

771 **ComputerEyes** Digital Vision, Inc., 66 Eastern Ave., Dedham, MA 02026; 617/329-5400.

772 **Cosmos 600** Racet Computes, Ltd., 3150 E. Birch, Brea, CA 92621; 714/579-1725.

773 **Courier series** U.S. Robotics, Inc., 8100 McCormick Blvd., Skokie, IL 60076; 312/982-5001.

774 **Cricket Presents** Cricket Software, Inc., 40 Valley Stream Pkwy., Malvern, PA 19355; 215/251-9890.

* **CSP9600E, CSP9600S, Spectrum 9600** Cermetek Microelectronics, Inc., 1308 Borregas Ave., Sunnyvale, CA 94088; 408/752-5000.

D

775 **DataPak** Mass Micro Systems, Inc., 550 Del Rey Ave., Sunnyvale, CA 94068-3528; 408/522-1200, 800/522-7979.

776 **Data WORM 800** Giga Cell Systems, 4201 Burton Dr., Santa Clara, CA 95054; 408/727-1049.

777 **Datrilink Ver. A, Datrilink Ver. B** Datricon, a division of Scientific Technologies, Inc., 31069 Genstar Rd., Hayward, CA 94544; 415/471-9717, 800/221-7060.

778 **DaynaNET** Dayna Communications, Inc., 50 S. Main St., 5th Fl., Salt Lake City, UT 84144; 801/531-0203.

779 **Dial Access 296** Concord Data Systems, Inc., 45 Bartlett St., Marlborough, MA 01752; 508/460-0808, 800/237-2283.

Reader Service

780 **Dimensions Presenter** Visual Information, Inc., 16309 Doublegrove St., La Puente, CA 91744; 818/918-8834.

781 **DirectOptical** Jasmine Technologies, Inc., 1740 Army St., San Francisco, CA 94124; 415/282-1111.

782 **Directory** Seagull Engineering of Sweden, Box 909, S220, 09 Lund, Sweden; 011 46 46 12 54 64.

783 **DirectServe** Jasmine Technologies, Inc., 1740 Army St., San Francisco, CA 94124; 415/282-1111.

784 **Disk Pack series** Mega Drive Systems, 1801 Ave. of the Stars, #507, Los Angeles, CA 90067; 213/556-1663, 800/322-4744.

785 **DL432** Ark Electronic Products, P.O. Box 2169, Melbourne, FL 32902; 407/724-5260, 800/228-0914.

* **DPI 44** DPI, 40 Corning Ave., Milpitas, CA 95035; 408/945-1850, 800/825-1850.

786 **DSP9630** NEC America, Inc., 110 Rio Robles, San Jose, CA 95134; 408/433-1250, 800/222-4632.

E

787 **EMAC SpeedTalk** EMAC, a division of Everex Systems, Inc., 48431 Milmont Dr., Fremont, CA 94538; 415/498-1111.

788 **EtherLink/NB** 3Com Corp., 3165 Kifer Rd., Santa Clara, CA 95052; 408/562-6400.

789 **EtherPort II, EtherPort IIL** Kinetics, a division of Excelan, 1340 Treat Blvd., #500, Walnut Creek, CA 94596; 408/562-6400.

(continues)

PRODUCT INDEX

READER SERVICE NUMBER

Software

BUSINESS

401 ADVANCED GRAVIS, 52
306 ALDUS, 40-41
220 ASHTON TATE, 21-25
— CHECKMARK SOFTWARE, 212
— CLARIS, 34-35
165 DESIGN SCIENCE, 236
18 EMERALD CITY SOFTWARE, 153
212 EMERALD CITY SOFTWARE, 192
360 INFORMIX SOFTWARE, 45
360 INFORMIX SOFTWARE, 47
94 MAINSTAY, 176
— MICROSOFT, IFC -PG1, 96-97
87 MONOGRAM SOFTWARE, 38
553 PEACHTREE SOFTWARE, 184
42 PERSONAL TRAINING SYSTEMS, 53
266 SILICON BEACH SOFTWARE, 224
190 SUPERMAC, 158
215 SYMANTEC, 26
88 SYMANTEC, 7
492 SYSTAT, 86
491 SYSTAT, 86
332 T/MAKER, IBC
126 WORDPERFECT CORP, 71

VERTICAL

— CHECKMARK SOFTWARE, 212
96 SYMANTEC, 74-75
237 SYMANTEC, 42

DATA MANAGEMENT

401 ADVANCED GRAVIS, 52
181 AEC MANAGEMENT SYSTEMS INC, 72
152 FOX SOFTWARE, 92
352 ODESTA CORPORATION, 182
— ORACLE, 151
42 PERSONAL TRAINING SYSTEMS, 53
451 PROVUE DEVELOPMENT, 216

WORD PROCESSING

220 ASHTON TATE, 21-25
— CLARIS, 34-35
— CLARIS, 37
165 DESIGN SCIENCE, 236
399 NILES & ASSOCIATES, 189
64 SKYLAR TECHNOLOGIES, 189
215 SYMANTEC, 26
332 T/MAKER, IBC
126 WORDPERFECT CORP, 71

CAD/CAM

459 BEROL USA, 185
12 COMPUTER SHOPPE, 64
77 GRAPHSOFT, 215
66 INTERGRAPH, 88

COMMUNICATION

144 ADAPTEC, 160
57 COMPUSERVE, 208
40 DATAVIZ, 98
241 DIGITAL COMMUNICATIONS ASSOC., 90-91
— GE INFORMATION SERVICES, 183
598 H-THREE SYSTEMS, 46
48 SOFTWARE VENTURE, 29

HYPERCARD

302 SYMMETRY, 222

EDUCATIONAL

165 DESIGN SCIENCE, 236
42 PERSONAL TRAINING SYSTEMS, 53
179 STAX, 226

FONTS

— IMAGE CLUB GRAPHICS, 156

GRAPHICS/DESKTOP PUBLISHING

— ADOBE SYS, 46
306 ALDUS, 40-41
35 ALTSYS, 217
137 CASADYWARE, 60
16 CASADYWARE, 60
15 CRICKET SOFTWARE, 229
346 DENEBA SOFTWARE, 197
212 EMERALD CITY SOFTWARE, 153
18 EMERALD CITY SOFTWARE, 153
— IMAGE CLUB GRAPHICS, 156
33 MANSFIELD SYSTEMS, 211
393 NUEQUATION, 33
213 PARACOMP INC, 149
295 QUARK, 165
353 QUME CORPORATION, 220
266 SILICON BEACH SOFTWARE, 224

PERSONAL BUSINESS/HOME

— INTUIT, 179
112 SURVIVOR SOFTWARE, 228

ENTERTAINMENT

134 CASADYWARE, 201
134 CASADYWARE, 201
291 PCAI, 196

NETWORKING

432 ALISA SYSTEMS, INC, 220
57 COMPUSERVE, 208
232 DAYNA COMMUNICATIONS, 12-13
421 SHIVA, 17
— TOPS, 5

LANGUAGES/DEVELOPMENT SYSTEMS

237 SYMANTEC, 42

UTILITIES

202 ALSOFT INC, 4
187 BERKELEY SYSTEM DESIGN, 210
381 BERKELEY SYSTEM DESIGN, 210
— CENTRAL POINT SOFTWARE, 218
326 EXODUS SOFTWARE, 191
439 GDT SOFTWORKS, 188
179 STAX, 226
190 SUPERMAC, 158
88 SYMANTEC, 7

MISCELLANEOUS

306 ALDUS, 40-41
— CHECKMARK SOFTWARE, 212
439 GDT SOFTWORKS, 188

Hardware

COMPUTER SYSTEMS

361 MACFRIENDS, 70

PRINTERS

2 ADVANCED MATRIX TECHNOLOGY, 61
11 GCC, 11
189 JASMINE TECHNOLOGIES, 14
109 MACFRIENDS, 44
65 MITSUBISHI, 28
265 ORANGE MICRO INC, 10
104 QMS/LASER CONNECTION, 186-187
353 QUME CORPORATION, 220
115 QUME CORPORATION, 220
143 TEKTRONIX INC, 167
93 VARITYPER, 31

BOARDS

1 AIR LAND SYSTEMS, 193
403 AMERICAN MICRO DISTRIBUTORS, 39
375 CLEARPOINT RESEARCH CORP, 225
69 CLEARPOINT RESEARCH CORP, 227
124 GW INSTRUMENTS, 58
161 MICRON TECHNOLOGY, 197
413 MOBIUS TECHNOLOGY, 192
450 NATIONAL INSTRUMENTS, 214
196 NATIONAL SEMICONDUCTOR, 94
347 NOVELL INC, 54-55
436 PINNACLE SALES INTERNATIONAL, 154
46 RADIUS, 8-9
— RASTEROPS, 56
473 TRUEVISION, 192-193

DIGITIZERS/SCANNERS

230 CAERE CORP, 142-143
312 LOGITECH, 84
109 MACFRIENDS, 44
327 SHARP ELECTRONICS CORP, 147
176 THUNDERWARE INC, 6

DISPLAY

101 E-MACHINES, INC, 170
586 IN-FOCUS SYSTEM, 64
65 MITSUBISHI, 28
223 PERSONAL COMPUTER PERIPHERAL CORP, 267

MODEMS

107 ABATON, 180
61 COMPUTER FRIENDS, 238
469 VEN-TEL, 68

HARD DISKS/STORAGE

403 AMERICAN MICRO DISTRIBUTORS, 39
3 ARCHIVE CORPORATION, 59
217 BRAEMAR CORP, 30
41 BRAEMAR CORP, 30
85 CMS ENHANCEMENTS, 230
452 EHMAN ENGINEERING, 82
440 HARD DRIVES, 213
471 IRWIN MAGNETICS, 194
102 JASMINE TECHNOLOGIES, 198-199
145 LA CIE, 18
361 MACFRIENDS, 70
263 MAYNARD ELECTRONICS, 73
275 MICRONET TECHNOLOGY INC, 163
424 MIRROR TECHNOLOGIES, 66-67
43 MIRROR TECHNOLOGIES, 66-67
58 MIRROR TECHNOLOGIES, 66-67
223 PERSONAL COMPUTER PERIPHERAL CORP, 267
321 TECMAR INC, 36

VIDEO

257 NEC, 62-63
223 PERSONAL COMPUTER PERIPHERAL CORP, 267

EXPANSIONS/UPGRADES

161 MICRON TECHNOLOGY, 197

SOFTWARE SECURITY DEVICE

401 ADVANCED GRAVIS, 52
106 RAINBOW TECHNOLOGIES, 172

MISCELLANEOUS

107 ABATON, 180
460 AGFA MATRIX DIVISION, 190
403 AMERICAN MICRO DISTRIBUTORS, 39
417 AMERICAN POWER CONVERSION, 174
61 COMPUTER FRIENDS, 238
586 IN-FOCUS SYSTEM, 64
450 NATIONAL INSTRUMENTS, 214
26 TRIMAR USA, 39
267 ZERICON, 222

Accessories

FLOPPY DISKS/HOLDERS

479 BASF CORP, 169

FURNITURE

— ANTHRO CORP, 10
296 SCANCO, 213

SERVICES

406 MACACADEMY, 219

MISCELLANEOUS

— 3M VISUAL PRODUCTS, 65
417 AMERICAN POWER CONVERSION, 174
61 COMPUTER FRIENDS, 238
385 I/O DESIGN, 200
— KENSINGTON MICROWARE LTD, BC
— MACWORLD EXPO, 243-246
276 MICRO COMPUTER 32, 216
296 SCANCO , 213
239 SECURE-IT, 188

Mail Order

5 BEVERLY HILLS COMPUTER, 240-241
32 CDA COMPUTER SALES, 235A-235B
562 DISKETTE CONNECTION, 239
368 DR. MAC, INC., 236A
86 MAC PRODUCTS USA, 223
70 MAC ZONE, THE, 48-51
— MACCONNECTION, 100-107
109 MACFRIENDS, 44
361 MACFRIENDS, 70
264 MACLAND, 242
78 MACWAREHOUSE, 76-81
45 OPEN MAC ENTERPRISES, 236B
44 PROGRAMS PLUS, 202-207
248 SOFTWARE EXCITEMENT, 237
— SOFTWARE LIBRARY, 239
54 USA FLEX, 236B

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(1-200)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

(201-400)

201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400

(401-600)

401	402	403	404	405	406	407	408	409	410
411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430
431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460
461	462	463	464	465	466	467	468	469	470
471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490
491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520
521	522	523	524	525	526	527	528	529	530
531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570
571	572	573	574	575	576	577	578	579	580
581	582	583	584	585	586	587	588	589	590
591	592	593	594	595	596	597	598	599	600

Expires 10/2/89

S1

JULY 1989

CATALOG INFORMATION

601	602	603	604	605	606	607	608	609	610
611	612	613	614	615	616	617	618	619	620
621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640
641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670
671	672	673	674	675	676	677	678	679	680
681	682	683	684	685	686	687	688	689	690
691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710
711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730
731	732	733	734	735	736	737	738	739	740
741	742	743	744	745	746	747	748	749	750

WHERE TO BUY

751	752	753	754	755	756	757	758	759	760
761	762	763	764	765	766	767	768	769	770
771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790
791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830
831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850
851	852	853	854	855	856	857	858	859	860
861	862	863	864	865	866	867	868	869	870
871	872	873	874	875	876	877	878	879	880
881	882	883	884	885	886	887	888	889	890
891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910
911	912	913	914	915	916	917	918	919	920
921	922	923	924	925	926	927	928	929	930
931	932	933	934	935	936	937	938	939	940
941	942	943	944	945	946	947	948	949	950

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(1-200)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

(201-400)

201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400

(401-600)

401	402	403	404	405	406	407	408	409	410
411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430
431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460
461	462	463	464	465	466	467	468	469	470
471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490
491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520
521	522	523	524	525	526	527	528	529	530
531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570
571	572	573	574	575	576	577	578	579	580
581	582	583	584	585	586	587	588	589	590
591	592	593	594	595	596	597	598	599	600

Expires 10/2/89

S2

JULY 1989

CATALOG INFORMATION

601	602	603	604	605	606	607	608	609	610
611	612	613	614	615	616	617	618	619	620
621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640
641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670
671	672	673	674	675	676	677	678	679	680
681	682	683	684	685	686	687	688	689	690
691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710
711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730
731	732	733	734	735	736	737	738	739	740
741	742	743	744	745	746	747	748	749	750

WHERE TO BUY

751	752	753	754	755	756	757	758	759	760
761	762	763	764	765	766	767	768	769	770
771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790
791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830
831	832	833	834	835	836	837	838	839	840
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871	872	873	874	875	876	877	878	879	880
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891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910
911	912	913	914	915	916	917	918	919	920
921	922	923	924	925	926	927	928	929	930
931	932	933	934	935	936	937	938	939	940
941	942	943	944	945	946	947	948	949	950

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(1-200)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

(201-400)

201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400

(401-600)

401	402	403	404	405	406	407	408	409	410
411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430
431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460
461	462	463	464	465	466	467	468	469	470
471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490
491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520
521	522	523	524	525	526	527	528	529	530
531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570
571	572	573	574	575	576	577	578	579	580
581	582	583	584	585	586	587	588	589	590
591	592	593	594	595	596	597	598	599	600

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CATALOG INFORMATION

601	602	603	604	605	606	607	608	609	610
611	612	613	614	615	616	617	618	619	620
621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640
641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670
671	672	673	674	675	676	677	678	679	680
681	682	683	684	685	686	687	688	689	690
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711	712	713	714	715	716	717	718	719	720
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731	732	733	734	735	736	737	738	739	740
741	742	743	744	745	746	747	748	749	750

WHERE TO BUY

751	752	753	754	755	756	757	758	759	760
761	762	763	764	765	766	767	768	769	770
771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790
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831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850
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891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910
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ADVERTISER INDEX

READER SERVICE NUMBER	
107	ABATON, 180
144	ADAPTEC, 160
—	ADOBE SYS, 46
401	ADVANCED GRAVIS, 52
2	ADVANCED MATRIX TECHNOLOGY, 61
181	AEC MANAGEMENT SYSTEMS INC, 72
460	AGFA MATRIX DIVISION, 190
1	AIR LAND SYSTEMS, 193
306	ALDUS, 40-41
432	ALISA SYSTEMS, INC, 220
202	ALSOFT INC, 4
35	ALTSYS, 217
403	AMERICAN MICRO DISTRIBUTORS, 39
417	AMERICAN POWER CONVERSION, 174
—	ANTHRO CORP, 10
3	ARCHIVE CORPORATION, 59
220	ASHTON TATE, 21-25
479	BASF CORP, 169
187	BERKELEY SYSTEM DESIGN, 210
381	BERKELEY SYSTEM DESIGN, 210
459	BEROL USA, 185
5	BEVERLY HILLS COMPUTER, 240-241
41	BRAEMAR CORP, 30
217	BRAEMAR CORP, 30
230	CAERE CORP, 142-143
16	CASADYWARE, 60
137	CASADYWARE, 60
134	CASADYWARE, 201
32	CDA COMPUTER SALES, 235A-235B
—	CENTRAL POINT SOFTWARE, 218
—	CHECKMARK SOFTWARE, 212
—	CLARIS, 34-35, 37
375	CLEARPOINT RESEARCH CORP, 225
69	CLEARPOINT RESEARCH CORP, 227
85	CMS ENHANCEMENTS, 230
57	COMPUSERVE, 208
61	COMPUTER FRIENDS, 238
12	COMPUTER SHOPPE, 64
15	CRICKET SOFTWARE, 229
40	DATAVIZ, 98
232	DAYNA COMMUNICATIONS, 12-13
346	DENEBA SOFTWARE, 197
165	DESIGN SCIENCE, 236
241	DCA, 90-91
562	DISKETTE CONNECTION, 239
368	DR. MAC, INC., 236A
101	E-MACHINES, INC, 170
452	EHMAN ENGINEERING, 82
18	EMERALD CITY SOFTWARE, 153
212	EMERALD CITY SOFTWARE, 153
326	EXODUS SOFTWARE, 191
152	FOX SOFTWARE, 92
11	GCC, 11
439	GDT SOFTWORKS, 188
—	GE INFORMATION SERVICES, 183
77	GRAPHSOFT, 215
124	GW INSTRUMENTS, 58
598	H-THREE SYSTEMS, 46
440	HARD DRIVES, 213
385	I/O DESIGN, 200
—	IMAGE CLUB GRAPHICS, 156
586	IN-FOCUS SYSTEM, 64
360	INFORMIX SOFTWARE, 45
360	INFORMIX SOFTWARE, 47
66	INTERGRAPH, 88
—	INTUIT, 179
471	IRWIN MAGNETICS, 194
189	JASMINE TECHNOLOGIES, 14
102	JASMINE TECHNOLOGIES, 198-199
—	KENSINGTON MICROWARE LTD, BC
145	LA CIE, 18
312	LOGITECH, 84
86	MAC PRODUCTS USA, 223
70	MAC ZONE, THE, 48-51
406	MACACADEMY, 219
—	MACCONNECTION, 100-107
109	MACFRIENDS, 44
361	MACFRIENDS, 70
264	MACLAND, 242
78	MACWAREHOUSE, 76-81
—	MACWORLD EXPO, 243-246
94	MAINSTAY, 176
33	MANSFIELD SYSTEMS, 211
263	MAYNARD ELECTRONICS, 73
276	MICRO COMPUTER ACCESSORIES, 216
161	MICRON TECHNOLOGY, 197
275	MICRONET TECHNOLOGY INC, 163
—	MICROSOFT, IFC -PG1, 96-97
43	MIRROR TECHNOLOGIES, 66-67
58	MIRROR TECHNOLOGIES, 66-67
424	MIRROR TECHNOLOGIES, 66-67
65	MITSUBISHI, 28
413	MOBIUS TECHNOLOGY, 192
87	MONOGRAM SOFTWARE, 38
450	NATIONAL INSTRUMENTS, 214
196	NATIONAL SEMICONDUCTOR, 94
257	NEC, 62-63
399	NILES & ASSOCIATES, 189
347	NOVELL INC, 54-55
393	NUEQUATION, 33
352	ODESTA CORPORATION, 182
45	OPEN MAC ENTERPRISES, 236B
—	ORACLE, 151
265	ORANGE MICRO INC, 10
213	PARACOMP INC, 149
291	PCAI, 196
553	PEACHTREE SOFTWARE, 184
223	PERSONAL COMPUTER PERIPHERAL CORP, 267
42	PERSONAL TRAINING SYSTEMS, 53
436	PINNACLE SALES INTERNATIONAL, 154
44	PROGRAMS PLUS, 202-207
451	PROVUE DEVELOPMENT, 216
104	QMS/LASER CONNECTION, 186-187
295	QUARK, 165
115	QUME CORPORATION, 220
353	QUME CORPORATION, 220
46	RADIUS, 8-9
106	RAINBOW TECHNOLOGIES, 172
—	RASTEROPS, 56
296	SCANCO , 213
239	SECURE-IT, 188
327	SHARP ELECTRONICS CORP, 147
421	SHIVA, 17
266	SILICON BEACH SOFTWARE, 224
64	SKYLAR TECHNOLOGIES, 189
248	SOFTWARE EXCITEMENT, 237
—	SOFTWARE LIBRARY, 239
48	SOFTWARE VENTURE, 29
—	SOMAK, 188A-188N
179	STAX, 226
190	SUPERMAC, 158
112	SURVIVOR SOFTWARE, 228
88	SYMANTEC, 7
215	SYMANTEC, 26
237	SYMANTEC, 42
96	SYMANTEC, 74-75
302	SYMMETRY, 222
491	SYSTAT, 86
492	SYSTAT, 86
—	3M VISUAL PRODUCTS, 65
332	T/MAKER, IBC
321	TECMAR INC, 36
143	TEKTRONIX INC, 167
176	THUNDERWARE INC, 6
—	TOPS, 5
26	TRIMAR USA, 39
473	TRUEVISION, 192-193
54	USA FLEX, 236B
93	VARITYPER, 31
469	VEN-TEL, 68
126	WORDPERFECT CORP, 71
267	ZERICON, 222

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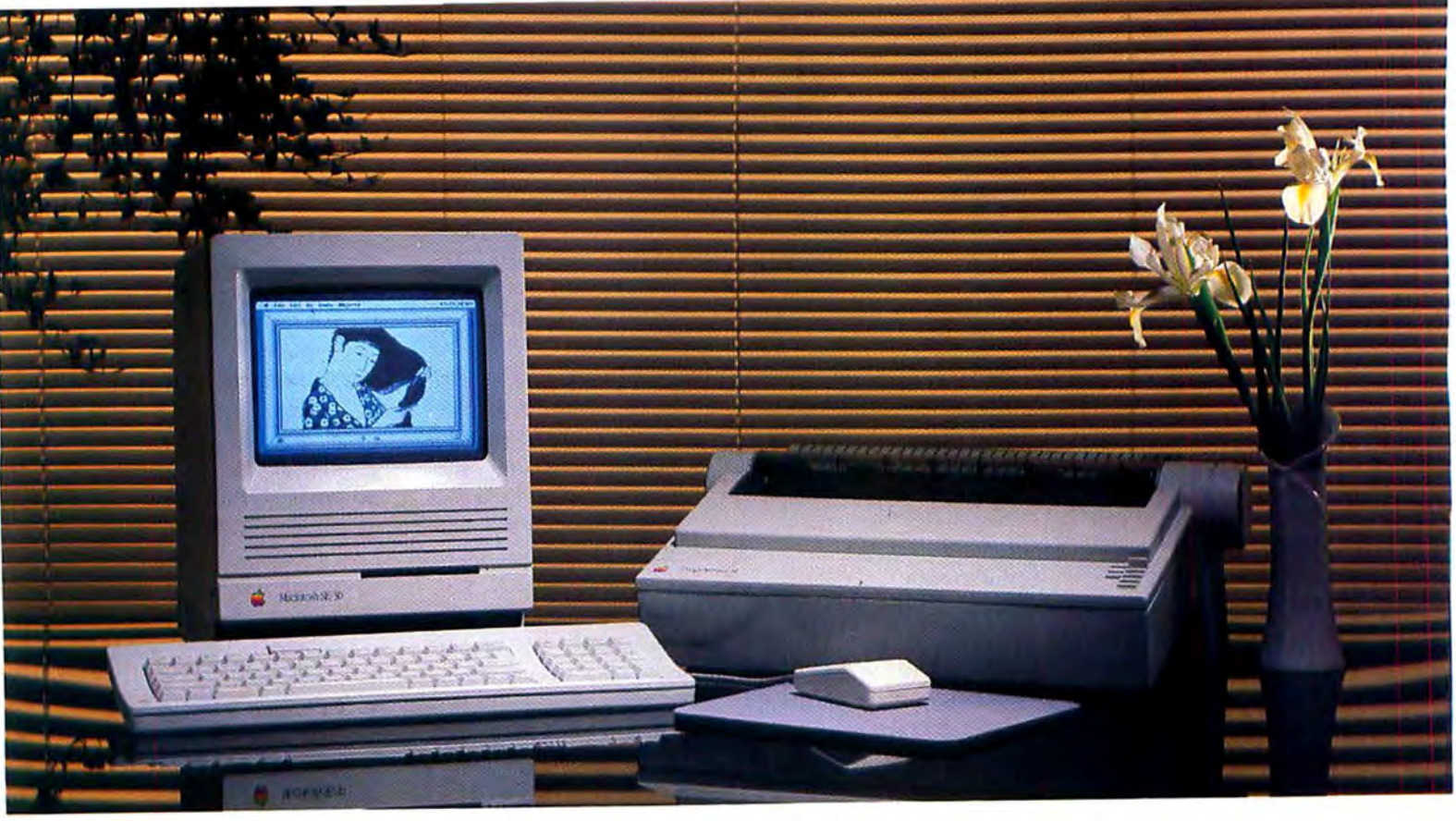

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Freehand 2.0 339
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ALTSYS
FONTastic Plus 2.0 54
Fontographer 225

ASD SOFTWARE
Fileguard 145

BEDFORD SOFTWARE
Simply Accounting 199

BRODERBUND
Drawing Table 76
DTP Advisor 46
Print Shop 37

BREAKTHROUGH PROD.
Market Master R/A 237

CAERE
Omnipage 549

CENTRAL POINT
Copy II Mac 19
PC Tools Deluxe Mac 38

CENTRON SOFTWARE
Casino Master 48
Casino Master Color 55

CE SOFTWARE
QuickKeys 50
Disktop 26
Quickmail 139

CHANG LABS
C.A.T. 2.0 225
Rags To Riches 3 Pack 285

CLARIS
MacDraw II 319
FileMaker II 235

DATA VIZ
Mac Link Plus 129
Translators 111
Maclink Wang VS 291

DENEBA
Canvas 2.0 153
Coach Professional 99
Coach Professional Network 263

DMA
MacTerm 73

DESIGN SOFTWARE
MacTree+ Includes DS Backup 45

ELECTRONIC ARTS
Studio 8 299
Thunder II 52

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FIFTH GENERATION
Fastback 59
Suitcase 43
Power Station 36

FOX SOFTWARE
FoxBASE +/ Mac 198
FoxBASE +/Mac Multiuser 311
FoxBASE + Runtime / Mac 155
FoxBASE Runtime Multiuser 259

ICOM SIMULATIONS
Tmon 85
On Cue 35
MacKern 116

INFORMIX
Wing2 270

INNOVATIVE DATA DESIGN
Dreams 265
Symbol Library 139

INTUIT
Quicken 29

JAM SOFTWARE
Smart Alarms 53
Multi-User (2 to 4) 106

LACIE
Silver Server 85

MARK OF THE UNICORN
Performer 311
Professional Composer 389

MECA
Managing Your Money 125

MICROSOFT
Word 4.0 250
Excel 247
File 2.0 137
Works 195
Power Point 247

ODESTA CORPORATION
Double Helix II 299
Double Helix II Multi User 265
GeoQuery 185
Data Desk Professional 265

OLDUVAI
Read It 249
Multi Clip 49
Font Share 145

PRO PLUS
Wall Street Investor 2.3 319
Wall Street Investor 3.1 455

QUARK
XPress 2.1 475
Style 175

SILICON BEACH SOFTWARE
Super Paint 2.0 125
Digital Darkroom 191

SOFTWARE VENTURES
Microphone II 219

SOLUTIONS INTERNATIONAL
SmartScrap & The Clipper 44
SuperGlue 48
The Curator 72

SUPERMAC SOFTWARE
SuperSpool 5.0 52
SuperLaserSpool 2.0 79
Multi-User SuperLaserSpool 195
Diskfit 52
Network Diskfit 195
PixelPaint 2.0 195

SYMANTEC
Mac SQZ 49
LightSpeed C 148
LightSpeed P 89
Symantec Utilities 62
More II 246

SYMMETRY CORPORATION
Acta Advantage 67
HyperDA 38
Picture Base 53

TRAVELING SOFTWARE
Lap Link Mac 79

T - MAKER
Write Now 2.0 109

TOPS
TOPS for Mac 144
TOPS for DOS 114
TOPS Flashcard 156
TOPS Flashbox 115
TOPS Repeater 124
Teleconnectors 26
Inbox Starter Kit 189
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WORDPERFECT CORP.
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System Saver SE 51
Turbo Mouse 107

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Cirrus 40 Meg 617
Cirrus 100 Meg 995

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Data Pak 1519
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MacTrack Trackball 79

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Flatbed 256 Grey Scale 1388

ORCHID TECHNOLOGY
MacSprint II 259

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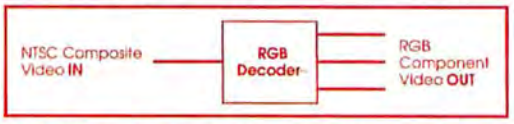

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☐ **Home Inventory (2012)** - Keeps track of all your personal items, expenses, and budgets.
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☐ **Stars (2102)** - Star charting-Astronomy (Breathtaking graphics and really fun education.)
☐ **Math Tutor (2104)** - Several fun math quiz games. A really great educational tool for kids.
☐ **Typing Tutor (2108)** - It's easy to improve your typing skills with this excellent tutor.
☐ **Teacher (2112)** - Allows you to track grades and create quizzes.
☐ **Spelling Tutor (2114)** - Listen and learn how to spell. (Requires MACinTalk)

UTILITIES

☐ **Menu Utilities (2200)** - Use these to edit and install menus.
☐ **Disk Utilities (2202)** - Disk and file recovery tools that everyone should have - just in case.
☐ **Vaccine (2204)** - Programs that will check for, eliminate, and protect against many computer viruses.
☐ **Screen Dump (2206)** - Allows you to print anything on the screen to your printer or a disk.
☐ **Disk Librarian (2210)** - A complete disk cataloging database program.

CREATIVITY

☐ **MACinTalk (2302)** - Allows your MAC to utilize its speech ability.
☐ **Songs (2306)** - Over twenty musical selections with a player utility.
☐ **Calendar Maker (2400)** - Make your own monthly calendars and monthly planners.
☐ **MACFonts (2410)** - Several new font styles for use with your Word Processor or Desktop Publishing programs.
☐ **Banner Maker (2430)** - prints large or small banners using the imagewriter printer.

GAMES

☐ **Football (2700)** - Be a computer desk quarterback (choose to be any NFL team.)
☐ **Billiards (2701)** - Fantastic graphics and extreme realism. Plays several different styles.
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☐ **MACYahtzee (2719)** - Play Yahtzee on your MAC. (1 to 4 can play)
☐ **Destroyer (2720)** - Two versions of "Battleship" Has great sound and allows you to play against a human of the MAC!
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☐ **Risk (2731)** - Try to conquer the World. (up to six can play!)
☐ **Spacestation Pheta (2732)** - Climb, Jump, and run through the spacestation picking up keys before you run out of oxygen.
☐ **Crossword (2733)** - Play the crossword puzzles provided for you, or create your own.
☐ **Blackjack & Poker II (2734)** - Includes three different styles of Blackjack play.
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- State the precise specifications of the merchandise, such as model, make, size, component parts, etc.
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30 Megabyte		
Caché Systems 30 *40ms*	$559.	**$489.**
CMS Enhancements 30 *38ms*	$589.	**$519.**
MacBEST 30 *28ms*	$549.	**$499.**
MicroNet 30 *38ms*	$579.	**$559.**
40 Megabyte		
Caché Systems 45 *40ms*	$629.	**$549.**
CMS Enhancements 45 *40ms*	$649.	**$599.**
MacBEST 45 *28ms*	$599.	**$579.**
Quantum 40* *19ms*	$699.	**$649.**
60 Megabyte		
Caché Systems 60 *40ms*	$729.	**$579.**
CMS Enhancements 60 *40ms*	$749.	**$719.**
MacBEST 60 *28ms*	$729.	**$649.**
MicroNet 60 *40ms*	$739.	**$699.**
80 Megabyte		
Caché Systems 80 *28ms*	$849.	**$679.**
CMS Enhancements 80s *28ms*	$899.	**$779.**
MacBEST 80 *28ms*	$849.	**$749.**
Quantum 80* *19ms*	$949.	**$899.**
90-100 Megabyte		
Conner 100 *25ms*	$999.	**$929.**
MacBEST 90 *18ms*	$939.	**$879.**
Quantum 105 *19ms*	$1,099.	**$999.**
140-173 Megabyte		
Caché Systems 150 *16ms*	$1,499.	**$1,299.**
CMS Enhancements 170 *18ms*	$1,799.	**$1,599.**
MacBEST 173 *18ms*	$1,749.	**$1,659.**
MicroNet (CDC) 173 *18ms*	$1,649.	**$1,599.**
300-600 Megabyte		
CMS Enhancements 300 *16ms*	$2,349.	**$2,179.**
CDC 300 Wren Runner *10.7ms*	$3,195.	**$2,895.**
CMS Enhancements 600 *16ms*	$2,999.	**$2,849.**
MicroNet 620 *16ms*	$3,899.	**$3,399.**

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	Reg. Price	Sale Price
20 Megabyte		
MacBEST 20 *65ms*	$399.	**$339.**
30 Megabyte		
Caché Systems 30 *40ms*	$425.	**$375.**
CMS Enhancements 30 *38ms*	$479.	**$399.**
MacBEST 30 *28ms*	$449.	**$399.**
40 Megabyte		
Caché Systems 45 *40ms*	$499.	**$449.**
CMS Enhancements 45 *38ms*	$569.	**$499.**
MacBEST 45 *28ms*	$499.	**$479.**
Quantum 40* *19ms*	$599.	**$569.**
80 Megabyte		
Quantum 80* *19ms*	$889.	**$799.**
100 Megabyte		
Conner 100 *25ms*	$899.	**$829.**
Quantum 105 *19ms*	$999.	**$899.**

Mac II, IICX Internals

	Reg. Price	Sale Price
40 Megabyte		
MacBEST 45 *28ms*	$499.	**$479.**
Quantum 40* *19ms*†	$599.	**$569.**
60 Megabyte		
Caché Systems 60 *40ms*	$639.	**$499.**
CMS Enhancements 60 *40ms*	$649.	**$549.**
MacBEST 60 *28ms*	$629.	**$549.**
80 Megabyte		
Caché Systems 80 *28ms*	$729.	**$575.**
CMS Enhancements 80 *28ms*	$749.	**$679.**
MacBEST 80 *28ms*	$749.	**$679.**
Quantum 80* *19ms*†	$889.	**$799.**
90-100 Megabyte		
CMS Enhancements 90 *18ms*	$999.	**$825.**
Conner 100 *25ms*†	$899.	**$829.**
MacBEST 90 *18ms*	$949.	**$825.**
Quantum 105 *19ms*	$999.	**$899.**
150-173 Megabyte		
Caché Systems 150 *16ms*	$1,429.	**$1,299.**
CMS Enhancements 170 *16ms*	$1,699.	**$1,499.**
MacBEST 150 *17ms*	$1,499.	**$1,279.**
MicroNet 130 Swift IICX *15ms*†	$2,199.	**$1,399.**
MicroNet (CDC) 173 *18ms*	$1,549.	**$1,499.**
300 Megabyte		
CMS Enhancements 300 *16ms*	$2,199.	**$1,899.**
CDC Wren Runner 330 *10.7ms*	$2,795.	**$2,595.**
MacBEST 300 *17ms*	$1,999.	**$1,899.**

	Reg. Price	Sale Price
600 Megabyte		
CMS Enhancements 600 *16ms*	$2,999.	**$2,779.**
MacBEST 600 *16ms*	$3,599.	**$2,775.**
MicroNet 620i *16ms*	$3,699.	**$3,199.**

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CMS Enhancements 44 *25ms*	$1,299.	**$999.**
MicroNet 44 *25ms*	$1,299.	**$999.**
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CMS Enhancements 60	$749.	**$699.**
MicroNet 60	$799.	**$699.**
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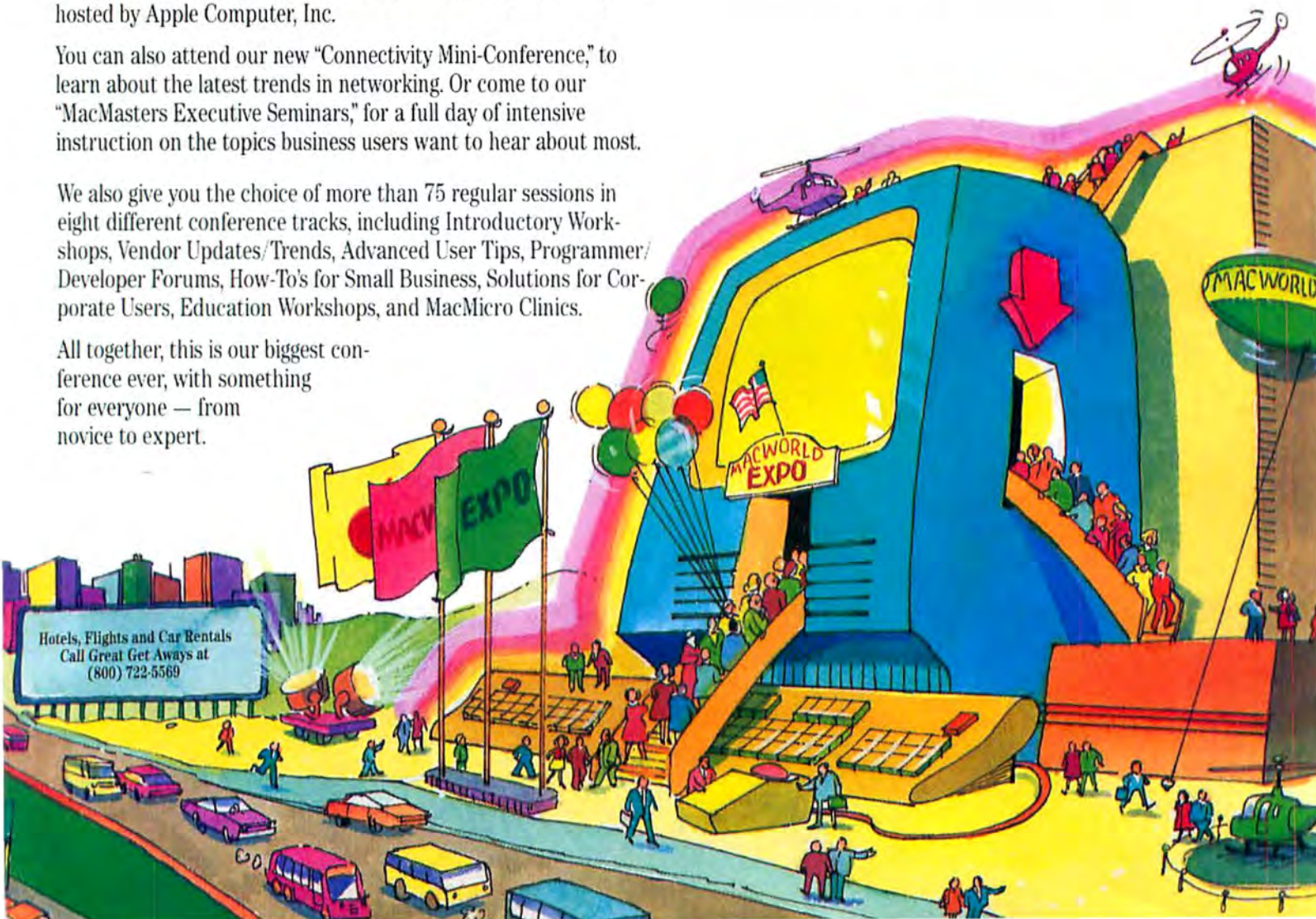

Show!

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You can save $15 on a full registration, including all conference sessions and exhibits, by registering before July 14th. ($65 in advance; $80 at the door.) Or you can register for exhibits only for just $20 ($15 for students — you must send a photocopy of your student ID with your registration form).

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Boston, August 10, 11 and 12

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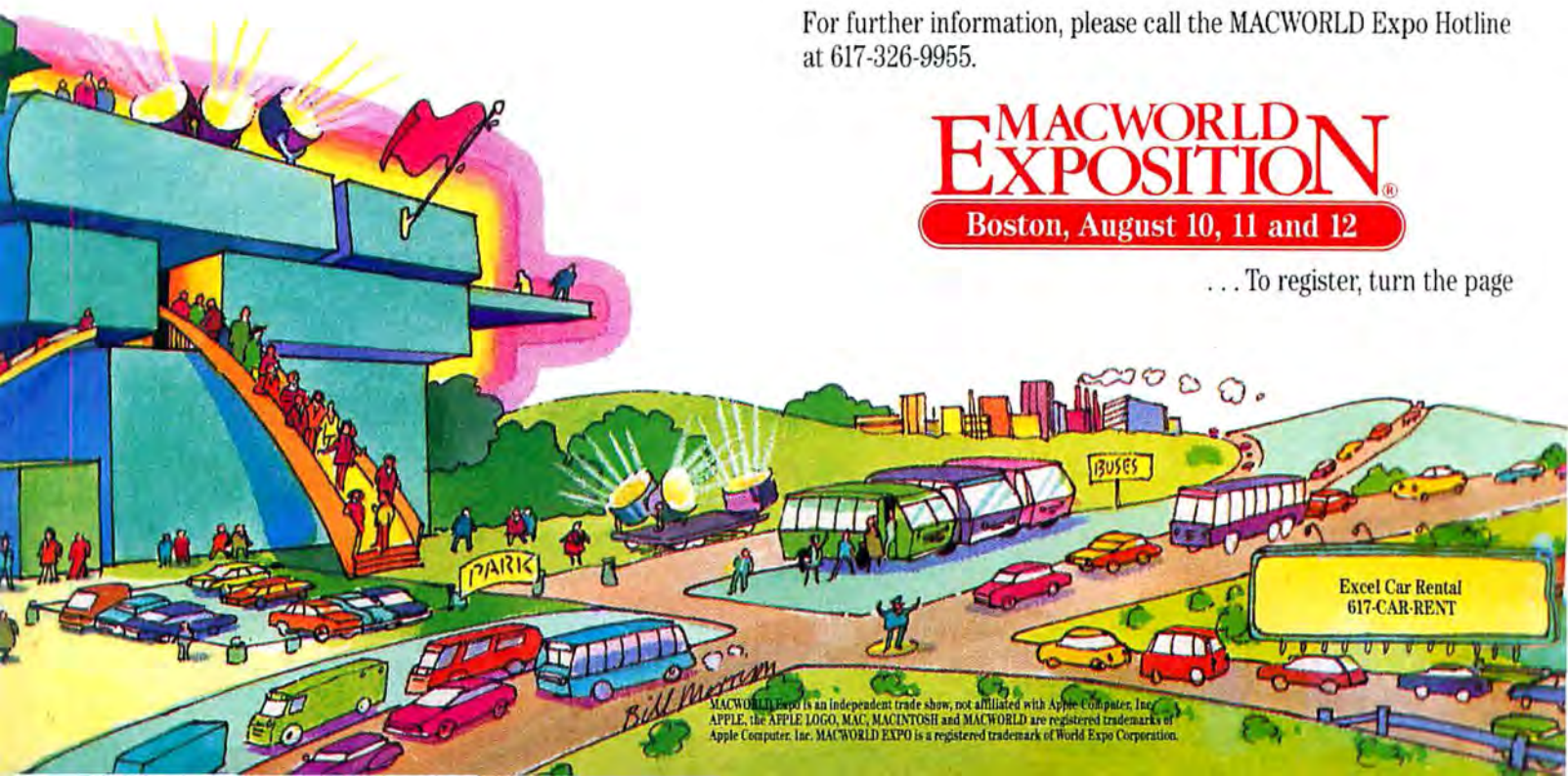

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Boston, August 10, 11 and 12

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Registration coupons must be received by July 14. And registration fees are non-refundable. For further information, call the MACWORLD Expo hotline at 617-326-9955. U.S. attendees will be mailed their badges on or around July 20. All other badges will be held at the Pre-registration Counter at Bayside Exposition Center for pick up beginning Wednesday, August 9, 1989. Registration coupons received after July 14 will be returned.

Please register me for:

☐ **Package One $65** Conference sessions* and exhibits. Pre-register by July 14. $80 at the door.

☐ **Package Two $20** Admission to exhibits only. Pre-register by July 14.

☐ Please rush me detailed information (including pricing) about the MacMasters Series.

Please send my badge and further information to:

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Please check the appropriate boxes:

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a. ☐ Manufacturer (non-computer)
b. ☐ Manufacturer (computer industry)
c. ☐ Distributor/dealer/retailer/service
d. ☐ Finance/insurance/ real estate
e. ☐ Business services
f. ☐ Professional (law/medicine)
g. ☐ Health services
h. ☐ Communications/publishing
i. ☐ Education
j. ☐ Government
k. ☐ Consultant
l. ☐ Other (specify) _____

Your title

m. ☐ CEO/president/vice president
n. ☐ Comptroller/treasurer/accountant
o. ☐ DP/MIS manager
p. ☐ Owner/partner
q. ☐ Engineer
r. ☐ Doctor/lawyer/dentist
s. ☐ Educator
t. ☐ Art director/writer/editor
u. ☐ Consultant
v. ☐ Marketing
w. ☐ Sales
x. ☐ Other (specify) _____

Size of your organization (number of employees national/international)

y. ☐ Under 50
z. ☐ 50-99
aa. ☐ 100-499
bb. ☐ 500-999
cc. ☐ 1,000-5,000
dd. ☐ Over 5,000

Which personal computer(s) do you own/or use?

ee. ☐ Macintosh
ff. ☐ Macintosh Plus
gg. ☐ Macintosh SE
hh. ☐ Macintosh II
ii. ☐ Apple II Series
jj. ☐ IBM PC (or compatible)
kk. ☐ None
ll. ☐ Other (specify) _____

What is your involvement with each of the following types of personal computers or microcomputer systems? (check all that apply)

		Macintosh 1.	Software 2.	Networks & Peripherals 3.
mm. ☐	Approve purchase	☐	☐	☐
nn. ☐	Develop/manufacture	☐	☐	☐
oo. ☐	Evaluate/select vendor	☐	☐	☐
pp. ☐	Own	☐	☐	☐
qq. ☐	Purchase or acquire	☐	☐	☐
rr. ☐	Recommend to others	☐	☐	☐
ss. ☐	Sell	☐	☐	☐
tt. ☐	Train people to use	☐	☐	☐
uu. ☐	Other (specify) _____	☐	☐	☐

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MAC

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Accessories

Furniture 249
Gifts 249
Hardware 249
Mouse Pads 249
Supplies 249

Hardware

Bar Code 250
Computer Systems 250
Data Acquisition 251
Emulators 251
Memory Upgrade 251
Miscellaneous 254
Peripherals 254
Printers 254

Hypercard Stacks

254

Services

Computer Insurance .. 255
Desktop Publishing 256
Laser Recharge 256
Training 257

Software

Animation 257
Accounting 257
Artificial Intelligence . 257
Astrology 257
Bar Code 257
Business 257
Clip Art 258
Communications 259
Data Base 259
Desktop Publishing 259
Educational 259
Engineering 260
Entertainment 261
Fonts 262
Fund Raising. 262
Genealogy. 262
Graphics 262
Health 262
Investment 263
Languages 263
Medical 263
Music/MIDI 263
Programming Tools 263
Public Domain 263
Real Estate 264
Recreational 264
Religion 264
Retail 265
Sales/Marketing 265
Scientific 265
Statistics 265
Utilities 266
Word Processors 266

Miscellaneous

Business Oppor. 266
Mailing Lists 266

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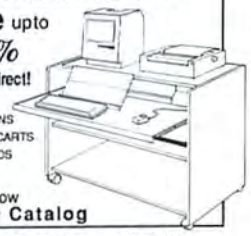

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•144	$3.70w/logo	$4.70w/logo
•500	$3.14w/logo	$4.14w/logo
•1000	$3.03w/logo	$4.02w/logo

Canvas Pads: Grey, Red, Gold
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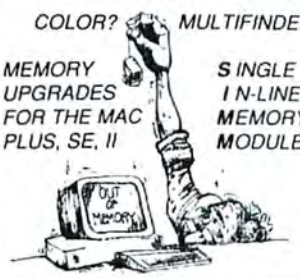

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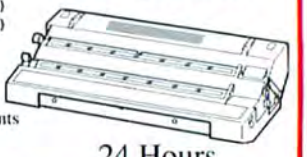

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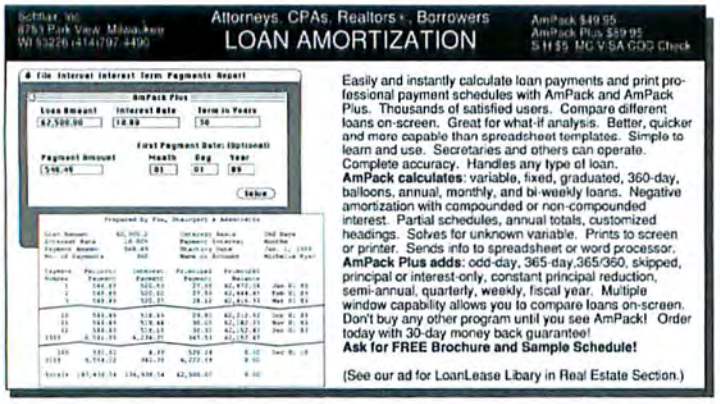

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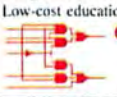

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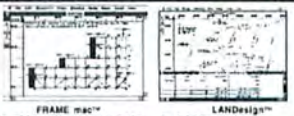

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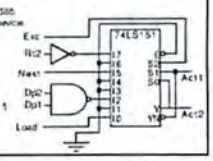

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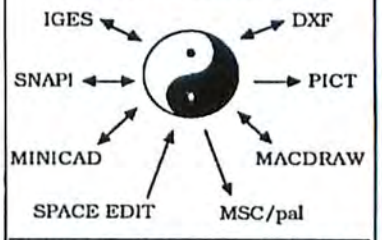

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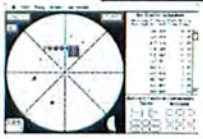

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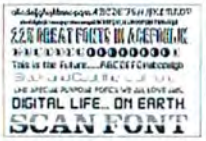

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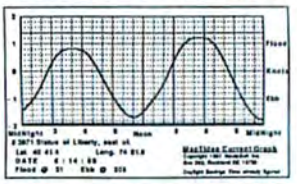

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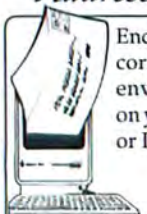

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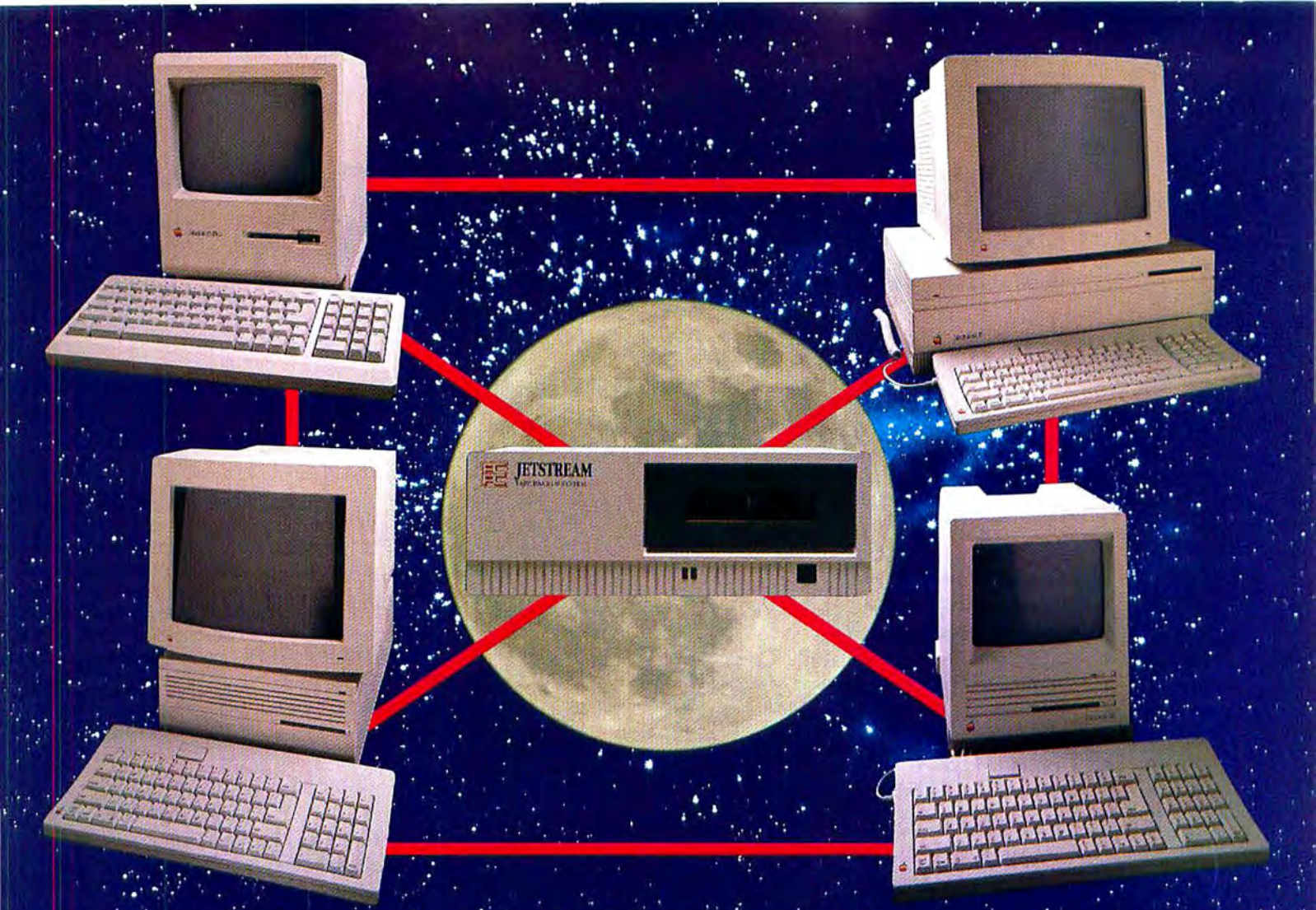

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29	1	1	**Microsoft Works**	*Microsoft*
41	2	2	**Microsoft Excel**	*Microsoft*
50	3	3	**Microsoft Word**	*Microsoft*
37	4	4	**PageMaker**	*Aldus*
10	6	5	**WordPerfect for the Macintosh**	*WordPerfect*
39	5	6	**MacDraw**	*Claris*
26	8	7	**MacWrite**	*Claris*
9	7	8	**FileMaker I**	*Claris*
1	—	9	**Microsoft PowerPoint**	*Microsoft*
4	10	10	**FreeHand**	*Aldus*

			EDUCATION SOFTWARE	
17	3	1	**Reader Rabbit**	*The Learning Company*
4	1	2	**Where in the World Is Carmen Sandiego?**	*Brøderbund*
33	2	3	**Math Blaster**	*Davidson & Associates*
30	4	4	**Typing Tutor**	*Simon & Schuster Computer Software*
13	—	5	**Early Games**	*Springboard Software*

			ENTERTAINMENT SOFTWARE	
33	3	1	**MacGolf**	*PCAI*
2	—	2	**Crystal Quest**	*Casady & Green, Inc.*
32	1	3	**Flight Simulator**	*Microsoft*
29	2	4	**Dark Castle**	*Silicon Beach Software*
13	5	5	**Beyond Dark Castle**	*Silicon Beach Software*

			NETWORKING/DATA COMMUNICATIONS	
29	1	1	**TOPS**	*TOPS*
25	2	2	**AppleShare**	*Apple Computer*
22	—	3	**MacTerminal**	*Apple Computer*
32	3	4	**LocalTalk**	*Apple Computer*
5	4	5	**MacLink Plus**	*DataViz*

Months on chart	Last month	This month	HARD DISKS*	
10	2	1	**MacStack SD20**	*CMS Enhancements*
5	—	2	**DataFrame 30/XP30**	*SuperMac Technology*
24	—	3	**Apple Hard Disk 20SC**	*Apple Computer*
7	1	4	**EMAC 20 External**	*Everex*
5	—	5	**MacStack SD30**	*CMS Enhancements*

			ADD-IN BOARDS	
7	2	1	**Radius Interface Display**	*Radius*
20	1	2	**Radius Accelerator**	*Radius*
12	4	3	**Macintosh II Video Card**	*Apple Computer*
19	3	4	**Apple 2MB Memory Expansion Kit**	*Apple Computer*
18	5	5	**Apple 1MB Memory Expansion Kit**	*Apple Computer*

PRODUCT WATCH

Editors' choice of other recent or forthcoming products of particular interest.

ColorStudio *LetraSet* Image processing package

In the Holy Land *ABC News Interactive* Interactive Videodisk

LapCAD for the Mac *LAPCAD Engineering* 3-D CAD program

Source: Exclusive InfoCorp survey of more than 125 Macintosh retailers and selected mail-order vendors. Covers sales during March 1989.

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Number of open documents	Unlimited *	1	30	30
Mail merge	**Yes**	No	No	Yes
Number of editable, on-screen columns (WYSIWYG)	4	1	1	1
On-screen auto-numbering footnotes	Yes	No	No	No
Automatic repagination	Yes	Yes	No	No
Graphics in same line as text	Yes	No	Yes	Yes
Multiple headers and footers	Yes	No	No	Yes
Extensive Undo	Yes	No	No	No
Variable line spacing (in points)	Yes	No	No	Yes
Selective font, size, style, and ruler changes	Yes	No	No	Yes
MacUser Magazine's Best New Word Processor	**Yes**	No	No	No
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Spell Check document	6.3 *sec*	2 *min* 34.0 *sec*	2 *min* 2.3 *sec*	1 *min* 48.0 *sec*
Copy & Paste large area	6.8 *sec*	1 *min* 0.9 *sec*	12.4 *sec*	12.3 *sec*
Change font size of document	10.7 *sec*	50.2 *sec*	17.6 *sec*	16.2 *sec*
Change font of document	10.8 *sec*	37.1 *sec*	14.1 *sec*	15.2 *sec*
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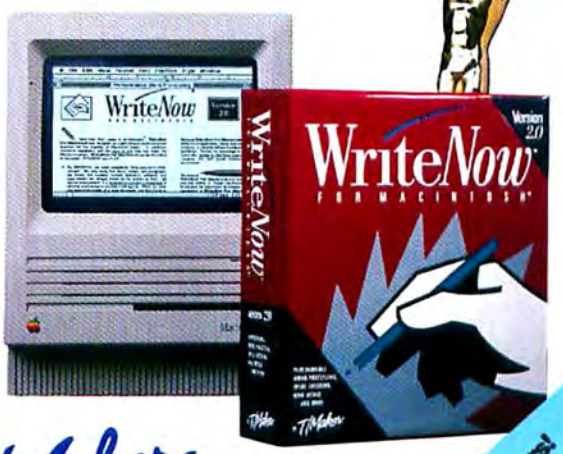
WriteNow 2.0 is *the* user's choice for best Macintosh word processor—*and we'll show anyone our customer registration cards to prove it!*



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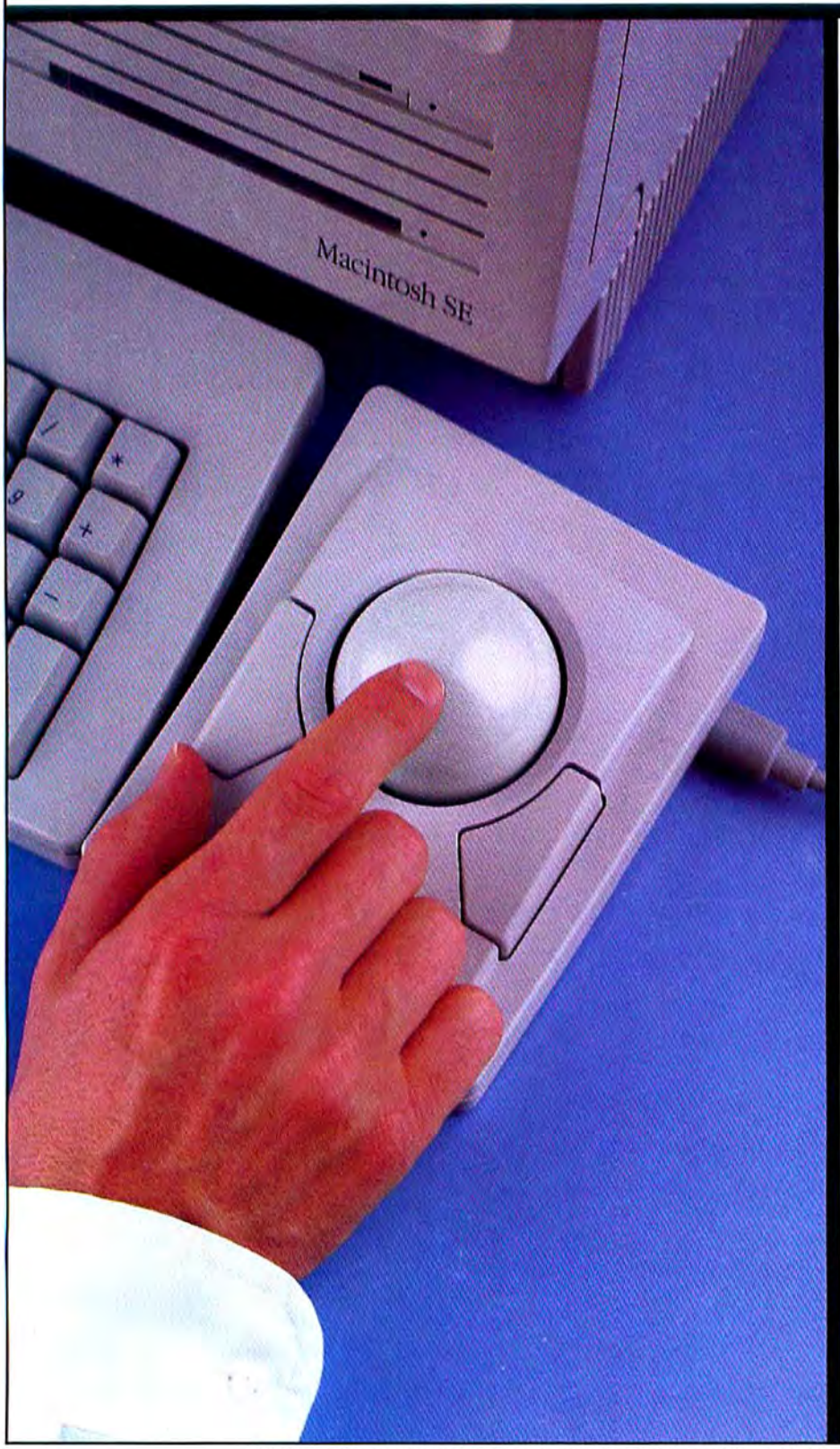

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