MACINTOSH FONT WARS: HOW TO AVOID COSTLY TYPE MISTAKES

RED-HOT BARGAINS:
Color Inkjet Printers

Get the right full-color printer, from under $1,000

19 DAT DRIVES:
Choosing the ultimate archiving machine

BUDGET SPREADSHEETS:
5 number crunchers that won’t crunch your wallet

DIGITAL AUDIO:
Turn your Mac into a recording studio
Betsy Mill put it all in perspective when she wrote to us, “I love [Microsoft] Excel as much as my microwave oven but no love is perfect.”

Well, Betsy, get a load of this. We think new Microsoft Excel version 3.0 is the closest thing to perfection ever seen in a spreadsheet for the Mac. For one good reason.

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The new Toolbar, for instance, reduces common, time-consuming tasks down to one step.

Highlight a row or column of numbers, hit theput (that’s Autosum”), and voila — it all adds up.

Do quick, push-button formatting. Use outlining features to collapse or expand worksheets without having to create multiple files.

As for charting, we took our cue from Paul Woods of St. Paul, Minnesota, who began his letter with the salutation, “Charts, charts, charts!” Hey, Paul — check out the picture for the full scoop.

Did we mention that you can consolidate up to 255 worksheets at a time, regardless of format?

Or the feature called Goal Seek? Put in the total you want, and Microsoft Excel works backwards from there to fill in the variable you need.
ever, with Ralph Levy's cat. Here in Redmond, we're not very well-versed in how to remove cranky, sharp-clawed felines from atop user manuals.

Let the cat have your old manual, Ralph. You'll get a new one when you update your version of Microsoft Excel for $129 (or $50 if you acquired it on or after 12/7/90). Call (800) 541-1261, Dept. Q80, to find out more.

And by the way, Bryan Larson of Mission Viejo, California: we said hi to Bill for you. He sends his regards.

Or the fact that this is the first System 7.0 application available?
We did fall short in one area, how-
We'd like to respond to your suggestions on how to improve Microsoft Excel.
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Catch a Wave: Digital Audio
BY PAUL D. LEHRMAN AND TIM TULLY
Lights! Camera! Music! If you have a Mac, you have the heart of a recording studio on your desk, ready for spicing up your presentations or cutting your next demo tape. Here’s everything you need to get started. .... 94

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BY PAUL YI AND THE MACUSER LABS STAFF
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A key player in that task will be Z-D Labs' new test manager, Andrew Eisner, formerly director of MacUser Labs. At Z-D Labs, Andrew's role will encompass working with Macintosh, PC, and workstation platforms as well as the networking technologies that are increasingly important in real-world product evaluations. Although we'll miss Andrew's day-to-day involvement at MacUser, we're pleased that our loss is your gain.

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About MacUser

Testing 1...2...3...Z-D

The benchmarks and test results you read in each MacUser Labs report are just the tip of the iceberg. Underlying all that data is a complex testing process that must take place before we ever begin to run the actual benchmarks. To help in that process, MacUser Labs is about to gain access to an incredibly powerful new resource.

The life cycle of a lab report begins months before any testing can occur. First, MacUser Labs project leaders and technicians scour the known product universe, leaving no stone unturned, to guarantee that we include all eligible products in a lab report on a particular product category.

A project team then analyzes the factors that are most critical to buyers of that type of hardware or software. To make these assessments, the project team must become intimately familiar with the state of the technology in that product category.

The next stage in the life cycle of a MacUser Labs report is critical: figuring out how to objectively evaluate and analyze product performance. The benchmarks must be designed to be unbiased, repeatable, accurate, and representative of the broad range of real-life applications and system configurations important to our readers.

The complexity of the testing process is further complicated by interoperability considerations that extend beyond the boundaries of the Macintosh platform. That's why we designed and built a facility in our labs called the NetworkShop. Soon, however, we'll have access to another, even bigger, even better resource: Z-D Labs (Z-D stands for Ziff-Davis Publishing Co., our parent organization).

Located a football's throw or so (if you're Joe Montana) from MacUser's offices in Foster City, California, Z-D Labs is being set up as a centralized, exclusive test facility for the six Ziff-Davis magazines published in the U.S.: MacUser, PC Magazine, PC Week, MacWEEK, PC Computing, Computer Shopper, and PC Sources. It will be headed by Elizabeth Springer, formerly director of end-user computing at Equifax, in Atlanta.

As of this writing, Z-D Labs consists of little more than blueprints and several thousand square feet of empty space. But by the time this issue of MacUser hits your mailbox or newsstand, Z-D labs will have emerged as an invaluable resource helping MacUser and our sister publications develop benchmarks that are relevant and consistent across all computing platforms.

A key player in that task will be Z-D Labs' new test manager, Andrew Eisner, formerly director of MacUser Labs. At Z-D Labs, Andrew’s role will encompass working with Macintosh, PC, and workstation platforms as well as the networking technologies that are increasingly important in real-world product evaluations. Although we'll miss Andrew's day-to-day involvement at MacUser, we're pleased that our loss is your gain.
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You could be missing the best parts of System 7.0
Make sure you get 32-bit addressing and virtual memory

Your Mac II, IIX, ILCx or SE/30 lacks some important capabilities of the current generation of Macs. It won't run Apple's new standard 32-bit addressing mode which lets you use much more memory and run programs faster.

In fact, you'll discover that 32-bit addressing does not even appear in the System 7.0 Memory control panel.

That is why Connectix created MODE32, the simple, affordable and unique software solution that lets older Macs use 32-bit addressing.

MODE32 gives you access to more memory and boosts your productivity. With additional memory, applications can work faster and more programs can run concurrently.

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You can get full use of 4MB and 8MB SIMMs or push virtual memory beyond the 13 megabyte limit with MODE32.

It’s ideal for memory-intensive applications such as graphics, desktop publishing, multimedia, CAD, large spreadsheets and image processing.

If you want 32-bit addressing, which is standard on the current generation of machines, you need MODE32.

Get virtual memory on your original Mac II

If you have an original Macintosh II, virtual memory is also missing from your control panel.

Virtual memory is a standard System 7.0 feature that allows you to increase your Mac's system memory without having to buy and install additional SIMM memory.

Put the power of virtual memory to work for you with an MC73™ PMMU (Paged Memory Management Unit). It quickly drops into an existing socket designed specifically for this purpose.

Get virtual memory with the MC73 PMMU. It is the latest version of Motorola's PMMU and is the only one that is known to be fully compatible with the Macintosh II.

Be sure to get the full power of System 7.0

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Get more done in less time with HAND-Off. MacWEEK said, "It's so good that Apple should have put it in their system software." Here are some key features of the new HAND-Off II:

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Get HAND-Off II, the productivity tool that MacUser rated five mice.

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For MC73PMMU circle 63
For HAND-Off II circle 64
State Unfair

It is with regret that I sit reading my last copy of MacUser. Why am I letting my subscription lapse? My employer, a state agency, authorizes only the purchase of PC clones.

I’ve used all the tricks and examples from MacUser articles for justifying Macs. I’ve made slides and graphics for fellow staffers who’ve been hampered by the limitations of their PCs. I’ve pointed out that although other state agencies have PC-purchasing policies, they make exceptions. Even our governor has a Mac. All to no avail.

Now I’m writing this letter on my new 8-megabyte 386 machine with WordPerfect — the most overrated word processor I’ve ever used.

Hal Beattie
Winslow, WA

They want you to have a PC clone? Fine. Macs are PC clones. Their drives read and write DOS disks without a hitch, and the SoftPC program from Insignia, of Mountain View, California ([415] 694-7600), lets your Mac run DOS applications. Or if they insist on a 386, the Orange 386 coprocessor from Orange Micro, of Anaheim, California ([714] 779-2772), ought to satisfy them. — LT

WordPerfection

Your review of WordPerfect 2.0 (June ’91, page 56) didn’t mention that WordPerfect brought one of its better features — automatic file backup with user-specified frequency — from the PC world to the Mac. I’ve almost lost files due to power blips and system freezes, but this feature has always saved me. Microsoft Word doesn’t offer this capability.

WordPerfect has always provided password file protection. Oddly enough, Microsoft offers password protection for Excel but not for Word. If the Mac wants to be a serious contender in the business world, its applications must have this feature.

WordPerfect has the ability to open documents in popular Mac formats such as MacPaint, MacWrite, and Word from inside the application. These conversions have to be installed by the Librarian command as a preference — otherwise you may miss this feature.

John Clayton
South Charleston, WV

Missing Links

Louis Benjamin’s five-mouse review of Excel 3.0 (July ’91, page 56) failed to mention a few shortcomings of the program: For one thing, it’s slower than previous versions.

Another problem is that the Links dialog box is too small to display file paths and filenames in order to change links.

Excel 3.0 changes line spacing when printing old files. Previous Excel versions could print 48 rows (Geneva default font) on a standard page. Now you can print only 44 rows under System 7 and 46 rows under System 6. This forces you to resize all your files so they can print properly.

Some upgrade. Who really cares about the

Dear Mr. Sculley

Have you installed System 7? Did you notice that Apple’s TrueType fonts installed themselves in the process? That’s one way to create a standard. Adobe’s tactic was different: In anticipation of TrueType, it announced a year ago that it would publish the specifications for type 1 fonts. That worked too. But now we have two font standards, and despite what Apple may have said, they don’t always coexist peacefully.

Speak Up:
Do we really need two type standards on the Mac?

When we asked readers how Windows users reacted when they tried the Mac, it sparked impassioned responses. Bernie Wojcik, of Minneapolis, Minnesota, addressed the question more directly than anyone else: “I can only say that I bought a Mac.”

Bill and Lou Falkenstein, of Durango, Colorado, use Macs and PCs, and they think “Windows is pretty much a pain in the neck! All the work we need to do is handled easily with Lotus 1-2-3, WordPerfect, and TaxPreparer. Using Windows is complicated and even ended up jamming the computer several times. We are considering dumping it completely and using only our character-based programs.”

Matthew Barczyk, of Holland, New York, feels that Apple made a mistake in directing Claris to bring out Windows products. “I know several people who would rather use Windows on a PC but continue to use a Mac for its programs, especially Claris’.” By providing an alternative to using Claris’ products on the Mac, Apple will lose some of its market.” But the most depressing evaluation came from Mark Mathias, of Sherman Oaks, California. He says the problem is that PC users won’t try the Mac in the first place. “When I brought my own Mac II into the office to run a scheduling application, not one person came in to look at the system!”
3-D graphs and the database features?
John O. Holland
Ridgecrest, CA

Although the links dialog box is smaller, the path fragment you see is just a hint. Click on a path and then on the Change button, and you get a dialog box that displays the full path. I don't feel a compelling need for Excel's 3-D charts or its database features, but I do welcome the tool bar, styles, and other features that simplify things for casual users. Power users should benefit from the improved customization options in the macro language and support for IAC under System 7. — LB

Wide Print
I'm a consultant for businesses that want to use their Macs for more than word processing. E-mail, and creating spreadsheets. They have multiuser networks that efficiently handle large amounts of data. I'm stumped by the lack of a wide-carriage heavy-duty dot-matrix workhorse printer. I don't need a laserprinter's quality or expense, but ImageWriter I printers are dying and Apple offers no wide-carriage printer nor do I hear of plans for one. IBM, however, has no problem here.

Didn't Apple want to gain a foothold in the business world? Businesses need to process and analyze information! This market is being left out of Apple's planning, as far as I can tell.

Carol M. Sees
Santo Domingo
Dominican Republic

Try the PrintLink Collection, from GDT Softworks, in Canada (604) 291-9121. This cable-and-software-driver combination lets Macs work with any of 100 wide-carriage DOS printers. The serial version costs $89 and the parallel version $189. — NP

New-Age Retrieval
I appreciate Michael Swaine's writing about Ted Nelson's long-awaited Xanadu (June '91, page 49). But I wonder if he has grasped the concept behind Xanadu and hypertext itself. Today, in what media theorist Jay Bolter has called the Late Age of Print, we are buried under an avalanche of print. The tools that once were adequate for storage and retrieval now seem antiquated and cumbersome.

Xanadu could save us from card catalogs and indexes. Unfortunately, Swaine's example presents the most pedestrian use of Xanadu: being able to consult reviews before deciding whether to read a new book. Hardly revolutionary stuff. If presumably enlightened souls see Xanadu through print-shingled eyes, it's no wonder it took Nelson 30 years to get funding for the project.

J. Yellowlees Douglas
Windsor, Berkshire

Shhh. How're we going to slip this one past the MIS managers if you let the cat out of the bag? The plan is for AutoDesk to release Xanadu on PCs, calling it a "database server." Once the software is in place, the revolution can begin. — MS

Formal Response
When I read Bob and Andy's Help Folder item on the U.S. government's infamous Standard Employment Form 171 (July '91, page 233), I was delighted that Apple is finally bringing power to the (civil) servants.

But it turns out that the Claris SmartForm Assistant 171 template that Bob mentioned isn't available yet, because of continued debate with the federal bureaucracy over reproduction rights.

I'm still hopeful. The ability to easily update and print a 171 form on a Mac may be the greatest boon to Mac sales since the comet of competitive pricing made a close pass last year. Never underestimate the power of long-suffering federal-form fillers-outers who'd love to deep-six their Selectric.

Woody Hesselbarth
Grapeville, ID

Claris (408) 727-8227) should be shipping the 171 template by the time you read this. For those who own MacDraw, MultiSoft Resources (301) 977-6972) has the forms available now. You have to use your mouse instead of tabbing to move around within the form, but for $39.95 maybe a little extra wrist action is acceptable. — NP

Free Software
Ouch! I'm not sure which hurts more: getting a so-so review of a product that's no longer on the market or the fact that we couldn't supply MacUser with the greatly improved version 1.5 of our QuickImage 24 video frame grabber in time for it to be included in July's "The Mac/TV Connection: Desktop Video" (page 124).

QuickImage's updated software corrects the image-quality and color-accuracy problems you discussed. It now lets you capture multiple sequential frames,
WHEN WAS THE LAST TIME A DRAWING PROGRAM MADE YOUR PALMS SWEAT, YOUR PULSE RACE, AND YOUR HEAD SPIN.

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Nothing handles curves better. While other drawing programs make you draw Bézier curves by connecting the dots, Canvas 3.0's freehand tool lets you create any curve by simply drawing it. And it gives you unparalleled Bézier curve editing power -- from multi-point selection and editing to automatic object conversions, combinations, and blends.

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Send in your old machine and Canvas 3.0 will blow the doors off the competition. But it doesn't top out there. You'll also find technical features like custom hatching, parallel lines and curves, and dashed lines, curves and borders. Automatic dimension lines. And a Smart Mouse™ drawing aide for precise alignment. What's more, there are new built-in file translators for important multi-platform formats like EPSF, TIFF, CGM, DFX™, IGES, and Illustrator®.

Take the Checkered Flag. Why drive some sedate sedan when you can own the road with the new Canvas 3.0? It's incredibly easy to use -- and the list price of just $399 simply adds to the thrill. So, take a deep breath. Buckle up. Double click. And unleash the awesome power of Canvas 3.0. You're in for the ride of your life.

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Benita Kimm
Marketing Communications Manager
Mass Microsystems, Inc.
Sunnyvale, CA

Hard Choices

Your lab report "Gigadriives: The 1,000-Megabyte Solution" (July '91, page 140) was very timely, especially with the ever-increasing demand for storage-intensive applications. The ultimate goal of the report seems uncertain, however. Are you simply trying to anoint one drive as the fastest or determine the best combination of performance, price, and reliability?

You stated that speed shouldn't be the only criterion for evaluating a drive. But you didn't add that vendors can tweak driver software to speed up a drive — often at the expense of reliability and data integrity. Or they can produce a reliable, superfast drive that simply costs too much.

Instead, you lavished attention on the technically impressive but prohibitively expensive $10,000 MicroNet SB7-1288NP drive. When running real-world applications, it yields only 5-to-10-percent performance gains over $5,000 drives.

Most real-world Mac users would agree that reliability and price carry as much weight as performance in their buying decisions. Perhaps you should add some sort of endurance test to measure predicted reliability.

The review also slighted the importance of warranty, support, and service policies. Although a 30-day money-back guarantee is nice, it does little to address problems that can occur during a product's life span. Readers should be informed about the longevity of vendors as well as their experience in the Mac market.

Cliff Wildes
President and CEO
Microtec International
East Haven, CT

We agree that reliability and price carry as much weight as performance — that's why we chose the $2,699 MacT oven DadaStar HM1.215M as one of our top picks in July. At the same time, we deferred the decision to purchase the speedy but pricey MicroNet SB7-1288NP to "you and your accountant." And, by the way, the SB7-1288NP's real-world performance gain was nearly 25 percent as measured by MacUser Labs' DiskBasher test — not the 5 to 10 percent you mention.

We disagree with your assertion that a money-back guarantee is simply "nice." Although we applaud Microtec's five-year warranty, we believe that buyers' right to change their mind during the first month is crucial. Only in everyday use can a buyer fully rate performance, software, features, noise, and all the intangible subtleties that can't be assessed in a dealer's showroom. —RM

Always a Silverlining

The "Gigadriives: The 1,000-Megabyte Solution" lab report (July '91, page 140) contained some mistakes concerning La Cie's 1000MB ZFP Plus 1-gigabyte drive.

The review reported that the drive comes with Norton Utilities for the Macintosh but that the optimizer isn't included. Not only do we include the Norton optimizer with the bundle but Silverlining, La Cie's Eddy Award-winning software, also has a built-in optimizer as well as many other functions, including quick and easy A/UX partitioning.

The review stated that Silverlining is outdated and doesn't comply with Apple's InsideMacintosh, Volume V specifications. In fact, Silverlining is always kept up-to-date; it was the first third-party Mac hard-drive utility to be Inside Macintosh, Volume V-compliant.

Donald J. Daeges
Technical Support Manager
La Cie Ltd.
Tualatin, OR

You're right. Because incorrect information influenced our evaluation of the 1000MB ZFP Plus 1-gigabyte drive, we have upgraded its mouse rating to four mice. —RM

ROM on Holiday

Thank you for a thorough review of our ColorPoint PS printer ("Easy Hard Copy: Color PostScript Printers," May '91, Buyer's Guide page 38) and for spotting a LocalTalk problem. We've traced it to a bug in our AppleTalk ROM that caused the printer to generate intermittent timeouts. The new ROM is now in all ColorPoint printers, which we believe would show improved performance in your tests.

Ron Patton
Product Marketing Manager
Seiko Instruments USA
San Jose, CA
Even before the Macintosh Clas­sics & its new companions came along to wow the reviewers with heroic price/performance ratios, UltraPaint was keeping them plenty busy.

“As advertised, Deneba’s UltraPaint...really does set new Macintosh graphics standards”, wrote Ernest Mau of CompuServe.

“...many more B&W paint features than SuperPaint, almost all of PixelPaint’s color tools, a superset of MacDraw II’s object-oriented features, and the gray-scale prowess of Digital Darkroom. All this comes in a single program for less than half the price...”, wrote David Pogue in MacWorld.

Perhaps Chris Prior of MacUser UK summed it up best when he wrote that “UltraPaint...could prove to be the ideal software package for those looking for a powerful, all-around draw and paint program.”

And it’s true. UltraPaint really does offer you the same sophisticated graphics processing power of several leading programs combined — all in one inexpensive, easy-to-use package.

Particularly if you’ve always pictured heaven as a place where you get big muscles without having to pay the price.

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COLOR CORRECTION

I always read your Letters section first because of the placement of this section in your fine publication and also to inject a little humor into my day. In the “What color is Apple?” letter (July ’91, page 13), I couldn’t help but notice a scientific faux pas in your reference to a “chromatographic query.”

Color specification isn’t chromatographic. It’s spectrophotometric. Spectrophotometry deals with the transmission, absorption, or reflection of specific wavelengths of the electromagnetic spectrum. Chromatography deals with the separation of chemical mixtures by molecular size, structure, functional groups, ionic strength, solubility, or other chemical properties.

Glenn H. Lewis
Chicago, IL

Our faces are suitably spectrophotometrically altered.—JB

SEEING RED

A few comments about John C. Dvorak’s “Rose-Colored Glasses” (July ’91, page 292). He hit on some interesting issues comparing Macs and PC clones. Regardless of Win3, Macs do equal PCs in speed for word processing and graphics, but are somewhat slower in number crunching. However, raw speed isn’t the be-all and end-all. Computing in the real world involves day-to-day tasks that are much more efficiently handled under the Mac’s graphical user interface. The DOS programs I have used are much inferior to those on a Mac.

Atlanta’s presentation to the World Olympics Committee was produced on the IBM Tower — on Macs. Why Macs? Because productivity (actually producing a product) is so much faster and easier with a Mac.

David L. Cox
Atlanta, GA

CLARIFICATIONS

In “Gigadrives: The 1,000-Megabyte Solution” (July ’91, page 140), the formatted capacity of the CMS PD1000S was incorrectly reported. The correct capacity is 990 megabytes. In the same article, the Microtech Nova N1000 was incorrectly listed as the Microtech MicroKGN N1000. Also, Norton Utilities and Total Recall were omitted from the list of bundled software for the Microtech Nova N1000.
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Mo' Better Blue?

It's a marriage made — well, not exactly in heaven. More like in Hollywood. After months of the caustic courtship this side of "Moonlighting," Apple and IBM are finally tying the knot, technologically speaking.

Even before the prenuptial agreements are signed, long before the lawyers have figured out how to get as much mileage from a joint venture as from a lawsuit, and way before Kitty Kelley has even thought about the high-tech behind-the-scenes exposé that could make that Nancy Reagan book look like a tea party, the sideline speculation is running rampant.

So what's it all about?
Or, rather, what's it not about?
The two companies are not merging. They will remain the staunchest of staunch competitors. All they've agreed to is to work together on several key technologies.

First, and probably most important, is the announcement that Apple and IBM will merge their individual research on object-oriented operating-system software into a hybrid system that will run on IBM's RISC System/6000 POWER PC chip (to be manufactured by Motorola). The two companies will form a joint venture to create this operating system, which will be used by both parent companies and licensed to other parties. The POWER PC architecture will form the basis of the mother of all motherboards that will power future generations of the Macintosh.

Both companies bring a lot of object-oriented blood, sweat, and tears to the table. Apple has been working on an object-oriented approach to system software — code-named Pink — for several years.

The name Pink supposedly derives from the color of the index cards on which Pink's features were written. When Apple first set out to define the operating system of the mid-1990s, Apple engineers brainstormed about what features to include in the new system. The easier features were written down on blue index cards — and ultimately became System 7. The ones that would take longer were written on pink cards. Pink is now much more than a collection of index cards, although it's certainly not yet ready for prime time.

IBM's most visible object-oriented effort has been participation in a venture called Patriot Partners, started with Metaphor Computer Systems. Presumably pleased with the progress of Patriot Partners, IBM — taking a cue from another Patriots fan, Victor "I bought the company" Kiam — recently announced its intention to buy Metaphor — lock, stock, and object — which now looks to be the likely home base for the new Apple/IBM venture.

Astaire-way to Heaven

Another agreement calls for the Mac to be more fully integrated into IBM's "client/server-enterprise environment." IBM and Apple will also co-develop a version of AIX, IBM's preferred flavor of UNIX, that will support Macintosh and OSF/Motif user interfaces.

In English this means that Apple doesn't want to be left out of IBM's big corporate deals and that IBM is at least a little nervous about not having a satisfactory answer when it's best customers demand Mac-like ease of use. As senior editor Russ Ito puts it, what the two parties get out of the deal is best explained by film critic Pauline Kael's explanation of why Fred Astaire and Ginger Rogers made such a dynamic duo: Fred gave Ginger class, and Ginger gave Fred sex.

Finally, the two companies have committed to developing new multimedia technology as part of this software environment, and it will be made available to other vendors.

If everything goes according to plan, someday you won't have to check to make sure if you bought the Mac or the PC version of Flight Simulator. There'll be just one version; when you pop the floppy into your computer, the software will first check to see what kind of hardware you're using. The application will automatically put on the appropriate interface for you and scale its sound and graphics output to exploit the resolution, hardware, and processing power of your system.

This last area is one in which the two companies are likely to maintain fierce competitive differences. Apple will continue to target the multimedia high ground, with machines that offer CD-quality sound and high-definition video and graphics, whereas IBM's machines will have all the pizzazz of a $20 boom box.

This all sounds harmless enough. So why are Apple employees up in arms? Why is there a rumor floating around that the members of the original Mac team are trying to recall the Mac Plus so they can scratch their names off the inside of the cases? And what does it mean for you?

Our armchair corporate psychoanalysis begins in Detroit in the 1970s. When the major U.S. auto makers started announcing joint ventures with their Japanese counterparts, the cry of "Buy American!" rang loud and strong.
It could hardly be otherwise; a country self-centered enough to call a purely domestic championship the “World” Series was not about to quietly concede first place in something as all-American as the auto industry.

But as Detroit discovered, when the stakes get high enough, there is no longer any such thing as being No. 1; cooperation is as important as competition. The major players need to make sure the basic car designs are similar enough that if you can drive one, you can drive them all. They need to work together to keep all of their major component vendors in business. They need to ensure the continuing existence of a trained work force. And they need to maximize productivity by sharing resources and expertise — without giving away the store.

Likewise, Apple simply can never become No. 1 in the computer industry. Not necessarily because it isn’t the best, but because its own survival depends on no one — at least no one too big — losing. If Apple somehow drove IBM out of business tomorrow, Apple wouldn’t win; it would soon follow suit, because the whole industry would quickly fall apart.

And just as Detroit missed the boat when Japan’s compact, energy-efficient cars took the market by storm, Apple missed the first wave of laptop and notebook fever. To catch up fast, it had to do something big.

It’s a Wonderful Life

Cross-platform, object-oriented, multimedia, enterprise-wide, client/server computing is big, all right — at least if you’re counting syllables. What it means is that developers can devote more of their time to thinking up new software ideas and fleshing out how their programs should work and less time to the actual process of writing lines of code. Developers can move from concept to finished product more quickly, so there’s more incentive for them to create specialized tools that match vertical applications you need, such as legal billing or academic coursework. It also means that, rather than always being forced into the Ginsu-knife approach to software — it slices, it dices, it subtotals, it does Beziers — developers can afford to create small, focused little gems of software that do one thing and do it exquisitely.

Unless...

Unless the deal falls apart. In which case Apple wins. So far, Apple has given up nothing, but it has gained the IBM imprimatur. Just by sitting down at the negotiating table with Apple, IBM has given the Mac its indelible seal of approval, and no amount of backpedaling can take that away.

But the deal will happen. It will happen because it must happen. The alternative is more losses, layoffs, cutbacks, and restructurings — and no more company BMWs.

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Software with a Silverlining.

Every La Cie drive includes a FREE copy of Silverlining, the #1-rated hard drive management utilities program.

Silverlining drivers can get 30% more speed from a drive than the competition. It works with any true SCSI drive, internal or external. So one program can manage it all. Plus, Silverlining optimizes your data so it's consecutive on your drive, which makes your applications run faster.

And, Silverlining drivers are intelligent. They test the drives' functionality at startup to ensure that everything is working properly. If it's not, it protects you.

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The Most Unusual Warranty in the Business.

La Cie features a RENEWABLE 2-YEAR LIMITED WARRANTY.† If anything goes wrong with your La Cie Quantum drive within two years, we'll repair or replace it within 48 hours—and then renew your warranty for another 2 years. Free of charge!

Every La Cie drive is backed by toll-free support from customer service and technical assistance experts.

†Restrictions apply. Please contact La Cie for complete warranty information.

Award-Winning Design.

Hard drives that win design awards? Who says intelligence has to be ugly? The Tsunami and Cirrus hard drives have received prestigious awards from both the industrial design and computer communities.

La Cie drives are designed from the inside out. Designed to be quiet (with a 1/2 speed fan), lightweight (as light as 2½ lbs.), durable and reliable. Plus, they have an external termination and SCSI address switch, which means you'll never have to open the case for any reason! You don't win awards for these features, but you do win a loyal following.

Rave Reviews from Critics and Customers.

Frankly, there's been a lot of talk about La Cie hard drives. Leading Macintosh consumer magazines praise us. Customers write us fan letters. In fact, we're happy to let critics and customers have the last word about La Cie drives. Because they tend to be words like these:

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My Life As a Wife

I have a lot of free time these days. I never had this much before, because I was always one of those DPs (diligent Orientals), obsessed with overachievement. You know the kind: takes advanced-placement courses in high school, graduates early from college, gets an M.B.A., while working full-time, slaves at Apple, and starts a company.

I’m off the fast track now, because I realized that all men are coked up. What’s the use of killing yourself as a corporate slave? Instead, I’m concentrating on leaving the best-looking corpse I can, and I’m also turning into a wife. This column is about what it’s like to be a Macintosh wife.

You can be a Macintosh wife whether you’re a man or a woman. I’m not being sexist, just empirically accurate. If this offends you, I’ll send you the file for this column and you can substitute “wife” or “husband” to make yourself happy. The point of this column is for you to appreciate your wife. You probably think that your life is hard and your wife’s life is easy.

Parameter-RAM Caching

Be forewarned: This column has almost nothing to do with Macintosh. If you don’t like it, I’m sure there’s a feature story comparing parameter-RAM caching in the top 100 3.5-inch hard-disk drives somewhere in this issue. Also, if you’re the wife of a Microsoft employee who emigrated from Singapore to search for political freedom, who likes to keep a machine gun around the house in case a herd of deer attacks, you’ll probably dislike this column.

While you’re at work mousing around, reading *MacWEEK*, pondering the impact of System 7 on INITs, and trying to stop Microsoft Word from unexpectedly quitting, we wives are at home suffering. You probably think that it’s easy to keep a home and family running, compared with the stress of shipping a faster version of software and making sure there’s lots of software for a computer with 128K of RAM built by a company whose role model seems to be a Latin American dictatorship. You’re wrong.

It’s not easy. Here are three reasons why. First, there is no support structure. At work, there are receptionists; secretaries; shipping clerks; and, God help us, management. At home, you face each crisis, no matter how small it may seem, all alone. Second, there is no camaraderie. At work, you can wander over to the next cubicle to bounce ideas off colleagues or to commiserate. At home, there isn’t a next cubicle at all. Frankly, it’s often quite lonely being a wife. Third, there is little tangible feedback. At work, there are milestones such as finishing a project, shipping a product, and getting a performance review. At home, each day seems like the day before, and I doubt that most couples get together to review their performance.

The Gory Details

So that you may gain a greater appreciation of what it’s like to be a wife, let me provide a tongue-in-cheek description of a wife’s life. I’m explicitly telling you that it’s tongue-in-cheek, because the minds of some readers are so fragmented that they can’t tell when I’m kidding.

Eating a meal becomes an event. Eating takes on enormous importance — almost as much as reading E-mail — because it breaks your day into pieces: breakfast, before lunch, lunch, before dinner, dinner, and before breakfast. If you’re a ’90s wife like me, half of your meals are eaten at restaurants. (You’ll know that eating is becoming important when you stop caring about the speed of service. From my perspective, I have to read the *San Jose Mercury News*, *San Francisco Chronicle*, and *The Wall Street Journal* anyway. I force myself to read *The Wall Street Journal* so that I can relate to my spouse’s career.)

Because eating takes on such significance, so does exercising. Arnold Schwarzenegger would be proud: 118 weights two times a week and play basketball three times a week. The high point of lifting weights is often seeing professional athletes — such as Roger Craig, Jerry Rice, and Ronnie Lott — working out at the same time. It’s kind of a male-bonding thing that transcends wisdom. The high point of playing basketball is watching the others hurry back to work without having lunch. I haven’t gotten into aerobics yet, because I hate putting on makeup and crotch-floss outfits to work out.

Shop Till You Drop

Getting back to eating, you really shop for food. Shopping for food used to mean buying Jolt at the Seven-Eleven. It was GIGO shopping: Get In and Get Out. Now shopping for food takes on the significance of an off-site retreat; it means going to multiple markets because of their relative strengths. For
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example, when I make pot roast, I go to one market to buy a specific brand of onion-soup mix. Then I make another trip to another market to buy a certain kind of meat. I once saw Steve Jobs at this market, and he told me, “If you ever want to do something important with your life again, contact me.”

When you’re a wife, you also really cook food. Cooking food used to mean opening the aforementioned Jolt and calling for a pizza. Not when you’re a wife; when you’re a wife, you cook from scratch because it uses up time and because it makes you feel like you’re contributing to the happiness of your (working) spouse.

I love to have a hot meal waiting at home for my spouse when she gets home from work. It really disappoints me when she gets home late and the food is cold. Later in this column, I’m going to provide my heretofore secret recipe for teriyaki chicken.

Pick-a-Little, Talk-a-Little

You hang around with other wives. My circle of daytime friends has changed from the likes of Randy Battat (a vice president at Apple) to his wife, Chris, and her two Portables: Scott and Alexandra. We always bump into each other at the market or at the mall. When we bump into each other, we always ask the obligatory questions: “How is Randy/Beth doing at work?” “Are you thinking of going back to work soon?” (Answer: “I’m taking some part-time work, but Randy/Beth really wants me to stay at home with the Portables.”)

I’ve heard from other wives — particularly the ones who used to be hotshot business executives — that there is no substitute for raising Portables. Nothing, it seems, could be more important or more satisfying than raising Portables.

You learn a lot of strategic things about running a home. Here are six. First, laundry that’s been washed can stay in the washer for two days before it starts smelling bad and you have to wash it again. Second, laundry that has been dried can stay in the drier as long as your spouse doesn’t need clothes. Third, putting water into dirty dishes and pots reduces the effort of washing them by 80 percent. Fourth, 20 percent of the dishes accounts for 80 percent of the usage (Pareto’s law of dishes.) With proper selection, you never have to put dishes away. Fifth, you cannot go to the Price Club without spending at least $200. (This is a very good omen for selling Classics in supermarkets.) Sixth, a great deal of Price Club merchandise can fit into a Porsche 911.

You try to talk a lot to your spouse when he or she gets home. After being bored all day, you need to talk to an intelligent human being about something other than the rising cost of groceries. I always ask my spouse about her day so that I can live through her vicariously: “I met with the agency people from Foote, Cone, & Belding. We discussed the new ads we’re shooting with Spike Lee. My ad budget has been increased to $25 million. How was your day?” I’d worked out and then had a café mocha and then gone marketing (food marketing, not strategic, “Helocan” marketing).

Finger-Lickin’ Teriyaki Chicken

You may not have noticed, but I try to write columns that provide information my readers can use. This month, instead of tips on how to use PageMaker or Photoshop better, I’m going to provide my world-famous teriyaki-chicken recipe. Ingredients: two pounds of assorted chicken parts, two cups of high-sodium soy sauce, two cups of sugar, one cup of chopped green onions, two tablespoons of minced ginger, two minced jalapeño peppers, and two tablespoons of sesame-seed oil.

Directions: combine all the ingredients except the chicken. Mix well (I use the Cuisinart that Jean-Louis Gassée gave us for our wedding gift). Add the chicken, and let it all marinate for two to three hours. Remove the chicken from the mixture, and microwave the chicken for 15 minutes at the highest temperature setting. Barbecue it to complete cooking and to add color to the skin. The chicken is done when the flesh starts to pull away from the knuckles of the bones.

Sick of Stacks

Some of you may contact me because you are sympathetic to my need for a career. Some of you will even send me HyperCard stacks that you think are the next Lotus 1-2-3 (the PC version, not the Mac version). Save your disks, because I like being a wife as much as I hate looking at HyperCard stacks.

On the other hand, you could send me your favorite recipe (but please don’t send me any software for keeping track of recipes). The most important thing for you to do, however, is to tell your wife how much you appreciate him or her. I’ve got to go. It’s time for basketball and then lunch and then marketing.
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Look, we’re already out of space and haven’t even touched on the UC630’s speed (up to 60% faster than others), optical precision (a system given top marks by MacUser and MacWorld), or dynamic range (accurate readings of 16.8 million colors, and all 256 shades of gray). Not to mention our 24-hour turnaround for repairs, and the free Adobe Photoshop® we include with every UC630.

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You’ll see we’ve kept a few other surprises for your visit.
The Desktop Blackboard

Apple’s long been ‘the education computer company,’ but the best Mac education tool isn’t Apple’s—it’s Stephen Wolfram’s.

Ah, autumn: Once more it’s back-to-school time for those teachers who still have jobs and for those students who still have schools.

Apple believes in education, particularly in computer-assisted education. More particularly, in computer-assisted education that doesn’t cost an arm and a leg, judging by a program Apple is collaborating on with LucasFilm Learning, The Marin (California) Community Foundation, and the San Rafael (California) School District.

Apple itself has only recently begun to stop extracting arms and legs from its customers, but in an excess of that faux-Islamic zeal so common among recent converts to religious doctrines such as competitive pricing, it has attempted to tone for its past transgressions by cutting off 10 percent of its hands. Among the surviving Apple hands are those with a finger in MacMagic, the aforementioned project, which is exploring how the computer (i.e., the Mac) can be used effectively in the classroom. The emphasis, according to LucasFilm’s Karla Kelly, is not on rote drill-and-practice but on using the computer as a tool for expressing ideas and exploring connections between ideas.

One Mac, One Class

The emphasis is also on discovering ways to make it all work in a classroom that has only one computer, it seems. That sort of attempt to improve education — in the face of realistic expectations regarding America’s willingness to invest in it — may explain why the project is called MacMagic.

Dealing with single-computer classrooms won’t be a problem in the Whittle Schools, if Whittle Communications is able to work its magic. Whittle is the company responsible for the infamous Channel One, the ten-minute-news-program service for schools that generated so much controversy by carrying commercials into the classroom (the commercials pay for the service).

Flushed with this programming triumph, entrepreneur Chris Whittle, who views himself as an inventor rather than an educator, has embarked on an ambitious program to redefine the American classroom, with a blend of free enterprise and high technology. Whittle hopes to open 200 schools by 1996, growing to 1,000 schools by the year 2000, to provide significantly better education than is the current American norm at no greater cost per student; and to make a profit in the bargain.

A bargain with the cloven-footed, you may say, assuming that Whittle’s magic formula probably involves more commercials in the classroom, but at least he has a program and it’s not elitist. Although the plan would put a computer on every student’s desk and maybe another in every student’s home, the computer technology involved would be the kind already being used by some innovative teachers.

A Classic Education

Those teachers who could get away from their summer jobs in June to attend this year’s National Education Computing Conference (NECC) in Phoenix saw a variety of innovative uses of computer technology in education. There as well, much of the creativity went into working out how to make do with low-cost equipment: Mac Classics, Apple IIIs, HyperCard, and carefully cost-justified CD-ROMs and videodisc players.

Well, something needs to be done. Literacy is on the decline in America, and not just in the Oval Office. What teacher and author David Guterson calls “the sorry state of American education” has driven him and many other teachers to pull their children out of the very public schools that, however poorly, pay their salaries. And federal, state, and local governments, and by implication the taxpayers — you and I — are unable or unwilling to spend the money necessary to address the problems.

All of which makes the deus ex machina summoned by MacMagic, Whittle, NECC exhibitors, and their ilk, seem much like the Holy Grail. But at the risk of coming across as elitist and with no pretense of being an educational expert, I’d like to call your attention to a grail of a different denomination.

Actually, it was disingenuous of me to speak of the risk of seeming elitist. What I’m about to describe is obviously, wildly elitist: an instructional technology that requires a Mac II with 5 megabytes of RAM and hundreds of dollars’ worth of software per student — just to teach math. But what is elitist today is generic tomorrow, and problems that have worked so long to create won’t be solved in a day.

It was also disingenuous of me to disavow any pretense of educational credentials. Although it is true that I have no more educational credentials than does Chris Whittle, I am just as pretentious, in my own way. Like most
writers. I'm really a professional student. In educational matters, I figure that that entitles me to speak for the victim.

From which perspective, it looks as if more people have been hurt by bad teaching of mathematics than of any other subject. I believe the American educational system does a much better job of teaching math anxiety than of teaching math, perhaps because math teachers themselves suffer from math anxiety — I don't know. The best system for teaching mathematics, still from the victim's perspective, would surely be one that got the teacher out of the way as much as possible and let the student explore the domain, discover relationships, make generalizations. It would be one that stretch the subject out on the slab and let students poke it.

**Mathematica for Kids?**

Mathematica, a program from Wolfram Research, of Champaign, Illinois ([217]398-0747), does that. Mathematica is a simulation of a large chunk of mathematics, designed for scientists, engineers, and college-students in fields that require math, and it is very successful in those markets. Now, some radicals are using it with elementary-school students, with some radical results.

In the book Exploring Mathematics with Mathematica by Theodore W. Gray and Jerry Glynn (Redwood City, California: Addison-Wesley, 1991), Glynn describes his experience teaching in something called The Math Program, in which he has been using Mathematica routinely with students of various ages. The “greatest potential for progress,” he says, “is with the younger students.”

Mathematica lets you set up what are called notebooks, containing text, sound, graphics, animations, and mathematical expressions that evaluate when told to do so. This is a good way to construct study units, textbooks as it were, but it is just as possible, after some orientation to the program, to leave a second-grader in front of raw Mathematica in its normal mode of evaluating whatever the user types in. This proves to be enlightening. In one case described in the book, Glynn showed a second-grader how to multiply 5 times 12.

He typed:

\[5 \times 12 = 5 \times 10 + 5 \times 2\]

and Mathematica responded

\[\text{True.}\]

He then gave the student another multiplication problem and let her work on it.

In another case, Glynn taught a fourth-grader about equations. He typed:

\[\text{Solve}\{2x+1=7, x\}\]

and Mathematica responded

\[[\{x->3\}]\]

He explained that \(x\) represents any number; that if \(x=3\), the equation is true; and that this is what it means to solve an equation — then he gave her another example. Soon, she was solving equations on her own, and in this same way she was able to learn quadratic equations and predict the roots of new equations.

Glynn is more interested, in his discussion of these examples, in what the students were doing than in the impressive results they were able to achieve. Mathematica retains the protocol of input and output on-screen for the student (and the teacher) to examine, and Glynn has studied the students' protocols to see what and how they learn and how they use Mathematica. Sometimes the students merely repeat what they've been taught, but frequently they extend the examples presented in obvious or novel ways. Altering the input is the main variable under the students' control, and so it is natural for them to try the same problem on different numbers. Which is what mathematics teachers and textbooks are getting at with rote drill-and-practice; with Mathematica, however, the students do it on their own initiative.

Some of the basic things Mathematica does could be done with a calculator or with a less memory- and processor-hungry piece of software. But the point of Mathematica is that it is math. That is, it's a simulation of some of math, allowing students to explore the domain rather than just follow the syllabus. Like any good simulation, it has the advantages of a field trip or a laboratory course without the insurance premiums or cleanup costs. And it is a very good simulation.

The quality of the simulation is more important to seven-year-olds than to scientists or engineers or college students, because the kids don't know how to spot holes in the simulation. They trust the program, and what it tells them about math they will accept. Fortunately, Mathematica mostly tells the truth about mathematics.

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No doubt you've read a lot about System 7. But what will it do for you? Recently, Macworld Contributing Editor Lon Poole—a system 7-savvy kind of guy—visited the production studios of PCTV® and helped us put together a video that makes the power of System 7 perfectly clear. It's free with any order over $100. Or you can buy one for just $9 (2244). We also have Lon's book Macworld Guide to System 7 for sale, for $19 (2298).

Products preceded by the symbol 🟠 are compatible with System 7. For specific features of System 7, please ask your salesperson at the time of your order.

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**Zedcor** ... 60 day MBG
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6350 DataLink/Mac Portable  209.
6837 QuadraLink 1.1  205.

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8552 CE Software  60 day MBG
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9981 PhoneNET Card PC 209.
6273 PhoneNET StarConnector 10-Pk 129.
4669 PhoneNET Connector 10-Pk (DINB) 129.
2206 PhoneNET StarController 300 899.
6667 PhoneNET StarController-EN 500 1739.

FreeSoft ...
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8115 White Knight 11 85.
8946 TelePort A300 139.
8945 TelePort/FAX 185.

Hayes
2300 Smartcom II 3.2A 84.
8614 Personal Modem 2400 Plus 149.
7391 Ultra 9600 Modem 669.

Insignia Solutions
1296 Mosaic 1.0 (3) 249. 1295 (10) 375.

Insignia Solutions
7557 Access PC 1.1 132.
7508 SoftPC-AT/EAGA Module 1.4 124.
9726 SoftPC 2.0 (Classic, LC, SE, Port.) 135.
4089 SoftPC 1.3 245.

Intel Corporation
5119 2400E Modem 179.
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3720 TOPS Network 3.1 (August '91) 187.

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Synergy ...
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1176 MX2400S Modem w/SendFax 9600 95.
2310 Fax/Modem FX9624 159.
1179 TurboModem w/MacModKit 169.
2311 V.32 9600 Modem w/MacModKit 439.

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UPS 370Ci 339.

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System 7? Lon Poole tells all!

As a Macworld Contributing Editor, author of The Macworld Guide to System 7, and all-around operating system aficionado, Lon Poole has been writing a lot about System 7 lately. But the best way to get a writer to really start making sense is to take his hands off the keyboard and put his face in front of the camera. So that's what we're doing—a video of Lon Poole explaining all about System 7 produced at the studios of PCTV® somewhere in the wilderness near Marlow, NH.

If you've been trying to figure out what System 7 can do for you, this is a great way to find out. And it's free to anyone who places an order over $100. (Limit one per customer.) Or you can buy a copy for $9.

By the way, Lon's publisher and accountant asked us to remind you that we'll also sell you his book on System 7 for just $19. Or buy the book and video for $25. You'll be System 7 savvy in no time.
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INTERGRAPH
Junk-mail redux:
Some months ago, Lotus canceled Lotus MarketPlace, a mailing-list CD-ROM, amid a firestorm of controversy over privacy. But like a soap-opera character, the idea didn't really die. Some of Lotus' former managers have formed MarketPlace Information ([617] 225-7850) and have shipped MarketPlace Business, a business-to-business CD-ROM that Lotus had planned to distribute before it bailed out. Junk mail always gets through.

By Russell Ito

Video season: Mac-video vendors got a big jump on the networks and debuted their new releases months before the fall TV season. RasterOps ([408] 562-4200) got things started with six new cards. The 8/24XLi is an accelerated card that's available in two versions — 8-bit ($2,499) or 24-bit ($4,499). The 8XL ($999) is an 8-bit entry-level card, and the ClearVue/GSXL ($999) is an 8-bit gray-scale unit. All four cards can drive displays as large as 21 inches. And for multimedia watchers, RasterOps now offers the 24XLTV ($4,999) and the 24STV ($1,799). Each is a 24-bit card that can render full-motion video in a window. The 24XLTV supports displays as large as 21 inches and is accelerated; the 24STV is intended for a standard Apple 13-inch RGB monitor. SuperMac Technology ([408] 245-2202) has announced two cards of its own: the 8-bit Thunder/8 ($1,899) and the 24-bit Thunder/24 ($4,999). Both cards are accelerated and can drive 21-inch displays.

The PrecisionColor 8 Interface ($795), from Radius ([408] 434-1010), is an 8-bit model that can drive displays as large as 21 inches from a variety of manufacturers, including PC VGA and SVGA monitors. Micron Technology ([800] 642-7661] has also introduced three budget cards: one for NuBus machines and two for the SE/30. The XCEED MacroColor II ($569) is a 24-bit card designed for 640-x-480-pixel displays. The XCEED Color 30 ($339) is an SE/30 PDS card that can render 8-bit color or gray scale on 640-x-480- and 640-x-870-pixel displays. The XCEED Gray-Scale 30 ($89) is a video adapter card for the SE/30 that, when it's installed in conjunction with the Color 30, turns the SE/30's internal display into an 8-bit gray-scale display. Finally, Lapis Technologies ([415] 748-1600) has introduced the DisplayServer LC ($449), a 1-bit card that lets you drive a full-page display with an LC, and the DisplayServer Classic ($349), which lets you do the same with a Classic. The Mac video season is in full swing. Maybe the Fox network had the right idea after all.

Up to Date . . .

Version 2.1 of QuicKeys 2 is the System 7 rev of CE Software's popular macro program. Version 2.1 supports Apple events and is 32-bit clean. (515) 224-1995. $149. ModelShop II is a complete rewrite of ParaLogic's architectural-modeling package. New features include 24-bit color and cast shadows. (415) 956-4091. $895. SuperCard, Aldus' meta-HyperCard, has been revved to version 1.6. Aldus' System 7 revision supports balloon help and Apple events and can convert HyperTalk scripts to HyperTalk. (619) 695-6956. $299.

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The Information Spreadsheet

A big part of personal computing is being able to pick the right tool for the task, which often means using outlining, word-processing, spreadsheet, scheduling, and database applications to do a single job. Unfortunately, it also often means that you have to duplicate a lot of information, and updating changing conditions among the various applications is a major hassle. With this in mind, Chena Software has introduced Fair Witness, a slick package that combines the essential functions of all those tools in one application.

Fair Witness starts as an outliner, in which users enter ideas in any order. Reordering ideas and establishing dependencies is a matter of clicking and dragging. The package also offers a fast way of grouping ideas: You can just drag an entry over a collection of icons at the bottom of the screen, so there’s no unnecessary scrolling. You can then expand the outline into what the developer calls an information chart, essentially a spreadsheet grid into which you can enter dates and notes, assign tasks, establish priorities, and even add sounds. Columns can be rearranged by dragging, and rows and columns can be hidden or revealed as necessary. You can also save multiple views of a single document, so you can access them quickly.

Once you’ve entered dates into the information chart, Fair Witness can generate a schedule chart automatically. You can then modify the schedule by dragging the bars around, and the new dates will automatically update in the information chart.

Fair Witness offers a high level of integration and simplicity. For example, you can enter mathematical formulas by using standard English words, such as Sum and Average, and the package automatically performs the operation — you don’t have to enter a cell range. Users used to juggling applications to manage their information may find Fair Witness a good deal more than fair.

Chena Software, 905 Harrison Street, Allentown, PA 18103; (800) 245-4577. $495.

Bernoulli Turns 90

Following the trend toward higher-capacity removable media, Iomega has announced a 90-megabyte version of its Bernoulli drive, more than double the capacity of its predecessor.

In addition, the new unit boasts data-transfer rates as much as 66 percent faster than those of the previous model. It also uses an automatic head-cleaning function that eliminates the necessity for periodic cleaning of the drive. The Bernoulli 90 can read earlier 44-megabyte disks, but it can’t write to that format.

Iomega Corp., 1821 W. 4000 South, Roy, UT 84067; (801) 778-1000. Transportable, $1,149; dual, $2,249.

Fair Witness is a unique package that lets you start with an outline that can be expanded into an information spreadsheet that can then produce a schedule chart.
The 600-dpi Desktop Printer

With user needs becoming more specialized, 300-dpi laser-printer resolution is no longer enough for many users. QMS has responded with two models that have double the standard laser-printer resolution — 600 x 600 dpi — but that aren’t double the price.

The QMS-PS 815 MR and 825 MR are PostScript multiple-resolution (300 x 300 dpi or 600 x 600 dpi) models that offer many of the features users have come to expect from QMS, such as automatic emulation switching for mixed printing environments. Users can set the resolution through either software or the printers’ front panels. QMS offers switchable resolutions because the company estimates that printing at the higher resolution can take as much as 25 percent longer.

A 20-megahertz 68020 chip drives each printer, and QMS includes 45 resident Adobe typefaces. This is ten more than the standard set and includes four typefaces from the Helvetica Condensed family and six from the Adobe Garamond family. The printers are identical except for their paper trays. The 815 MR offers a single 200-sheet letter-sized-paper cassette, whereas the 825 MR offers two 200-sheet cassettes.

QMS, Inc., One Magnum Pass, Mobile, AL 36618; (800) 631-2692. QMS-PS 815 MR, $5,495; QMS-PS 825 MR, $6,495.

GreatWorks: Eight in One

Firing the first shot in what promises to be an integrated-application war, Symantec has launched GreatWorks, a package with eight integrated application modules: a word processor, database manager, spreadsheet program, chart generator, drawing program, painting program, outline, and communications program.

Tasks such as text formatting, file translation, and using a ruler are the same in every module. Symantec calls features common to all eight modules CORE Technologies. GreatWorks also supports XTND file translators, so sharing and importing data aren’t problems.

Each of the application modules has a feature set similar to that of a stand-alone application. The word processor, for example, supports multiple-column documents, custom font styles, and mail-merge (in conjunction with the database manager). The spreadsheet program offers worksheet dimensions of 256 columns by 16,384 rows, with more than 100 predefined functions. The drawing module supports 8-bit color, whereas the painting module is monochrome only.

Integrated packages should prove attractive to buyers on a budget, and with GreatWorks getting things started, buyers should soon have a wide variety to choose from.

Symantec Corp., 10201 Torre Avenue, Cupertino, CA 95014; (800) 441-7234. $299.

Symantec’s GreatWorks is an eight-in-one integrated package that includes word-processing, spreadsheet, chart-generating, painting, drawing, database, and telecommunications modules.

Apple and IBM Team Up

SAN JOSE, CA — Completing an agreement that would have been anathema only a few years ago, Apple Computer and IBM have announced the signing of a letter of intent to develop and market new technologies that will be used across a variety of computer platforms.

One of the key elements in the agreement is the formation of a jointly owned and independently managed software company that will develop and market an object-oriented operating system capable of running on everything from an Intel x86-based machine to a Motorola 68000-family unit (such as a Mac) to an IBM RISC System/6000. The intent is to design the OS so that applications currently written to run under AIX (IBM’s version of UNIX), OS/2, and Mac operating systems will run normally. Apple has been developing such a cross-platform operating system, code-named Pink, for some time, and some analysts have predicted that the new partnership will slow the project considerably.

Apple and IBM will also develop, market, and support networking and communications products for integrating the Mac into IBM’s client/server enterprise environments. As part of this effort, the companies will develop an enhanced version of AIX that will run on a range of computers from desktop workstations to servers while offering both Macintosh and OSF/Motif user interfaces. In a published report, Roger Heinen, Apple’s vice president and general manager for Mac software, said that Apple would have a version of the Mac operating system that would work with both the RS/6000 and Motorola’s 68000-family microprocessors before Pink was finished. Some reports indicate that Apple may produce a RISC-based Mac as early as next year.

Apple will also adopt IBM’s RS/6000 POWER architecture, called POWER PC, for future Macs. Motorola will work with IBM to design and manufacture the new chips, which Motorola will also sell to other manufacturers.

Finally, the companies have agreed to work together to develop platform-independent multimedia technologies. The first products from the venture are expected to reach the market in two to three years.
Radius Rocket

CPU-intensive applications really take off with the new Radius Rocket 68040 accelerator for NuBus machines.

No matter how much memory and horsepower you pump into your Mac, the machine is still hard-pressed to meet the demands of certain processor-intensive applications. If you’re working with multimegabyte 24-bit graphic images, book-sized desktop-published documents, and thousand-cell spreadsheets, Mac CPU performance is often a bottleneck. Fortunately, Radius has come up with a bottleneck breaker called the Rocket. The 68040-equipped NuBus accelerator, designed for Mac IIs, IIXs, and IICs, is capable of quenching the CPU thirst of the most-demanding applications.

Lift-off

For close to the same price as Apple’s Mac IIX Logic Board Upgrade kit for the Mac II and IIX, the $3,495 Rocket achieves a performance level that’s unmatched by any other accelerator tested by MacUser Labs. Although the Rocket is clearly aimed at users who are considering Apple’s upgrade, the product also boosts the performance of Mac IIXs’ and Mac IICs’ Mac IIX owners who are looking for an accelerator should look elsewhere, because the Rocket doesn’t work with the IIX. The Rocket also doesn’t work with the Mac II A/UX configuration.

The Rocket is a technological tour de force comprising a single NuBus card equipped with a 25-megahertz Motorola MC68040 processor, sophisticated memory-cache features, and a massive heat sink. In addition, the board sports eight sockets that can accommodate as much as 128 megabytes of SIMMs. That’s Mac II-compatible memory, not Mac IIX-compatible memory, so Rocket users don’t have to invest in new RAM, unlike those who are upgrading their machines with Apple’s Mac IIX upgrade. By having the CPU and the memory on the card, the Rocket minimizes the data-throughput reduction that occurs when a traditional Mac’s CPU communicates with its memory and other NuBus cards.

Rocket memory that the Mac’s system software doesn’t use can be configured into a RAM disk with a program such as Connectix’s Maxima 2.0 to provide the speedy processor with a disk drive that won’t slow it down.

In addition to sporting the fastest Mac-compatible processor, the Radius Rocket contains a built-in QuickDraw accelerator that permits high-performance NuBus block-mode transfer with the Radius DirectColor/24 video-display card and a Radius QuickCAD accelerator for use with QuickCAD-compatible applications such as AutoCAD and Vellum. The Rocket provides not only increased CPU performance but also faster video output, both of which represent critical performance hurdles for high-end Mac computing. The Rocket also performs block-mode data transfers with block-mode-capable SCSI-2 disk-adapter cards.

Looking to the future, the Rocket comes equipped with a 32-bit PDS (processor-direct slot) that will allow special-function daughterboards — such as disk controllers, high-performance video interfaces, or JPEG-compatible image-compression boards — to be plugged directly into it.

Not surprisingly, the Rocket consumes a lot of NuBus power: It’s rated at 4.5 amps at 5 volts with 8 megabytes of RAM. Although this shouldn’t be a problem in Macs that have a single additional card, the Rocket’s power requirement is about double the Apple-defined maximum for a single card. This may pose problems in systems that are equipped with multiple cards.

Installing the Radius Rocket is simple: Insert the card into an empty slot, and install the Radius Rocket software, which can include as many as seven INITs, depending on the configuration. You turn the Rocket on and off via a control panel.

In addition to QuickCAD and the Radius Math INIT (which sends mathematical calculations to the Rocket’s built-in FPU), the Rocket comes with three networking INITs that let it communicate with LocalTalk/EtherTalk devices.

The Rocket functions in either 68030 or 68040 mode, based on the setting of the Cache Mode switch in the RadiusWare control panel. Radius claims that Rocket users can boost application performance by 10 to 20 percent, using 68040 mode versus 68030 mode with software written to take advantage of the 68040 cache.

Radios also ships the Rocket with default 68030 settings for more than 70 popular programs. Users can add other programs and set the cache mode accordingly.

Rocket Thrust

From a subjective point of view, life with the Rocket is nothing short of wonderful: Excel recalculations on huge spreadsheets fly by, for example, and working with large Illustrator files is no
For a more objective evaluation, MacUser Labs used a variety of benchmarks that mimic a typical high-end environment to compare the performance of a plain Mac llx and one with a Rocket (with 32 megabytes of memory) installed. We also compared the Rocket-equipped llx's performance with that of a Mac llfx.

Both Macs contained a block-mode-compatible Radius DirectColor/24 board and an FWB Hammer 300-megabyte external hard drive. To show industrial-strength image processing on the llx with the Rocket, we performed a 3-D ray trace with StrataVISION 3d. The llx with the Rocket was almost four times as fast as the regular llx. Compared with the llfx, the Rocket machine sliced the processing time by a third. When the Rocket was installed, rotating an image in Photoshop 2.0 resulted in an almost fourfold performance gain over the standard Mac llx.

In addition, a recalculation of an 8-x-2,076-cell Excel 3.0 spreadsheet resulted in performance that was more than four times as fast when the Rocket was used on the llx and almost 49 percent faster than the performance of the Mac llfx. The llx with the Rocket was also more than three times as fast as a standard Mac llx and 48 percent speedier than Apple's fastest Mac, the Mac llfx. Graphics applications showed the biggest performance gain, but even nongraphics applications such as Excel and Word performed faster with the Rocket.

Based on MacUser Labs' overall test results, a Rocket-equipped Mac llx proved to be more than three times as fast as a standard Mac llx and 48 percent faster than Apple's fastest models. The Rocket Rocket's greatest appeal will be to Mac llx and llx owners who are working with the various vendors to eliminate them (all but the problem with the Mac llci's cache cards). The hardware incompatibilities with such programs as Silverlining, SoundEdit, and DeltaGraph are problematic and require the additional cost (formerly for new memory chips and in the llx's case, a new disk drive associated with Apple's Mac llci Logic Board Upgrade Kit) for upgrades that may not be needed when the llx's cache problems are eliminated.

The Bottom Line

The Radius Rocket's greatest appeal will be to Mac llx and llx owners who are looking to upgrade their machines without the additional cost (formerly for new memory chips and in the llx's case, a new disk drive associated with Apple's Mac llci Logic Board Upgrade Kit) for upgrades that may not be needed when the llx's cache problems are eliminated. The software and hardware incompatibilities, some of which are significant, are reminiscent of the Mac llci's initial problems. So you can be reasonably assured that they'll be cleared up with updated software and ROM chips in the near future.

— Jeffrey A. Steinberg

Radius Rocket

Microsoft Mail 3.0

Building on Mail's solid architecture and performance, Microsoft adds handy new features for handling and organizing E-mail.

To date, Microsoft has failed to extend the iron grip it has on the Mac spreadsheet and word-processor markets to the realm of E-mail. This is the domain in which CE Software's QuickMail has enjoyed widespread success. With Microsoft Mail 3.0, however, Microsoft has added significant new features that are attractive to users as well as network administrators. Although both Mail and QuickMail offer advanced features such as gateways to remote sites and the ability to enclose multiple files with mail messages, Mail clearly outshines QuickMail when it comes to server architecture and performance.

The Basics of Mail

The Mail package consists of user software and server software. It's not necessary to dedicate a Mac as a mail server, because Mail can run on a Mac that's also operating as an AppleShare file server, a print server, or a software bridge and router. Mail's Network Administrator application — software for adding and deleting users and groups — also resides on the server, although you can access Network Administrator from any Mac on the network.

You log on to Mail in the Chooser in the same way you log on to an AppleShare server. You can also set Mail to log you on automatically when you boot your Mac. After you're logged on to the system, you can use the Apple menu to access Mail's Summary window, which is where you read and send messages.

Mail's interface has some noteworthy strengths as well as a few weaknesses. When mail arrives, a window pops up and displays the message title and the name of the sender so you can decide whether to interrupt your work to read the message. If you don't like this feature, you can turn it off. This level of customization extends to the Address Mail window, which comes up first unless you choose to display a message-composition window first. You make this change by using Mail's Preferences command. You can also eliminate the Address Mail window altogether and have a simplified scrolling user list appear in a message-composition window. Unfortunately, these choices are obtusely labeled and are not immediately evident.

Other annoyances include the inability to resize windows and to retrieve messages after you've sent them, which you can with QuickMail's Unsend command. We also found that incoming messages set off the virus alarm of SAM (Symantec AntiVirus for Macintosh) when SAM was set at its advanced level.

Fortunately, Mail 3.0 makes up for these deficiencies by providing top-notch mail-handling features. When you send files, for example, you can enclose an entire folder of files by clicking on a button (although folders within folders are not maintained). By contrast, QuickMail users must select files within a folder individually to send them. QuickMail limits you to 16 attached files, but Mail lets you attach an unlimited number of files. Mail recipients receive a list of the attached files with the message, whereas QuickMail users must go to another window to see what's attached.

Another useful Mail 3.0 feature is the ability to store folders on the server, which means you can organize the messages you receive without downloading them from the server first. You can create project, subject, or category folders, for instance, and sort mail accordingly. To move messages to folders, simply click and drag message titles to the folder list at the bottom of the Summary window. You can also save messages on your hard disk as text files.

New links to Word and Excel let you open mail messages from within those applications, and you can enclose the Word or Excel document you're working on with a message.
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An important feature of Microsoft Mail 3.0's server software is its ability to automatically update the user lists of multiple servers in multiple zones, so the network never gets bogged down with useless mail that's been sent to users who are no longer on the network. By clicking on the Local button, you can also see a list of the users in your zone who are currently logged on to Mail.

You can customize and create message forms with the Mail Forms Designer, a HyperCard stack that's included with the package. Several forms are included that let you send images and sound with your mail messages. The Voice form, for example, lets you copy and paste sound from such programs as Farallon's SoundEdit and then play, fast-forward, and store the sound as an snd file. To use this feature, you need a microphone and a sound driver (such as those included with the Mac Classic, LC, and I1s) as well as System 6.0.7 or later.

The Heart of Mail

Although the user software provides the most visible and familiar aspect of an E-mail package, its performance and connectivity strengths are determined by the software that runs on the server. This is where Mail truly shines. Its server software stores only one copy of a message, no matter how many people it's addressed to. QuickMail's current server (version 2.2.3), on the other hand, creates and stores a copy of the message file for each recipient, which uses much more disk space and can seriously degrade server performance. (For an in-depth look at how mail servers work, see "Mail Call," July '90, page 92.)

Mail's server architecture provides performance that's downright snappy. We tested Mail with 20 users in two zones separated by a router. Even when we accumulated hundreds of messages on several nodes, performance was unaffected. Opening the Mail DA took 4 seconds with 225 messages accumulated; QuickMail required about 25 seconds to open with 110 accumulated messages. Sending and receiving messages were also faster with Mail. However, downloading 16 attached files (about 650 megabytes' worth) took about a minute and a half with either system.

Mail 3.0 also does an outstanding job of handling multiple servers in different zones. Each server shares its user list with other servers on the network automatically, so users can see a list of all the users on the network, not just those in a particular zone as is the case with QuickMail. This makes it easier to send messages to multiple zones. Even more importantly, because the Mail servers automatically update each other's user lists across zones, mail can't be sent to users who have been deleted from the network.

QuickMail makes it easy for users to select the user lists from other zones. This causes problems when users who haven't updated their lists send messages to users in other zones who are no longer on the network. The QuickMail server stores these messages, taking up valuable disk space and bogging down the server.

The server architecture also adds flexibility to the way groups are handled. Like other mail packages, Mail lets you name and add groups of addresses to the user list. These groups can be universal groups created by the network administrator for everyone's use or personal groups created by individual users for their own use. Users can also create personal address books with their most frequently used groups and addresses. In addition, Mail lets you see who is in a particular group from the Address Mail window and choose users from within a group for a message without altering the group.

Mail is completely System 7-compatible. The servers and the users' Macs can run either System 6 or 7 without problems, although balloon help wasn't implemented in the version we tested. We tested Mail on a mixed network with both operating systems and encountered no problems.

Mail can connect to networks at other sites via modem and offers dial-in remote-access capabilities. Third-party products are available that allow Mail to connect to QuickMail, mail systems on VAX computers, wide-area networks, and MCI Mail. Gateways to other mail systems appear when you click on the Special button in the Address Mail window.

The Bottom Line

Microsoft Mail is the best choice if you plan to use multiple servers in different AppleTalk zones. The ability it gives its servers to see each other's user lists and automatically update them is a significant advantage over the methods of other E-mail systems. The server architecture is particularly well designed, providing solid performance and reliability as well as the capacity to handle large-scale network expansion.

Furthermore, version 3.0 makes it easier than ever to send and organize messages. You can enclose folders with messages as well as an unlimited number of files, and the software lets you organize the messages you receive in folders on the mail server. You can also send images and sound with your messages. Mail lacks a command for unsending messages, but overall, Mail is distinguished by a solid base that's unlikely to crack as the program evolves in future versions.

—John Rizzo
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PixelPaint Professional 2.0

With new tools and a revamped interface, PixelPaint Pro can hold its own against any of the Mac's top-notch painting programs.

PixelPaint Pro 2.0 is not just another upgrade to the first 24-bit-color painting program for the Mac — it's a major revision that adds new tools and a spanning new interface. The result is a refined painting program that rivals Studio/32 and Oasis.

New Look and Feel
PixelPaint Pro 2.0 eliminates the restrictive, single-document windows and the fixed palettes of its predecessor. The new version lets you open multiple documents simultaneously (memory permitting) and adds new floating palettes for tools, color mixing, and coordinate display. In addition, new painting implements, including charcoal, pastel, and rubber stamp as well as new selection tools such as magic wand and cropping allow more-sophisticated techniques.

Professional graphic artists will welcome PixelPaint Pro's new Bezier-curve tool. For ease of use, new tool modifiers, visual effects, and fill effects are now located on convenient, context-sensitive pop-up menus accessible from buttons on the Tool palette. The ability to select different path modes (continuous, polygonal, spline, discontinuous, and random) for all painting tools is also particularly useful.

Even with mouse input, PixelPaint Pro capably mimics the real-life effects of pressure on the process of media application. The use of PixelPaper, a collection of nine template documents that simulate the texture of painting surfaces, heightens the illusion. In addition to this, PixelPaint Pro's painting tools respond to pressure-sensitive graphics tablets, such as those from Wacom and Numonics. Altogether, this combination makes PixelPaint Pro 2.0 an excellent emulator of traditional media and methods.

One of the best new features of version 2.0 is Wet Paint, which gives the forms you create more flexibility and manipulability by mimicking drawing in an object-oriented program. When you draw a line or geometric element, it appears on-screen as an editable line object with control points. When you're satisfied with its placement, you can click a second time to merge the object into the bit-mapped image below.

Although PixelPaint Pro offers various dynamic transformations, such as flips and rotations, it's still not as quick or versatile as Studio/32 in this regard. Complex effects such as scaling, distortion, and free rotation, for example, are still off-limits to images selected with the lasso. On the other hand, Studio/32 lacks PixelPaint Pro's excellent mesh-warp effect, which overlays an image with a matrix of control points, letting you gradually distort it.

Zoom views now extend over an entire window, replacing the split-screen approach of earlier versions. The larger magnification area is welcome, but what's still missing is an actual-sized view, which is particularly useful for large images.

Text handling in PixelPaint Pro is flexible but cumbersome. Each letter has control points for individual placement while text is still "wet." But you're required to enter text and set its characteristics in a dialog box. As a result, testing different sizes and styles of text can be tedious. Anti-aliasing and support for Adobe Type Manager produce sharp, high-quality results. And early converts to TrueType will be interested in PixelPaint Pro 2.0's support for Apple's new outline-font format. The program also supports balloon help and System 7's publish-and-subscribe, which lets you post updates to your image directly to other applications such as page-layout programs. As a bit-mapped graphics program, PixelPaint Pro does not support the object-oriented subscribe function.

Color Support
As with previous versions of PixelPaint Pro, you access the program's 256-color Color palette via the Tool palette. Five new gradients are available, as is a slider control that lets you adjust transparency on the fly. In dialog boxes, the program provides sliders for brightness, contrast, and color balance.
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PixelPaint Pro’s restyled Color Editor lets you switch to any of 16 preset palettes, and you can also customize your own. You select colors by using the Mac color wheel or pickers based on traditional color theory: RGB, HSV, CMY, and the Pantone Matching System. If you’re using SuperMac’s SuperMatch Display Calibrator to correlate on-screen colors with colors produced by specific output devices, the TekColor picker replaces the Mac color wheel as the default selection method.

With all these options, it’s surprising that PixelPaint Pro 2.0 cannot save custom color palettes, especially considering that earlier versions had this feature. Because palettes reside with documents, they can be preserved in template files, but saving palettes independently was a better solution. Graphic artists who need to work repeatedly with specific colors will miss this convenience.

A real plus for professionals, however, is PixelPaint Pro’s new color-separation support. Although such support is common in image processors such as ColorStudio and Photoshop, PixelPaint Pro is currently the only color painting program to support color separations. In fact, the complement of available printing options, including halftones and duotones, in PixelPaint Pro 2.0 is one of the program’s distinguishing strengths.

PixelPaint Pro is adept at reading and writing graphics file formats besides its native format (PixelPaint 2.0). It can read the original PixelPaint format, PICT, paint, and TIFF and write to PICT, TIFF, EPS (PostScript), and Scitex CT file formats. The Scitex CT format is especially significant for many professional publishing environments.

Virtual-Memory Scheme

PixelPaint Pro’s virtual-memory scheme is a mixed blessing. Because 24-bit color requires copious amounts of memory (multimegabyte files are common), PixelPaint Pro retrieves portions of open documents from disk when needed, rather than keeping entire images in RAM. As implementations of virtual memory go, this is a good one. Documents can be as large as 4,000 x 4,000 pixels, and users can scroll to off-screen image segments without changing view modes.

If you don’t have enough RAM, virtual memory is a godsend, but there are trade-offs in operating speed and disk utilization. Programs that use virtual memory must access the hard disk as mandated by image changes, and the temporary files required for virtual-memory documents are large.

PixelPaint Pro reserves RAM for documents, so it goes to disk for everything from Clipboard operations to dynamic transformations of on-screen image segments. Never the speediest program, it suffers from the resulting continual disk accesses.

Moreover, PixelPaint Pro’s virtual memory is always on. So instead of being limited by RAM, the program is constrained by disk space. Even with 8 megabytes of RAM at its disposal, PixelPaint Pro couldn’t open a 500K image without approximately 3 megabytes of available disk space.

As a concession to simplicity of operation, an on/off toggle for virtual memory was removed from the program before release. Granted, some novices might be flustered by memory-management issues, but the freedom to allocate RAM and disk space according to the task at hand would make PixelPaint Pro more useful.

In delivering professional rewards, PixelPaint Pro makes decidedly professional demands on both hardware and memory. The minimum configuration for running the program is a Mac II with 4 megabytes of RAM and System 6.0.5 or later. For effective MultiFinder use, you need 8 megabytes. And to make full use of the software’s functions, a 24-bit-video card (preferably with built-in acceleration) is required. One caveat: SuperMac reports PixelPaint Pro incompatibilities with Apple’s Macintosh Display Card 8-24 cc. And finally, you need a high-capacity hard disk—the bigger the better. Although SuperMac recommends a minimum of 3 megabytes of free disk space for PixelPaint Pro, professionals will likely end up devoting an entire disk drive to it.

The Bottom Line

Although late in arriving, PixelPaint Pro 2.0 nonetheless feels a little rushed. For example, when you magnify an image, horizontal lines are draped across the screen, and painting tools in Zoom mode also leave a trail of lines. These artifacts don’t affect images, but they really shouldn’t be there. There’s no question that PixelPaint Pro 2.0 is a vast improvement over its predecessors, but it doesn’t always look as if it’s completely finished.

That said, PixelPaint Pro 2.0 is a valuable renovation of one of the Mac’s most popular painting applications. Although not as crisp in operation as Studio/32 and perhaps not as artistically intuitive as Oasis, it’s a worthy competitor with some special features. Mac graphic artists tend to collect programs the way traditional artists collect brushes. Most won’t be able to resist this one.

— Carlos Domingo Martinez

Get Info

PixelPaint Professional 2.0

Published by: SuperMac Software, 485 Potrero Avenue, Sunnyvale, CA 94086; (800) 345-2898 or (408) 245-2202.

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Order out of Chaos

Databases are foreign to most DTP programs because of the way the information is stored. Any standard database program exports its information as tab-delimited files: text files with tabs (or commas) between the fields and a carriage return after each record. When you import a tab-delimited file into a page-layout program, you end up with a mess. Instead of flowing smoothly, as a word-processing document does, the file has its justification thrown off by the tabs. And just stripping the tabs out isn’t a good solution, because you end up with unformatted text that all runs together.

That’s where DataShaper comes in. The program acts as a PageMaker filter, converting tab-delimited files as they are imported into a layout. The tabs (or commas) are stripped out, and in their place, styles are assigned to each field. As simple as this sounds, the process requires some fairly extensive groundwork. The easy part is deciding how you want your information to appear on the page and assigning styles with point sizes and fonts — elementary stuff for savvy PageMaker users. Then comes the tedious part: You must write the PageMaker filters for the database yourself, using DataShaper’s esoteric coding. The code comprises placeholders that represent each field inside a record. You then assign the appropriate style to the placeholder.

Writing the filter code requires great attention to detail, and it can quickly get confusing. Every field’s placeholder starts with the symbols %% and ends with a successive letter of the alphabet. For example, in a company database, the filter for name, street address, city, state, and ZIP looks like this: %%a %%b %%c %%d %%e. The program can accommodate as many as 260 fields, with the addition of a numeral before each letter. For styles, if you want the company name to appear in bold 10-point Times italic, you assign that style to the placeholder %%a.

You can also add text to the fields. For example, to have a comma fall after the name of each city, you create the filter as follows: %%%c, %%%d, %%%e. And the text isn’t limited to single characters: You can also add words or paragraphs.

Once completed, the filter file automatically converts each record in the database to an assigned style as the text flows into PageMaker.

More Power to You

This in itself is a lot of power over publishing, but DataShaper automates the process even further. For dividing your information into categories (such as geographical regions for a company database), DataShaper lets you add category heads and/or subheads.

DataShaper also supports PageMaker’s...
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indexing features, by letting you define a field as an index entry. You can optionally display the field or leave it out of the page layout—a nice feature if you use indexed keywords for each entry but don't want those keywords displayed anywhere except in the index.

And there's more. DataShaper goes the whole nine yards in DTP by letting you place graphics in your layout based on information in the database. For example, if you have scanned logos on your hard disk for a company database, you might want to have DataShaper search the disk for images associated with specific names. Unfortunately, this doesn't extend to EPS graphics, the most popular format for desktop publishers. However, DataShaper does import paint, PICT, and TIFF files.

DataShaper provides several templates, including directories, catalogs, mail merge, envelopes, Avery mailing labels, and a calendar of events. You can even add postal bar codes to an envelope, using a special font included with DataShaper.

**The Bottom Line**

DataShaper is a powerful tool that's not for the faint of heart when it comes to programming, but if you're willing but inexperienced, you'll be glad to know that the program is somewhat forgiving of coding errors. And although the learning curve is steep, DataShaper's tutorial is excellent, providing step-by-step instructions for the entire coding process.

Its power aside, DataShaper would be more accessible to a broader range of users if it were more WYSIWYG. As it is, the program requires a meticulous eye when it comes to coding.

If you use PageMaker and need to publish a database, DataShaper is for you. You'll have to do some programming, and preparing the filters for PageMaker is time-consuming, but DataShaper will save you hours over manual preparation each time you use it.

— Ben Templin

### Graphics & Design

#### Infini-D

**Infini-D packs modeling, rendering, and animation into a truly outstanding 3-D-design package.**

For less than $900, graphics professionals can explore the world of 3-D design with a package that rivals high-end 3-D software. Infini-D, the latest entry in the burgeoning 3-D-design software arena, is a modeling, rendering, and animation that offers true object metamorphosis, freeform objects, 32-bit ray tracing, time-based animation, and multilayer surfaces.

What's more, Infini-D's impressive functionality is presented in a well-integrated package that's surprisingly straightforward and easy to use.

**From Primitives to Free-Forms**

For modeling, the $895 Infini-D hovers somewhere between a CAD package and a 3-D modeler. You can create a wide variety of shapes with Infini-D's modeling tools, but the program lacks the absolute precision of CAD software. Infini-D uses an internal scaling system, which makes it a good choice for concept design but not for real-world drafting.

As an alternative to modeling with Infini-D, you can import models created in CAD packages and saved in the DXF file format. However, be aware that the DXF format is not set in stone. Unlike the reliable process of converting PICT-formatted graphics to TIFF format, converting files to DXF format can distort or rescale the original graphic.

Infini-D supplies six basic predefined primitives for modeling: cubes, spheres, cylinders, cones, 2-D squares, and infinite planes. You can also model more sophisticated objects in the program's 3-D WorkShop, using its lathe, extrude, and free-form tools.

A key advantage of Infini-D over other 3-D-design packages is the ease with which you can modify objects once you've created them and positioned them in a 3-D scene. Infini-D lets you edit objects away from the clutter of scenes simply by double-clicking on the desired object. The program automatically selects and opens it in 3D WorkShop, where you can make your changes.

As you're modeling objects, Infini-D provides multiple views of your work. Standard views (including Top, Front, and Right) offer fixed perspectives of the 3D WorkShop. The Camera View lets you rotate your point of view. By letting you change views, Infini-D makes it a breeze to create asymmetrical, odd shapes with extreme precision.

Move tools let you move objects through vertical or horizontal planes for accurate placement in your world, or scene. Rotation tools rotate objects around a default center point, but you can easily alter the rotation point to allow for combined objects such as hinged doors or elbow joints. You can scale objects uniformly or resize them nonuniformly, using the squash and stretch tools. An extensive dialog box is available for specifying exact parameters for any of these actions.

Hierarchical grouping of objects is available for making complex assemblies from simpler components. What sets Infini-D apart from other 3-D packages in its price range is that its object grouping is far more sophisticated and multifaceted. With the ability to define complex inter-relationships among objects, you can create realistic animation sequences by specifying how interrelated objects move relative to each other in your 3-D world.

Specular International, Infini-D's maker, shows a definite enthusiasm for fractals, with impressive results. Infini-D's terrain tool lets you create instant landscapes by defining the parameters of mountains (or molehills, for that matter). Because the program models the resulting land masses in a random fashion, they exhibit a natural realism that's difficult to match with traditional hand modeling. The ease of creating compelling terrains makes the process downright addictive.

**On the Surface**

In addition to ray tracing, Infini-D provides five rendering modes that give color, texture, and other surface qualities to your models. Each mode represents a different trade-off between image quality and rendering time. Of course, the higher the quality of the image, the longer it takes to render. In general, it's best to construct scenes in Wireframe mode and then check the progress of your designs, using the various rendering modes, before doing ray tracing.

One drawback of Infini-D is that ray
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Infini-D is a 3-D-design package that excels at creating realistic terrains and complex surface textures. The fractal mountains shown here were rendered in Best (Phong Shaded) mode and stripped in with Photoshop. Even so, the ray tracing took about three days to complete.

When you launch Infini-D, you see four default View windows: Top, Front, Right, and Camera. The first three are fixed views, but you can rotate or zoom in Camera View.

tracing takes place in RAM, so if you experience a power interruption or some other disaster that knocks out your Mac, you have to start the process from scratch. This is not a trivial problem, considering how time-consuming ray tracing can be. System 7 users can get around this problem by using virtual memory for ray tracing, because Infini-D's 32-bit clean. However, using virtual memory is quite a bit slower than doing ray tracing in RAM.

Another of Infini-D's strengths is in its handling of surfaces. Any ray tracer provides the basics: transparency, reflectivity, refraction, and cast shadows. These are mere starting points for Infini-D, however. The package includes fractal mapping, tiling, bump mapping, and corrosion. There is even an editable wave effect that looks like rippling water. An extensive library of predefined surfaces accompanies the package, and shareware surface libraries are also available on America Online to supplement these.

To create custom surface compositions, you can combine Infini-D's surfaces with imported PICT or PICS picture files and map the results to any object. The program offers five types of surface maps — Color, Bump, Transparency, Reflection, and Glow — as well as six ways to wrap a surface around an object. The ability to layer and blend all varieties of surfaces is unique to this class of modeling programs.

You can animate all objects in Infini-D and export the animations you compose to other applications, such as MacroMind Director. Infini-D's Sequencer, which edits objects in time, is an event-driven, time-based system that looks for changes in scene objects. This approach differs markedly from the traditional key-frame method most other rendering packages use and somewhat resembles MacroMind Director's Score.

Professional animators will be pleased that SMPTE time code and not the inaccurate clock chip supplied with the Mac manages the Sequencer. The Sequencer's configurable Timebar displays time to a hundredth of a second or in terms of frame numbers, which allows for exact interfacing with high-end animation systems and video equipment.

You can set objects, lights, and cameras to move around scenes on linear or spline paths. Lights and cameras can be locked to objects or to each other to maintain constant effects as you move about in your 3-D world. Infini-D's ability to interpolate virtually anything is what will cause most animators to sit up and take notice. Not only can Infini-D smoothly blend changes in position, orientation, and dimensions over time but it can also interpolate surfaces, lighting colors, and even object shapes. Specular International plans to add TrueType metamorphosis as well, by the third quarter of the year.

The minimum configuration required for running Infini-D is a II-class machine with 4 megabytes of RAM, 8-bit video, a hard disk, and 32-bit Color QuickDraw. Power users, especially animators, will want to use the fastest machine they can afford, equipped with a large monitor, 24-bit video, loads of RAM, and every conceivable accelerator. Ray tracing is a processor-intensive activity, and large, complex images for prepress or long animations can take many hours or even days to process.

The Infini-D package consists of two disks, a tutorial, and a users' manual. The documentation is clear and succinct and includes many clever analogies that speed the learning process. Infini-D is a product with depth, so careful study of the manuals is a necessity. Specular International maintains a forum in the Industry Connection section of America Online as well as a helpful tech-support staff to assist in troubleshooting problems.

The Bottom Line
Infini-D represents a quantum leap for 3-D design packages priced at less than $1,000. No other competing product in its class comes close to matching Infini-D's power and the quality of its features, effects, and performance. Moreover, the program's well-integrated path between modeling and rendering is a real strength that's further enhanced by a well-thought-out and intuitive interface. The program is a must-have for serious modelers, and even high-end-CAD users can benefit from its extra abilities.

— Doug Barnard

Get Info

Infini-D

$895

Published by: Specular International, 233 N. Pleasant Street, P.O. Box 888, Amherst, MA 01002; (413) 549-7600.

Version: 1.0.

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ThoughtPattern

ThoughtPattern's unique database helps you keep a wide variety of information at your fingertips.

ThoughtPattern is a free-form database program with powerful search-and-retrieval capabilities that works much like an electronic index-card file, storing data from a variety of sources. Although it may sound like another HyperCard, ThoughtPattern provides ways to organize and locate data that no other package offers. Unfortunately, though, its innovative approach to personal-information management is marred by numerous bugs.

Pick Up the Tab

One of ThoughtPattern’s advantages is that you don’t have to create templates or fields before storing information in the program’s database. You simply type information or import it from other programs — if your database program can export data to a formatted text file, ThoughtPattern can import it.

ThoughtPattern organizes data and lets you search for and retrieve it, using tabs. In a ThoughtPattern database, each record is an item. Tabs are search words or phrases attached to particular items, and you can assign an unlimited number of tabs to each item. The most common way to create a tab is to select text from within an item. The program’s CrossIndexing function then creates tabs for every item that contains matching text. You can also create tabs for words not included in an item’s text. All tabs linked to an item are easy to view on a pop-up menu.

The primary purpose of the tabs is to filter a database for a subset of items. When you select a tab, ThoughtPattern displays only those items associated with that tab. You accomplish more-complex searches with ThoughtPattern’s filters, and you can create (and save) multicriteria filters (for example, all items that contain both vacation and lake as tabs).

ThoughtPattern provides two other filter criteria: priority levels and alarms. You can select a subset of all items assigned a specific priority (for example, high or low) or all items with alarms set for a specified time frame. ThoughtPattern alerts you when any alarm is triggered, but it does so only when it is the active application, which limits its usefulness as a substitute for appointment-calendar utilities such as Alarming Events.

ThoughtPattern also includes a Text Search command similar to HyperCard’s Find command. This function would be

How to be social.

Think how much more effective your people would be if they could communicate better. That’s the idea behind WordPerfect Office 3.0 for the Macintosh.

It’s actually several programs in one. WordPerfect Office comes with a very versatile E-mail package (WordPerfect Office Mail), that makes it easy for people on a Macintosh network to keep in touch. The mail screen shows you everything you need to compose and circulate messages to an individual, to a group, or to the entire corporation.

With Mail, not only can you send and receive messages, but you can also attach up to 100 files of any format. Beyond that, you can add sound or voice annotation, broadcast a message to anyone logged onto your network, or send carbon and blind copies.

Ever wish you could take back your words? Mail’s unique status tracking capabilities let you know when a message has been delivered or opened. So if a message hasn’t been read yet, you can retract and edit it.
more effective if you could use it for searching and replacing. As it is, making similar changes across multiple items is a cumbersome process.

Once you've set up your Thought-Pattern database, you can add, delete, and modify existing tabs a single item at a time or as a group. When a tab list gets too long for display all at one time, you can subdivide it into tab groups.

ThoughtPattern can also link other applications and documents to items, after which these applications or documents can be opened from within ThoughtPattern. When you quit, you're automatically returned to ThoughtPattern. This is a convenient feature for grouping related files and information. For example, ThoughtPattern can maintain notes for a manuscript and link them directly to the manuscript itself. Unfortunately, for this feature to work properly, the program must scan the desktop file each time it's launched. If you are using a high-capacity hard drive, this can take several minutes, especially on slower Macs. Bananafish Software says it

Of course, open communication is only one of many ways to bring people together. That's why WordPerfect Office 3.0 for the Macintosh also offers an integrated calendar and network scheduler to help you make appointments, coordinate meetings, schedule events and company resources as well as make to-do lists.

Along with WordPerfect Scheduler and Calendar, WordPerfect Office includes other useful desktop utilities such as Notebook, a flat-file database program; File Manager to help you organize your files; and Forms Maker to create custom forms for Mail, Notebook, and Calendar.

Want to know more about WordPerfect Office 3.0 for the Macintosh? That's easy, too. Just call us at (800) 526-2260. It could be the start of a very productive relationship.
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REVIEWS

will remedy this problem in version 1.2, which should be shipping by the time you read this.

A Few Blemishes
ThoughtPattern succeeds in its primary goal: to provide powerful search-and-retrieval capabilities for unstructured databases. There's much room for improvement, however. For example, when working with tabs, you can't select a subset, such as those tabs that have been created since the last save, for cross-indexing. ThoughtPattern always cross-indexes every tab. And you can't replace one tab, such as Pending, with another, such as Done.

The program also suffers from a poorly written and inadequate manual, which has no screen shots or index. ThoughtPattern makes a subtle but significant distinction between filtered items and selected items, yet this distinction is never clearly explained. The program's menus and dialog boxes for tabs and filters are confusingly similar, and the manual lacks an adequate explanation of their differences. ThoughtPattern also has limited sorting capabilities, yet sorting is not even mentioned in the manual! Fortunately, the program has an innovative on-line help system, similar to Apple's System 7 balloon help.

Even more serious are ThoughtPattern's numerous bugs. At times the text cursor vanished, so we couldn't add new text. Several files were inexplicably corrupted and wouldn't open. A variety of problems occurred when we attempted to delete items. And more than once, the system crashed completely. Bananafish acknowledges these bugs and claims they will be eliminated in version 1.2.

The Bottom Line
If you require a free-form database structure, ThoughtPattern may be just the ticket. Its tabs and filters provide a sophisticated set of features that is unavailable anywhere else. Before you make your purchase decision, though, you should consider ThoughtPattern's limitations. The package desperately needs an improved manual, bug fixes, and more-flexible tab functions. Moreover, standard database programs can perform many functions, particularly those relating to sorting data and generating reports, that ThoughtPattern can't handle.

Given some time and effort on Bananafish's part, though, ThoughtPattern could become a useful tool for users who find conventional databases too rigid.

— Ted Landau

Get Info

Thought Pattern

Published by: Bananafish Software, Inc., 730 Central Avenue, San Francisco, CA 94117; (415) 929-8135.
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Accounts Receivable
The A/R (Accounts Receivable) system can handle as many as 252 special journals, which can be tailored for product-, company-, or management-specific reporting. The system does an outstanding job of tracking financial data at different levels of a business operation. You can, for example, track product sales at the customer, sales, item, and territory level.

Once a sale has been recorded, the A/R system keeps track of open balances, using the balance-forward method. You can also opt for the open-item method to apply specific payments. And because the system posts transactions in real time, you can generate up-to-the-minute reports after each entry. In addition, you can generate statements at any time, including the automatic calculation of finance charges for past-due accounts.

Although you can use the A/R system on a stand-alone basis, without integrating it with a ledger system, doing so limits its value as an accounting tool (in contrast to a cash-collection tool). Fortunately, Satori's A/R system interfaces directly with the company's other Components modules and all the Satori modules automatically share data.

Because it's difficult to anticipate the needs of every business, Satori has included a state-of-the-art report-writing and graphics tool with the A/R system for creating custom reports and business forms. The graphics portion of the program includes familiar drawing tools similar to those in many Mac drawing programs.

Satori's report writer can also do calculations on the fly, and you can use it to generate bar, line, and pie charts based on

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Satori’s Accounts Receivable module lets you track the same data at multiple levels of your business operation. Here, ledger cards display product sales at the customer, item, sales-rep, and territory level.

data stored in the A/R system. In addition, you can customize the system’s interface by modifying the windows used for entering and using the system.

The A/R system is one of the fastest and easiest to use on the market. It makes excellent use of the Mac’s interface and provides a full audit trail, ages customer balances, and easily closes out every month’s activity. And last but not least, the program’s documentation is thorough and well designed. For small-to-medium-sized businesses that don’t require a multiuser accounting system, Satori’s packages should be an excellent fit.

The Accounts Payable module uses a facsimile of a check to make managing payments as easy as managing your personal checkbook. In fact, using it may be even easier than employing your personal checkbook, because the program can reconcile your accounts with just a click.

**It's a graphics program.**  **It's a business program.**  **Is not.**
Accounts Payable

The A/P (Accounts Payable) system is an excellent complement not only to the A/R system but also to the entire Components line. A/P makes it a snap to set up account information, including bank information, payment terms, and expense items for disbursements.

Once you’ve added your vendors to the system, the software tracks every conceivable tidbit of information for paying and tracking bills. You enter data into the system primarily in one of two windows: Purchases and Checks. You use an interactive, customizable screen to record purchases. The check, or disbursement, section of the program uses an on-screen facsimile of a check, making the process of completing a check and making a payment totally intuitive. You manage the system exactly as you manage your personal checkbook.

Bank reconciliations are a breeze. You can compare your bank statement with the system-maintained check register. A simple click in the Clear column removes, deducts, and updates the check, amount, and balance.

The A/P module also provides a complete set of management reports, including vendor-balance agings, month-end closings, and vendor summaries. The system handles a wide variety of journals, including purchase, check, bank entry, and credit, and it has a powerful data filter that screens data elements for inclusion in reports.

As with the A/R system, the A/P system includes drawing tools and bar, line, and pie-chart graphing tools and the documentation is excellent.

The Bottom Line

Satori’s Components Accounts Receivable and Accounts Payable packages offer outstanding capabilities as well as price and performance advantages over Peachtree Software’s Insight Expert Accounting Series or the Great Plains Accounting Series.

Evaluating the packages as stand-alones is difficult. What’s clear is that to gain the full value of both programs, you must combine them with the Satori Components General Ledger. The combination adds up to an award-winning business-accounting system that sports an excellent Mac interface and performance, very good documentation, and outstanding ease of use.

— Ken Landis

Get Info

Components Accounts Receivable

Components Accounts Payable

Published by: Satori Software, 2815 Second Avenue, Suite 295, Seattle, WA 98121; (206) 443-0795.

Version: 1.0

List Price: $795 each.

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To inveterate Mac game players, news of a new Cliff Johnson game brings a sense of both anticipation and dread — anticipation of what new wonders Cliff's warped mind has produced this time around and dread of the amount of time that they'll spend playing the game (instead of making a living).

The man who brought us The Fool's Errand and At the Carnival has delivered 3 in Three, and those feelings of anticipation and dread are well justified. The plot of this game is a bit Tron-esque: An innocent number 3 has been bumped off her (Cliff's anthropomorphism, not mine) rightful place in a cozy spreadsheet cell during a power surge and has fallen into the innards of the Mac. Even worse, the wayward 3 has fallen into The Land of the Letters, where the residents don't even know what a 3 is. The object: to get our hapless 3 home safely. As usual, that's easier said than done.

Along the way, there are plenty of opportunities to make fun of just how stupid computers really are. Humor abounds, as do brain teasers. As with earlier Cliff Johnson concoctions, the primary task involves solving puzzles — in this case, 80 of them on five menus. This time, however, there are no dead ends that force you to start over, so losing is impossible. If you run into a problem with one puzzle, you can try another. That's fortunate, because the infuriation level of some of the puzzles reaches an all-time high. This is to be expected: It is a Cliff Johnson game, after all.

The game contains the now-familiar mix of anagrams, word squares, logic puzzles, mazes, games with no rules until you figure them out, and number progressions. New forms of puzzles defy verbal description. Suffice it to say that Cliff has achieved a new level of weirdness.

The most impressive aspects of 3 in Three are the sounds and the 256-color screens. The game has a five-minute, fully animated Prolog and a similar Finale, and connecting pieces between each puzzle contain dialogue and sound (look in the Finale for special thanks to Steven Sondheim, one of Cliff's most ardent latenight fans). The game has more than 60 minutes of animated screens all told, yet compressed, the two game files fit on one 800K disk! For those without color Macs, the game has special dithering routines that make the pictures look almost as good in black-and-white as in color. The game runs equally well on all Macs, and we have not encountered compatibility problems. The only problem with 3 in Three is hair loss — try not to pull out too much hair as the game's puzzles wreak havoc with your brain.

In-line Design, 5 W. Mountain Road, Sharon, CT 06069; (203) 364-0063. Version 1.0. $49.95.
— Ken Gruberman

After Dark, the screen-saver utility from Berkeley Systems, is one of the more beautiful and whimsical solutions to the problem of screen burn-in. Version 2.0 has a total of 31 modules for your visual fascination.

The program works by monitoring your Mac and displaying animated screen savers after a user-specified period of inactivity. In addition to a variety of colorful screens, After Dark offers controls for customizing the screen-saving process. Once you've installed the software in your System Folder (or Control Panels folder if you're running System 7), you can decide how long you want your Mac to be idle before After Dark puts the screen to sleep. You can also determine whether you'd like sleep and no-sleep corners and where to position them on the screen. You activate and deactivate the screen saver simply by moving the cursor to a designated corner.

When a program presents a dialog box while the screen saver is activated, the screen wakes up and displays the dialog box. Password options control access to snoozing Macs, and a System feature prevents After Dark from engaging if it detects CPU-intensive activity, such as downloading files, printing documents, and backing up. Note that MIDI activity doesn't conform to the Apple serial standard and therefore does not stop After Dark from switching on.

Version 2.0's modules range from traditional screen savers such as Bouncing Ball and Fade to the Jefferson Airplane-inspired Flying Teasers, complete with the sound of flapping wings and an option of choosing light, medium, or dark toast.

Multimode lets you run several After Dark modules simultaneously. You can layer multiple modules, place them side by side, or overlap them. You can also personalize certain modules — for example, logo displays scanned or drawn PICT-format graphics. Messages lets you type and display your own comments to the world at large. and Slide Show projects alphabetized color PICT documents. Regrettably, a handful of modules are available only in color.

If you find yourself tiring of toasters and fish (yes, there is an aquarium containing more-colorful and less-aggressive creatures than those featured in Fifth Generation Systems' $39.95 Pyro!), read the section in the manual on programming your own modules. Nonprogrammers can enjoy the fruits of another's labor by checking out the local BBS for additional modules (try the Monitors library in CompuServe's Macintosh System Software Forum).

All Mac users should have a way to protect their screen, and After Dark offers more colorful eye-candy than any other screen saver (competitor Pyro offers only 12 modules, compared with After Dark's 31). If you want to avoid the ghostly images of screen burn-in and you have a penchant for the beautiful and occasionally bizarre, check out After Dark.

— Christopher Breen

The amazing thing about Amazing Paint is the plethora of features it offers at a relatively low cost — $79.95. The black-and-white program offers more than 75 features, many of which are patterned after those of more-expensive, high-end illustration programs. There isn't enough room to list them all, but the most noteworthy are multiple undos and redos limited only by memory; editable brush and shape patterns; and a slew of effects options, including slant, flip, mirror, trace, invert, and distort. The package also lets you print poster- or billboard-sized versions of documents.

The multiple undo function is a boon, because the fun of using a paint program has always been altering pictures to see what outrageous effects you can create.
Amazing Paint supports some glitzy text functions: If you can stomach a 999-point plaid letter over a herringbone background, Amazing Paint won't stand in your way. The program also supports ATM and TrueType.

The only fly in the Amazing Paint ointment is a poorly written manual, an all-too-familiar occurrence these days but one that's unexpected from CE Software. We are firm believers in tutorials, especially when it comes to paint programs with lots of tools. If ever a program needed a tutorial, Amazing Paint does. But with only 45 typo-littered pages (6 of which are dedicated to Mac basics usually ignored in other manuals), the manual provides only a terse, cursory explanation of the program's many features.

On the other hand, the manual invites you to experiment and explore, albeit out of necessity. And what's most apparent about Amazing Paint is that the CE Software people had a great time developing the program. A sense of goofy fun pervades the entire package.

If you're looking for a powerful, inexpensive, fun paint program that gives you the most features for your money and runs even on a Mac 512K, Amazing Paint is for you.

CE Software, 1801 Industrial Circle, P.O. Box 65580, West Des Moines, IA 50265; (515) 224-1995. Version: 1.0.1. $79.95.

— Ken Gruberman

BannerMania

BannerMania is a specialty graphics program designed for creating banners, bumper stickers, signs, posters, and T-shirt designs.

The program includes 19 custom outline fonts that let you enlarge your banner type without creating jaggies. And BannerMania type is BIG—a single letter can fill an 8.5-x-11-inch sheet of paper. If you don't find the fonts you want in BannerMania, you can import Adobe Type 1 fonts. Once you've entered your type, you can bend and twist it into arcs, pennants, and ribbons. The program supplies 24 ways to manipulate type and has more than 20 built-in special effects, such as shadows, perspective, and 3-D.

BannerMania's most fascinating feature, Transmogrify, sets the program spinning through an almost endless series of variations based on a banner you've created. The program cycles through different fonts, colors, letter shapes, and layouts in quest of a better alternative. Your only problem will be making up your mind about which variation to choose.

A Preview window is BannerMania's handiest feature. After you type in a few lines of text for a banner, you can call up the Preview window for immediate feedback on exactly how the banner is going to look when printed. Even the page breaks are displayed, which is helpful if you want to take advantage of a print option that lets you skip the page breaks or print over them in one long, unbroken sheet.

You can print your BannerMania banners in black-and-white, or in color if you use an ImageWriter II with a color ribbon. The program also works with the LaserWriter and other sheetfed printers, but they don't give you the dramatic banner sizes that the ImageWriter produces.

The program's 36-page manual is as close to perfection as a manual can get. It's informative and uncondescending, although obviously written with first-time Mac users in mind. After reading the manual, I had no questions at all about any function of the program.

BannerMania's only shortcomings are that it can't import other graphics file formats and that it exports files only in 72-dpi PICT format.

These minor drawbacks aside, BannerMania is the fastest, easiest way imaginable to embellish your world with logos, greetings, slogans, and other assorted words of wisdom and foolishness.

Broderbund Software, 17 Paul Drive, San Rafael, CA 94903; (415) 492-3200. Version 1.0. $59.95.

— Ken Gruberman

One Shot Worksheet

One Shot Worksheet is a DA forms generator with sophisticated calculation capabilities. Unfortunately, the package's limited drawing tools and restrictions on the number of objects per page limit the variety and quality of the forms you can create.

One Shot organizes forms into workbooks that can contain up to 32 spreadsheet-style worksheet pages. You can design each workbook by using a total of 100 items such as labels, data fields, and graphic objects. Although this may seem to be an
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NEW ON THE MENU

QUICK CLICKS

adequate number, it's easy to reach the 100-item limit quickly. To mitigate this somewhat, One Shot lets you select ranges of cells to be considered as single objects. The program provides more than 150 calculation functions for building equations for worksheet fields. Equations can link fields on different worksheets within the same workbook.

You can even use equations with graphics, which then work like buttons. Some calculation functions are rather esoteric, such as the one that returns the hyperbolic secant of a value, but most are the standard mathematical, statistical, trigonometric, financial, date, and time functions you find in spreadsheet programs.

You work with One Shot in User mode for data entry and in Layout mode for forms creation. As with other forms generators, One Shot doesn't function as a database program. Each worksheet stores only the information displayed on-screen, and forms are not layouts for multiple records.

Neither is One Shot a true spreadsheet program, despite its worksheet metaphor and calculation capabilities. For example, creating ranges of cells for simple spreadsheet operations is tedious, because One Shot doesn't let you enter text and numbers in the same range.

One Shot is good at creating basic forms teamed with useful behind-the-scenes data calculations. It won't suit your needs, however, if you want to create fancy, or even attractive, forms. It supplies only basic drawing tools, and a lot of effort is required to make a really good-looking form. If you want a drop-shadowed rectangle, for example, you have to draw a white rectangle on top of a black one and use the offset for the shadow. And with no option for creating rows of check boxes, you have to draw individual squares. Consequently, you soon reach the 100-item per page limit.

Perhaps that's why the program's sample files are not exactly aesthetically pleasing, although some are practical and show off the program's calculation functions. The documentation isn't much to look at, either, and its contents fall far short of what's needed to describe the program's potential. Overall, One Shot is a good start, but it needs improvement.


— Sharon Zardetto Aker
Everyone knows that in order to do a job right, you need the right tool. For precision drawing and drafting, you need a powerful, easy-to-use program well-suited to the project at hand. Like MacDraft® or Dreams®. Each a serious, no-nonsense tool for architectural and engineering design & drafting, as well as technical illustration. Designed to respond quickly and accurately to the way you think and work.

If your job requires a versatile program offering a full complement of drawing tools including arcs, polygons, and Bezier and spline curves, choose MacDraft. You can create multi-layered scaled drawings in both English or metric, while MacDraft’s auto dimension lines and area calculations are displayed in the units of your drawing. You can also rotate text and objects by less than 1°, create custom line styles, and store commonly used graphic elements in user-created symbol libraries. All this and much, much more.

When you need higher levels of power and more advanced features, choose Dreams. Dreams expands on MacDraft’s drawing and editing capabilities and provides these extras: A parallel line tool to create walls and intersections, keyboard editing for precise resizing or placement of objects, and tools to extend and trim lines and create fillets (arcs tangent to lines). With Dreams, you can merge objects together or subtract one from another, glue lines and curves together to create objects, or unglue complex shapes into their component edges. Dreams also provides associative dimensioning that will automatically update when an object is resized or moved. The list goes on and on...

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Multimedia

Catch a Wave: DIGITAL AUDIO

The Mac offers a lot more than just pretty pictures. A host of audio products also makes it the ideal digital sound machine.

BY PAUL D. LEHRMAN AND TIM TULLY

Audio is so integral a part of multimedia that most users would recognize its importance only by its absence. Although the video world is currently confronting the difficulties of digitizing, compressing, and storing still images, the audio world has spent the past six years undergoing its own digital revolution and has now settled in to watch the costs of memory and media go down.

Business presentations, training materials, and professional recordings have all benefitted from the ease with which the Mac handles every aspect of audio production—from generating synthesized and sampled sound to recording, editing, storing, and synchronizing it to the various visual media. To a great extent, the audio side is now ready for multimedia and is just waiting for digital video to catch up.
The Good, the Bad, and the Superbad

So you want to be a rock-and-roll star, and you have visions of letting your Mac replace the man with the big cigar? Here are three different levels of studio you can build around a Mac and their cost breakdowns. Each includes one MIDI instrument/controller external to the Mac on which you actually play the music you record. (Of course, if you’re interested only in editing and playing back prerecorded MIDI music, such as Passport’s MIDI hits, you won’t need one of these.) You also need some sort of amplified speakers or a set of convert it back to the analog domain for amplification and playback. This is the basic technology of the now-familiar CD (compact disc) and of DAT (digital audiotape).

The other side of the audio Macintosh is the MIDI sequencer. Even though it has been around longer, the sequencer is still somewhat mysterious even to the computer-literate, although the multimedia movement is changing this quickly.

The Mac and MIDI

The Mac handles sound in two basic ways. The more straightforward (although the later to mature) is digital audio. Sound goes from a microphone to the computer, where the computer digitizes it, much as a scanner digitizes a picture. Once it’s in the Mac, as with any digital data, you can edit it in variety of ways — usually more quickly and easily than on analog media; store it; and with total fidelity,
headphones with which to hear the music.

Each system includes a sequencer you can use to record, edit, and play back the music you perform on the MIDI controller. And each system allows for some form of digital audio.

Total cost (excluding Mac): $15,020

The L1fx is (for now) Apple's fastest. Its six slots, loaded as described, give you pro-level audio and a virtual orchestra's worth of instrumental sounds. You'll never see the sun again.

- Mac IIx ($8,069) with one MacProteus card ($895) installed
- Opcode's Studio Vision ($995) (also provides digital-audio recording, editing, and playback)
- Mark of the Unicorn MIDI Time Piece ($495)
- Three Digidesign SampleCells with 8 megabytes of RAM each ($7,350 total)
- External keyboard sampler or synthesizer ($2,000)

Sequencers

Sequencing is the less expensive approach to creating sophisticated sounds on your Mac. The term sequencer comes from a function of early synthesizers. The first sequencers appeared in the late '60s, when primitive analog synthesis systems included modules for programming a series, or sequence, of events that could be triggered and repeated. In the '70s, digital sequencers appeared that could memorize notes played on a keyboard and spit them back out with perfectly duplicated tempo, dynamics, and phrasing.

In 1983 MIDI (musical-instrument digital interface) appeared, giving synthesizer and computer manufacturers a common language and protocol that let all their equipment work together. Instead of being limited to one manufacturer's equipment, sequencers could now work universally. Getting a computer to talk MIDI was easy, and sequencing programs soon appeared. Almost overnight, editing and manipulating MIDI sequences took a quantum leap in user friendliness. With a Mac as the frontend of your synthesizer setup, you now had a full screen (instead of a synthesizer's small LCD panel) and a keyboard and a mouse (instead of a few cryptic controls) to work with. Plus you could use your Macintosh's printers and networking capabilities, floppy- and hard-disk storage options, and all the other advantages of a general-purpose computer.

With a healthy standard and a computer that looked and felt right in a musical environment, the stage was set. Software sequencers that took advantage of the Mac's superior interface and processing power soon proliferated. Today, several competing sequencers are available that can record musical performances with expressiveness and subtlety and play them back on any number of sophisticated MIDI synthesizers, samplers, and drum machines. Better, perhaps, they let you edit the nuances that your instrumental technique lacks into a recorded sequence, just as good composers might score a piece on paper that they might not have the expertise to perform.

In addition to editing musical fine points such as phrasing, intonation, and articulation, you can also edit a sequencer composition on a macro scale. All told, today's Macintosh sequencers let you arrange and orchestrate a piece and hear each part and section performed as soon as you've written it. Some programs, such as Opcode Systems' Vision, can even nudge you out of the creative doldrums by generating new melodies extrapolated from the ones you record.

It's no exaggeration to say that contemporary sequencers serve as co-composer, conductor, band, and recording studio, and it's no secret why they're ubiquitous in composing circles as well as in production studios. And although sequencers have grown in sophistication, they've also become much simpler to use for those with less-demanding requirements.

Three sequencers currently dominate the professional market: Mark of the Unicorn's Performer 3.61, Opcode Systems' Vision 1.2, and Passport Designs' Master Tracks Pro 4.5, each priced at $495. A newcomer at the same price is Cubase 1.8, Steinberg/Jones' direct port of the heralded German sequencer for Atari computers. In addition, Opcode and Passport, respectively, offer EZ Vision ($149) and Trax 2.0 ($99), stripped-down versions of their professional programs, for the hobby and multimedia markets. Occupying a $319 price niche in between is the relatively new package
Beyond 2.0, from Dr. T's Music Software. On the horizon, is Dynaware's Ballade-Macintosh, an inexpensive sequencer that's already available for PCs and that has a colorful recording-console-style interface.

When they first appeared, the major players took very different approaches, but over the years, they've profited from each others' experiences and have, along with the newcomers, incorporated elements of the others. An inevitable overlap has occurred, and current Mac sequencers now share so many similar features and functions that differentiating among them is difficult — choosing one is largely a matter of taste and feel.

A sequencer is connected to a MIDI instrument via the Mac's modem and/or printer ports and a dedicated interface box. Playing the instrument sends out MIDI information describing the start time, pitch, duration, volume, and other parameters of the notes you play. The sequencer, largely modeled after multitrack tape decks, displays on-screen shuttle controls such as Play, Stop, Fast Forward, Rewind, and Record. Click on the Record button, and the sequencer starts recording the instrument's MIDI data. Click on the Play button, and it sends the MIDI data back to the instrument, replaying your performance more or less exactly.

Once you've recorded the first performance on one of the sequencer's tracks (as with a multitrack tape deck), you can play it back while you record a second, independent track; then a third; and so on until an entire composition is built up. If the first track is intended to be the piano part, for example, on playback it's sent to an instrument programmed to sound like a piano. Each subsequent track typically consists of a part for an individual instrument, so as you record more and more tracks, you may need more than one instrument to perform all the parts at once. Fortunately, you can now buy so-called multitimbral synthesizers that can simulate several different instruments simultaneously, which lets you create a reasonably full ensemble with just a single box.

Connect the Mac to the requisite synthesizers and samplers programmed to play the sounds you want, and you've got an ensemble limited only by your budget. Different instrumental sounds within a synthesizer are normally addressed by numerical MIDI commands known as program changes, but all the pro-level programs go one better than this by letting you label each track with the name of the instrument sound you assign to it. Vision has even been hot-linked to Opcode's universal synthesizer librarian program, Galaxy, and automatically displays new sounds that you send to an instrument with Galaxy.

The sequencer helps you record by letting you slow the tempo to allow a nonvirtuoso to play a part and then speed it up at playback. You can also record in step time, in which you tell the sequencer what the duration of the next note or notes will be and then play them one at a time at your own pace until you need another duration. You then adjust the duration and do it again.

Sequencers also improve on their tape-deck analogues in the controls department. The shuttle controls are instantaneous and exact. Advanced control functions include turning a metronome on and off, automatic punch-in, auto-rewind, and tempo control. All the programs have some manner of loop function that plays a given track or section of a track repeatedly, but Performer probably has the most elaborate, allowing both record and play loops of programmable iteration and even complex, nested loops at any point in any track (see Figure 1).
Editing

Because the recorded “performances” are actually digital data, editing your recorded tracks is also faster and more precise than with tape. One important sequencer function is to quantize recorded notes — that is, move them so they start or end on the nearest beat, even if the timing of the original performance was sloppy. Some sequencers also have a Humanize feature, which lets you do just the opposite: take a precise performance (or a step-time generated sequence) and introduce a tiny bit of randomness to make it sound more natural.

In any of these programs, you can adjust how close to the beat the program moves notes, which notes it moves, and several other parameters. One of Master Tracks Pro 4.5’s best features is its Change filter, which lets you easily specify certain beats in a measure; it then applies quantizing or other operations only to notes that are to fall on those beats.

The way individual notes are represented and edited used to be a principal difference among the sequencers. Passport was the first of the Big Three to use graphic note editing, in which notes are displayed as horizontal rectangles that scroll by on a “piano roll” grid as the sequence plays. It’s possible for you to change a note’s pitch, attack time, and duration by clicking and dragging. Mark of the Unicorn, on the other hand, developed the alphanumeric event list of notes (see Figure 1), in which note parameters such as attack time, duration, and pitch are edited with menu commands and keyboard input. The piano-roll approach tends to be more direct and intuitive, whereas the list method boasts numerical precision.

All the packages now have both kinds of display, with only a few small differences among packages. Only Performer and Cubase (see Figure 2), for example, let you select discontiguous groups of notes for editing, and Performer offers a unique notation window, displaying an editable track in standard music notation.

With any of these sequencers, you can splice parts together; copy and paste single notes, tracks, groups of tracks, or entire songs; transpose, invert, or reverse notes or phrases; and send them to different instruments — all with a few mouse moves. The piano-roll grid makes note editing simple and intuitive, although mixing and matching large sections of music can be unwieldy. Master Tracks Pro 4.5 long held the prize for this latter task, offering a track-editing window in which bar-sized chunks of any number of tracks could be cut and pasted with amazingly little fuss (see Figure 3). Recent versions of Performer have adopted a similar approach, however, and Beyond, Cubase, and Vision cover these sorts of note-editing functions by allowing you to display an entire subsection of a piece as a small rectangle and then letting you drag, overlap, paste, and otherwise manipulate several subsections to build up a composition.

One of the newer features being offered is a moving on-screen fader. Beyond, Performer, and Vision display recording-console-style faders that affect volume, pitch bend, timbre, and a bushel of other sound qualities. As a sequence plays, you can record any changes you make to a fader, and the changes play back dynamically while the fader moves on-screen for visual feedback. To make such changes in Master Tracks Pro 4.5, you must use the mouse to draw a line in a controller window to represent the change you want. Cubase has a similar feature.

Figure 3: Part of a sequencer’s job is to make music easy to edit. Passport Designs’ Master Tracks Pro 4.5’s track-editing window lets you cut, copy, and paste large blocks of music with lots of visual feedback.

Figure 4: Farallon Computing’s inexpensive SoundEdit software, which until recently was available only as part of the MacRecorder package, has a wealth of editing, mixing, and modifying functions for 8-bit RAM-based sound.
Digital Audio

Synchronizing to Video

All the programs except the junior versions (EZ Vision and Trax) fully support video synchronization. They can lock their timing to visual media via SMPTE (Society of Motion Picture and Television Engineers) and MIDI time codes — a scheme in which a signal recorded on videotape sends timing data to the sequencer.

All these sequencers are mature, full-featured programs that (with the exception of Beyond) have been performing successfully for at least a few years, but there are distinctions. Performer displays tracks in standard notation, and you can use it with as many as four of Mark of the Unicorn's MIDI Time Pieces to support as many as 512 MIDI channels. Vision has more features than any of the others, including the ability to play multiple simultaneous sequences with different time signatures and tempi and a sophisticated instrument-layering and-channelizing feature that makes the most of a multiinstrument setup. Master Tracks Pro 4.5, although less loaded with features, is the easiest to learn and use and requires the fewest references to the manual; it's also the only one that's not copy-protected. Cubase has a Selection filter that lets you select a phrase and use the placement of its notes to align the rhythm of other notes to create custom-designed grooves. Beyond is well designed and is comparable to Master Tracks Pro 4.5, although its interface isn't always as elegant. It's less feature-rich than Vision or Performer, but it costs nearly $200 less than its competition, so it's worth considering.

Choosing any of these sequencers will provide you with a useful musical tool, and picking one over another is largely a matter of personal taste. As with any musical instrument, how a sequencer feels to you is probably at least as important as its feature set. It's hard to be creative if you're constantly fighting with your applications, so it's well worth your time to do as much comparison shopping as you can before you write that check.

Digital Audio

Although MIDI lets a computer control external sound-producing devices, the Mac itself can handle "real" sound. The Mac's sound capabilities have come a long way since novelties such as the Talking Moose, and today Macs are producing high-quality audio for a wide variety of uses, including music in HyperCard stacks; multimedia presentations with speech, sound effects, and music; sound editing for professional film and video production; and even CD recording and mastering.

The fidelity of sound when it is recorded, or sampled, depends on two factors in the digitizing process: the resolution and the sampling rate. The resolution, or the number of bits used for each sample, is responsible for the difference between the loudest and the softest sounds that can be recorded and played back. CDs and other professional digital-audio formats normally use 16-bit resolution. The internal sound hardware in all Macs uses 8-bit resolution, which provides about the same dynamic range as an inexpensive cassette recorder. To handle 16-bit sounds, the Mac needs additional hardware.

The sampling rate — how many times per second the sound is digitized — determines the highest frequency (pitch, in musical terms) the system can record. The upper frequency limit of a sampling system is equal to slightly less than half the system's sampling rate. CDs use a rate of 44.1 kilohertz, so their top frequency is about 20 kilohertz, which is the upper limit of human hearing. Other sampling systems use lower rates, such as 22 kilohertz, which gives...
the quality of a good FM table radio, or even 7 kilohertz, which is telephone quality. The highest sampling rate the Mac can handle by itself is 22 kilohertz, but additional hardware can help.

Sound takes up a lot of room in memory, but the amount of room a sound requires is determined by its sampling rate and resolution. One minute of 8-bit 22-kilohertz sound uses up about 1,200K. A minute of 16-bit 44-kilohertz sound takes up four times as much space: around 5 megabytes. For stereo, double everything. Generally (but not always), 8-bit sound is recorded and played back from RAM, whereas 16-bit sound, because of its storage requirements, is always recorded and played back directly from a fast hard disk.

Mac Audio

From the beginning, all Macs have been capable of playing at least two channels of 8-bit 22-kilohertz sampled sound from RAM. Until recently, however, Apple provided no way of getting sound into the computer, a vacuum that was well filled by Farallon’s MacRecorder. More recently, Articulate Systems has introduced three sound tools: Voice Record, a software-only recording and editing package; Voice Impact, a simple digitizer with built-in gain control plus Voice Record; and Voice Impact Pro, a more advanced digitizer with Voice Record, on-board DSP, compression, and additional audio input jacks for external sources (see “Sound Investments,” September ’91, page 46). The Mac LC and the Mac IIci come with their own sound-digitizing microphones, but the technology is essentially the same as the MacRecorder’s, and for manipulating the sounds, Farallon’s SoundEdit software is still the standard.

The MacRecorder is an inexpensive audio digitizer with a built-in microphone that plugs in to one of the Mac’s serial ports. The microphone is good enough for voice quality, but it also has a jack for a line-level input, which gives much better fidelity. (Farallon’s new Voice Digitizer, a lower-cost version without the line input, gives earlier Macs the same voice-recording capability as newer ones, but it is unsuitable for music.)

The MacRecorder’s powerful and intuitive SoundEdit recording and editing program (see Figure 4) can splice, filter, compress, reverse, reverberate, or impose a pitch envelope on a sound file. In addition, it can mix as many as four files into one, in mono or stereo, and speed up or slow down a sound without changing its pitch. It also includes HyperCard stacks for recording, editing, and playing back sounds and giving other stacks the same capabilities.

Since the Mac II, all Macs have had a chip that can play four channels of 8-bit sound, but the System software to allow this was not available until Apple included Sound Manager in System 6.0.7. (The Mac LC doesn’t have the four-voice chip, but it emulates it with software.)

One of the first applications to take advantage of Sound Manager was Sound Exciter, from Passport Designs. Sound Exciter works in conjunction with MIDI Manager, the recent addition to System software that allows internal routing of MIDI data. It lets notes from a sequencer or an external MIDI source such as a keyboard play up to four simultaneous sounds from the computer’s RAM. As with a MIDI-controlled sampler, the sounds can be played over a range of pitches and volumes. Sound Exciter comes with its own library of instruments and “orchestras,” and it can also play sounds recorded with the MacRecorder.

Normally, 8-bit sound files are stored as Sound documents or as snd resources within documents and are played from RAM. However, Apple has recently introduced a
Digital Audio

brand-new scheme: 8-bit AIFF files. AIFF (Audio Interchange File Format) is an Apple-approved universal sound format that can handle mono or stereo sound at any resolution or sampling rate. Most significantly, you can play an AIFF file directly from a hard disk without first loading it into RAM, which means that the amount of computer memory available is no longer a limiting factor in the length of sounds that can be played.

Passport Designs is about to release the first two products to use this format: AudioTrax and a new version of Alchemy (see Figure 5). AudioTrax is a version of Passport’s Trax that allows two separate channels of audio to be recorded and played back in conjunction with a MIDI sequence. Alchemy is a professional-level sample-editing program, and Passport has said that the next major upgrade will turn the system into a disk-based package, in contrast to the current RAM-based version. Additional features will include sound editing and playback of 8- and 16-bit audio files, so Alchemy will be able to perform sophisticated operations on the sounds recorded with AudioTrax. The combination of the two promises a lot of power at a reasonable price.

Professional Audio

Sixteen-bit audio is professional quality. Being able to record, manipulate, and spit out CD-quality sound with a personal computer is awesome. It’s also not as expensive as you might think.

The first product that let the Mac handle 16-bit audio was Digidesign’s Sound Accelerator card for the SE and Mac II. Originally a playback-only system used in conjunction with Digidesign’s MIDI sample-editing software, Sound Designer, Sound Accelerator evolved into the Sound Tools system when Digidesign introduced a companion outboard digitizing box, originally called the Ad In, for recording audio.

The Sound Tools system is today the most widely used digital hard-disk recording and editing system in the music industry. It is used by CD-mastering houses, classical-record producers, dance-music mixers, film-sound-effects editors, multimedia producers, and audio studios large and small. Because its capacity is limited only by the hard disk connected to it, it can be used to work on everything from three-second sound effects to 70-minute albums.

The Sound Tools system comes with Sound Designer II (see Figure 6), which lets you precisely modify, edit, and rearrange the hard-disk audio. Like Alchemy and SoundEdit, Sound Designer II allows cutting, pasting, and merging of mono or stereo sound files; offers several types of equalization; and has the ability to change a sound’s tempo and pitch independently. Several input modules for the system are available: The Analog Interface provides analog inputs and outputs; DAT I/O allows direct input from digital sources, including DAT decks, CD players with digital outputs, and digital mixers and processors; and Pro I/O features balanced analog audio inputs with high-performance filters for maximum quality.

The Audiomedia package, a junior version of the Sound Tools system for the Mac II family, includes input and output functions on the same card. Despite the low price—one-third that of a basic Sound Tools system—its fidelity is very nearly as good and it is ideally suited for multimedia applications. The major differences between the two are that the Audiomedia board does not have the high-end alternative input devices available for the Sound Tools system and that the version of the Sound Designer II software that comes with the Audiomedia board (called, confusingly enough, Audiomedia) does not allow sounds recorded with the system to be exchanged with MIDI-based external samplers (if you need this feature, it’s provided by another Digidesign program, Sound Designer II SK).

To fully exploit its hard-disk audio technology, Digidesign also developed Deck (see Figure 7). This inexpensive software package allows a Mac equipped with the Sound Tools system or the Audiomedia board to become a fully functional four-track digital recording studio, with automated mixing, equalization, and effects on each channel. Files created with Deck can be edited further with Sound Designer II or Alchemy, and files created with those programs can be imported as tracks within Deck. In addition, Deck includes a simple MIDI sequencer that can record and play back MIDI tracks at the same time as it records and plays audio and can also play MIDI files created with other sequencers. The limitations on Deck are that you can record only one track at a time with a Sound Tools system—or two at a time with an Audiomedia card—and that, because you are dealing with four tracks of audio, storage requirements are doubled.

Mixing MIDI and Audio

Musicians who work with MIDI and sequencers also have a need for real sounds. Certain types of audio, such as human voices, hot sax solos, and complex sound effects, don’t lend themselves well to MIDI control. The traditional way around this limitation and a method of integrating those sounds with MIDI-controlled instrumental tracks is to use tape for those sounds and to put a timing signal such as SMPTE time code onto another track of that tape, which in turn controls the MIDI sequencer. But as we’ve seen, sequencers offer far more flexibility than tape for arranging and composing. To have the same power over audio that sequencers give us over MIDI, compositions have long been a dream of musicians who work with computers. Finally, the technology is here that lets us move, stretch, and otherwise edit recorded sound without destroying it.

Although Deck is primarily a digital-audio recorder/player, it has some MIDI capabilities. So does Q-Sheet A/V, an earlier Digidesign program used primarily by audio editors working with video. AudioTrax, as we said, integrates MIDI with 8-bit audio. But for sound quality and
elegance of interface, Opcode’s Studio Vision tops the list. Studio Vision (see Figure 8) extends the capabilities of Opcode’s sequencer, Vision, giving it the ability to record, edit, and play back digital audio within a sequence, using Digidesign’s Sound Tools hardware. The program displays both MIDI and digital audio graphically, and it lets you move audio around in time, cutting and pasting it as easily as you can MIDI data. Up to 16 tracks of audio — mono or stereo — can be included in a sequence, but only two (or one stereo) can actually play at a time. This lets you, for example, select individual notes or phrases in multiple takes of a musical line and create a new take out of them. Or you can adjust the timings of several sound effects, each on its own track and each, if you like, in its own color. Individual audio “events” can be faded or panned, just as if they’re MIDI tracks.

When you edit audio in Studio Vision, you actually only move “pointers” — the recordings themselves are not changed, which makes the program extremely fast. The Strip Silence feature automatically deletes silent sections of files, thus saving disk space.

The program hot-links into Sound Designer II: Select a portion of an audio track and choose Edit Soundfile, and Sound Designer II automatically launches, with the selected audio already loaded. When you’ve finished editing, the new audio is in place in the Studio Vision sequence. The program is also file-compatible with Audiomedia and Alchemy.

Studio Vision is not going to be alone for long: Mark of the Unicorn has announced a combination hard-disk recorder and sequencer, also using the Digidesign hardware, called Digital Performer. And as the hardware continues to get more sophisticated and cheaper, other manufacturers are waiting in the wings too.

There are plenty more audio products available for the Macintosh. Sonic Solutions, a company that grew out of Lucasfilm, makes high-end CD-mastering and -editing systems, including No Noise, which digitally analyzes and eliminates noise to make great recordings out of otherwise unsalvageable tracks. Digital Dynamics, Symetrix, and New England Digital use the Macintosh as the central controller for their multigigabyte multitrack digital-recording systems.

On the other end, desktop-multimedia applications such as MacroMind Director have hooks for playing back MIDI sequences and audio files in sync with visuals. So don’t forget as you’re putting together all those pretty pictures — the Mac is a great-sounding machine too.

Paul D. Lehrman and Tim Tully comprise Bi-Coastal MIDI Consultants, providing direction, implementation, and production services in Mac-assisted multimedia, from Oakland to Boston.
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When considering a spreadsheet program, don’t overlook the reasonably priced alternatives.

BY SHARON ZARDETTO AKER

Excel and WingZ are the Mac’s top-of-the-line spreadsheet programs, and the IIfx is the top-of-the-line Mac CPU. But not everyone needs the power of a IIfx or a killer spreadsheet program such as Excel. If your spreadsheet needs are not so much number crunching as number munching, there is life before Excel and WingZ. Here’s a look at five of the available alternatives: BiPlane, from Night Diamonds Software; DeskCalc, from Zedcor; Full Impact (part of SmartBundle), from T/Maker Co.; MacCalc, from Bravo Technologies; and Works, from Microsoft.

Why does anyone need a spreadsheet program? What do you do with it? Work on a budget. Keep a checkbook. Plan simple financial strategies such as figuring the return on an IRA or other long-term investment. Find out whether a four-year car loan at 6 percent is better than a five-year loan at 5 percent. Keep track of medical bills and insurance claims. There are also some tasks that have to do with lists and numbers but not money, such as everyone’s standing in your bowling league.
Budget Spreadsheets

Each of the spreadsheet programs in this roundup was evaluated in three areas: interface, functionality, and presentation capabilities. The interface evaluation included not just the overall look and feel of the product (most spreadsheet programs look and feel pretty much alike) but also all the ways you interact with the program when you enter and view information. Features such as split windows, viewing formulas rather than results, a built-in help function, and the ability to move or duplicate cell information without using the Clipboard all contributed to the interface appraisal. Pasting options were another important interface feature: Could you paste cells that had been cut or copied, using only their values (instead of any included formulas), and more importantly, could you paste the cells and reverse their row/column orientation? The ability to protect certain cells from being changed, hide cell contents, and add cell notes were pluses in this category.

The functionality category included the maximum size of a spreadsheet, how many sheets could be open at a time, and the number and kind of functions. The sheer number of functions didn't really matter here, provided that a core of the most useful ones was available. (Naturally, the larger the number, the more likely it was that useful ones were included.) Along with the standard spreadsheet-program functions (Sum, If, and so on), were there enough financial functions to do basic financial planning? Could the functions handle strings of text ("if cell A1 is 'yes'...")? Was there a lookup function so you could access tables of information? And, to make itself useful for all sorts of small jobs, could the spreadsheet program sort selected areas?

The presentation category included how things looked on-screen and in printouts. Every spreadsheet program supplies basic number-formatting capabilities (to specific decimal places or as currency or percentage) and lets you turn gridlines on and off, but the looks of a spreadsheet are also affected by added graphics and text formatting for individual cells and cell borders. Charting capabilities were a plus too. Being able to set up headers, footers, and page numbers for printouts also went into this category.

BiPlane

BiPlane was previously available as a shareware product. The first commercial version comes as a stand-alone application (see Figure 1) as well as a full-featured DA (see Figure 2). BiPlane lacks a lot of little features that would make it easier to work with. You can't split the window (but you can freeze the row and column titles), there are no pasting options, the DA version lacks handy in-window menus, and no cell notes are available. It does have a help feature and the ability to hide and protect cells.

BiPlane's biggest interface flaws are slow performance and unusual screen reactions during some basic operations. Copying a single number through 50 rows, for instance, took about six seconds on an 8-megabyte IIcx (compared with less than a second with the other spreadsheet programs). During this process, the selected cells flashed between black and white in an undulating pattern. Another minor flaw is BiPlane's erratic scrolling: If you drag the scroll boxes to their extreme positions to see the end of the spreadsheet, you can reach only column 23 and row 134 — to go further, you have to use the Display Cell command, the scroll arrows, or a keyboard option for moving from cell to cell (with more than 16,000 rows, that takes a long time).

For its price and considering that it also works as a DA, BiPlane has an amazing number of functions:102. They include everything you need in a 16,384-x-512-cell worksheet. You can open multiple sheets in the application.
but not in the DA. BiPlane not only handles strings inside a formula but it also provides many string-manipulation functions. Extra functions include Playback and Picture, which incorporate sound and graphics, respectively, into a spreadsheet. (Sounds and pictures have to be installed into your system or into the application with ResEdit, so they are not functions you’ll use very often.)

BiPlane’s Chart function is nearly identical to DeskCalc’s. Figure 3 shows the Chart dialog boxes of both programs. In BiPlane, font, size, and style can be applied to any cell, and you can adjust the row height. In addition to the usual cell borders, you can use the Borders function, which lets you create border styles, which you can apply to any part of the spreadsheet. Surprisingly, there’s no way to create headers, footers, or page numbers for a printout.

Priced at less than $60, BiPlane is an exceptional value. Its large number of functions and DA option make BiPlane a good choice for anyone who needs to munch figures occasionally.

DeskCalc

DeskCalc is one of seven DAs/applications in the Zedcor Desk collection (the others are a word processor, a database program, a painting program, a drawing program, a communications package, and an appointment calendar). If you want a spreadsheet program for many little tasks, the DA approach is great, but DeskCalc doesn’t limit you to small projects — it’s a fully functional spreadsheet program that also has charting capabilities.

DeskCalc supplies a menu bar inside its spreadsheet window so you don’t have to use the single hierarchical DA menu to access its commands. Icons at the bottom of the window let you page up and down through a spreadsheet and access the charting and help features instantly. DeskCalc lets you protect cells from inadvertent changes and hide their contents too.

The program doesn’t let you split the window (although there’s a Freeze Titles command to keep the first row and column from scrolling away), and it has no special pasting options. The formula bar doesn’t expand downward as you type — input simply disappears at the right side of the window, but it does appear in the cell when you press Return. If you type something in the formula bar and enlarge the window to give yourself more typing room before you enter the data into a cell, all the input disappears, defeating your purpose in enlarging the window.

DeskCalc’s spreadsheet dimensions are 1,000 rows by 2,048 columns, and you can open only one sheet at a time. There are 46 functions, but only 2 in the financial category: PMT (payment, which is probably the most useful financial function) and Net Present Value. Without a function such as Future Value, however, you can’t check the results of any investments. DeskCalc can handle strings of text in formulas, but it lacks a lookup function and it can’t sort any of its data.

DeskCalc provides eight types of charts, which are easy
Figure 5: Full Impact 1.1 is included in T/Maker's SmartBundle. Although it's one version behind the current release (2.0), it's more powerful than anything else in its price range. However, it's overkill for most simple tasks.

Figure 6: MacCalc's menu problems exemplify some of its limitations. Note the lack of keyboard command equivalents (left) and its nonstandard rolling menus (right).

Figure 7: MacCalc gives a readout (the 284 in the oval) of the position of the scroll box as you drag it. In this case, releasing the box would take you to row 284. The nonstandard scrolling entry bar is at the top.

to construct (simply drag the cursor across the data you want to chart, and then drag across the area you want the chart to fill). There's a selection of five bordered backgrounds for charts. Although the program is supposed to let you hide any part of the spreadsheet behind a chart (in case you want to place the chart right on top of its data), this feature didn't always work, so the numbers always showed through.

Charts are defined by the Chart function, which is automatically entered in the top left cell of the chart area (see Figure 4). You can work directly with the Chart function to define a chart or to edit one created with the drag method.

You can format any cell individually for font, size, and style and adjust the row height at any time. Standard borders are available for cells or groups of cells; there's also the Shaded Cell option for color systems, but the shading contains annoying bit-mapped dots. Printing options are limited: You can define a frame for a page, but the program can't create headers, footers, or page numbers.

Zedcor's DA approach makes DeskCalc readily accessible, and it's adequate for most spreadsheet tasks. Its limit of having only one open spreadsheet at a time, however, makes transferring data cumbersome.

Full Impact

The 1.1 version of Full Impact is included in T/Maker's SmartBundle, which also includes WriteNow, a word processor; Record Holder Plus, a flat-file database manager; and SuperPaint, a painting/drawing program. It gets fewer words than any of the other spreadsheets in this article, because it's really on a par with Excel and WingZ rather than with the other spreadsheet programs reviewed here (it's part of this roundup because of its reasonable price).

Although Full Impact (see Figure 5) is now in version 2.0, the bundled version (1.1) is good enough to be tops in all three spreadsheet-program-criteria categories. In comparison with the other products discussed here, it's off the scale. Its interface has all the goodies you could want, including row/column readouts in scroll boxes, an icon bar for quick commands, and a macro language that's better than Excel's. Its 256-x-2,048-cell spreadsheets can be linked to each other, and it features 90 functions, including database operators. For presentations it has charts and graphics galore.

The usual disadvantages of a powerful program — power comes at a price — aren't really true in this case, because the package price is for the bundle and it's a bargain. One problem pertaining to power programs persists: It takes time to learn how to harness power, and if you don't need the power, you've wasted the time. And you should decide if you really want a version of a spreadsheet program that's one revision behind the current edition, which is itself moribund. Also, users considering upgrading to System 7 should know that Full Impact isn't System 7-compatible, and Ashton-Tate hasn't announced a time schedule as to when it might be.
MacCalc

MacCalc won a MacUser Eddy Award several years ago, but in today’s market, calling it a disappointment is an understatement.

It’s the only spreadsheet program whose editing area scrolls instead of expanding downward when your formulas get longer than the allotted space. This approach is different from that of other spreadsheet programs but isn’t necessarily better. It also has “rolling menus,” nonstandard scrolling menus with half-x’s at the ends of the menu to indicate that more commands are available (see Figure 6). The menus don’t extend the full length of the screen, so you must use the rolling-menu feature even if you have a large-screen display.

MacCalc complicates a simple operation such as Fill Down or Fill Right (which copies a cell’s contents into adjacent selected cells) by making you copy a cell to the Clipboard, select the other cells, and use the Paste Multiple command. It also lacks keyboard command equivalents for basic functions such as New, Open, Close, and Print. In addition, it has no pasting options.

The program does, however, have cell notes, a good help feature, great searching capabilities, and the ability to move cell contents without use of the Clipboard. You can split a window, password-protect a spreadsheet, and protect any cells within a spreadsheet. One nifty feature gives you a readout of what row or column you’re moving to when you drag the scroll box to a new position (see Figure 7).

MacCalc’s maximum spreadsheet size is 125 columns by 999 rows, but all the cells might not always be available. We found it necessary to double the recommended memory allotment to 750K so that we could put numbers into the first and last cells. Even on an 8-megabyte Irix with a memory allotment of 750K, we couldn’t select all the cells and clear them without running out of memory. Although that’s not a large memory partition, this seems to indicate a memory-management problem.

The program has 48 functions, some of which are overly limited. Date functions, for example, can’t register a date prior to 1940. The Future Value function accepts only three arguments and assumes that you’re putting in a certain amount of money every year. So you can compute an IRA investment of $2,000 per year, for example, but you can’t figure out what the return on a lump-sum investment will be. MacCalc offers a Lookup function, and it can sort selected cells.

MacCalc’s presentation and printing options are limited but adequate. You can set the font, size, and style for an entire spreadsheet as well as for individual cells. You can use standard cell borders for cells or groups, and row height is adjustable. When you print, you can frame an entire page and define a header and footer in a barely adequate dialog box.

MacCalc has no charting capabilities, which puts it far behind its competition.

Works

Whereas MacCalc is a disappointment, the spreadsheet module in Microsoft Works is a pleasant surprise.

The module offers many convenient features. You can split the window, paste with special options, move items without using the Clipboard, view cells as formulas or values, protect selected cells from being edited, and use cell notes.

A Works spreadsheet can be as large as 16,382 rows by 256 columns, and you can have as many sheets open as memory allows. Its 64 functions are comprehensive, but it can’t handle text formulas. It lacks string functions (which is forgivable), and if you check a cell with the Isblank function, it will tell you that the cell is blank even if it contains text. The Works spreadsheet module meets all the other basic functionality requirements, however, including having a lookup function and sorting capabilities.

The flaws in Works’ rudimentary presentation capabilities are compensated for by its drawing layer (see Figure 8).

Figure 8: Despite its text limitations, Works has the most useful spreadsheet module. By pasting a chart into Works’ drawing layer, you can disassemble the chart and alter its components. This figure shows the original data in the upper left of the spreadsheet.

Figure 9: Except for bold and underline, text formatting in a Works spreadsheet is global, so you can’t do much to make it look unique.
It offers five types of charts, and Works is the only spreadsheet program in this roundup besides Full Impact that allows a logarithmic x-axis so you can chart very disparate values on the same chart. With logarithmic scaling, you can chart things such as five workers turning out 300,000 widgets while seven workers make 600,000. Although charts are in a separate window and can’t be directly incorporated into a spreadsheet for printing, you can copy a chart and paste it into the floating drawing layer (charts in the drawing layer are no longer linked to the data that generated them). You can manipulate the chart in the drawing layer, changing fill patterns, moving elements around, and even exploding it if it’s a pie chart.

Works’ other presentation limitation is that you can’t format the text of individual cells except by using boldface and underlines — font and size choices affect the entire spreadsheet (see Figure 9). This problem is mitigated to a great extent by the drawing feature, whose text tool lets you type in any font, style, or size anywhere in the spreadsheet.

Works lets you define headers and footers for a printout in an archaic dialog box. Although this dialog box is non-WYSIWYG, it’s better than nothing.

In spite of its text limitations, Works’ spreadsheet module packs enough power to handle most general spreadsheet tasks.

The Bottom Line
If you’re looking for a small but useful spreadsheet program and you already have word-processing, database, and graphics programs, BiPlane is the best deal. It easily beats MacCalc, which costs more than twice as much, and BiPlane’s DA version is an extra convenience.

Recommending a spreadsheet module that’s part of a bundled package is much more difficult: The worth of the package depends on how good the other components are and how much you need them. Full Impact is undoubtedly the best spreadsheet program in this roundup, but it’s frustrating to use a hammer to kill a fly when flyswatters are available. Zedcor’s Desk package is a great approach if you need a little bit of everything, but keep in mind that you’re only getting a little bit — DeskCalc’s overall rating is fourth. (For more on the total Desk package, see review, January ’91, page 74.)

That leaves Microsoft Works, a tired- (that’s not a typo) but-true package that includes an adequate word processor, a limited database manager, a crippled communications program, and the most sensible spreadsheet program available.

Sharon Zardetto Aker is the primary author of the third edition of The Macintosh Companion and The Macintosh Bible, recently published by Addison-Wesley.
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BY
STEPHEN SATCHELL,
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digital-audiotape — DAT — cartridge is less than half an inch thick and smaller than a business card. But don’t let its petite dimensions fool you: One standard DAT cartridge can hold 1.3 gigabytes of data. That’s room for a double-spaced report stacked taller than the Washington Monument.

Even more surprising is how quickly this gargantuan capacity can be filled with 24-bit scanned images, color page layouts, sound files, and digital video. Ask anyone who works with monster-file makers such as Adobe Photoshop, Digidesign’s Deck, or QuarkXPress — a gigabyte of backup space just ain’t what it used to be.

The technology that crams such an enormous amount of data onto a tiny, inexpensive cartridge is the same that brings high-fidelity, concert-quality sound into the living rooms of the most-advanced audiophiles — hence the name digital audiotape. Add error-correcting circuitry, a SCSI port, and software, and you have the most cost-efficient backup technology available today. What’s more, heated competition among several manufacturers is making DAT drives more affordable daily. For this month’s report,
we tested 19 that start at a little less than $1,500, compared with $3,000 last year.

Two key advantages of DAT are its high capacity and low cost (see Figure 1). An 88-megabyte removable SyQuest cartridge costs about $175 and a 600-megabyte magneto-optical disc about $200, whereas a 60-meter DAT cartridge holds a minimum of 1.3 gigabytes and costs less than $20. Convenient transport is another factor: The low weight — less than 2 ounces — and sturdy construction of a DAT cartridge let you ship data across the country for pennies per megabyte.

DAT is not the first tape format available for the Mac — just the best. Earlier generations of backup tape may require a lower initial investment, but they don’t approach DAT’s storage capacity. For example, a data cartridge such as the Teac 60, which is similar to the popular Philips-type audicassette, holds only 60 megabytes; the 20-year-old quarter-inch 3M data cartridge can hold up to 250 megabytes; and its downsized brother the DC2080 holds 80 megabytes. DAT’s helical-scan technology — a technique that was originally designed for videotape recording that creates diagonal rather than
DAT Drives

How It Works: Helical-Scan Recording

In helical-scan recording, the read and write heads are mounted on a spinning drum that is mounted at a slight angle to the tape. The drum spins as the tape moves past it, and the heads track at a slight angle to the tape. This places the tracks of information in tightly packed narrow rows, saving space and allowing much information to be stored.

The digital audiotape is pulled out of the cartridge and guided around the drum.

The DAT cartridge has a hinged cover, similar to that of a videocassette, to protect the tape from dust and debris.

The drum spins as the tape moves past at a 90-degree wrap, which reduces friction between the tape and the drum.

Four heads are equally spaced around the drum. One pair of heads is for writing, and the other pair is for reading after writing — part of the error-checking process.

Helical-scan technology writes data in stripes at a shallow angle to maximize the use of the tape's surface area. The relationship between the spinning head and the stripes of data forms a helix, or corkscrew pattern.

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longitudinal tracks on the tape — has the older technologies beat by a mile (see the “How It Works: Helical-Scan Recording” sidebar).

DAT's only real competitor is another helical-scan technology: 8-millimeter videotape. Commonly known by the mechanism vendor's name — Exabyte — 8-millimeter drives store 2.2 gigabytes on a standard cartridge, and some advanced drives use hardware compression to cram up to 25 gigabytes onto a single cartridge — that's nearly 10,000,000 pages of text. However, DAT drives take up less desktop real estate, and their 4-millimeter cartridges are smaller and therefore easier to store and mail. Also, the cartridges are self-sealing, offering an extra margin of protection against environmental hazards such as dust and eraser crumbs. In addition, the cost of DAT equipment is dropping faster than that of 8-millimeter-tape storage systems and should continue to do so as mechanism manufacturers jockey for market share.

The 19 drives we tested for this month's report each use a mechanism from one of four manufacturers — Archive, Hewlett-Packard/Sony, WangDAT, and WangTek — and all use the DDS (Digital Data Standard) format for storing data on tape. DDS is the de facto standard for backup storage recently endorsed by the DDS Manufacturers' Group, a coalition of more than 20 drive vendors. DATA/DAT, an alternative DAT storage format that lets you mount your DAT cartridge on the desktop, is being adapted for use in multimedia environments, because its file-finding strengths make it ideal for file-by-file image retrieval. DDS, on the other hand, is strictly a streaming-tape technology and as such has faster throughput than DATA/DAT. If the data is compressed as it's being written onto the tape — an increasingly popular tactic — throughput can also be increased (see the “Compression Drives” sidebar).

Reliability, however, is more important than mere speed: When you need to restore a file from a DAT cartridge, it had better be intact. We conducted our tests accordingly. In addition to timing a series of backup and restore operations, we checked the integrity of the data at each step, using CompareFolders, a MacUser Labs custom application. We also assessed ease of use, evaluated distinguishing features, and examined the manufacturing quality of each drive's internals.

**Plug-'n'-Play Installation**

When we looked under the hood of each drive, we found a few surprises — all pleasant. Although all the drives are well designed and built, some deserve special mention. The APS Archive Python, Irwin 9131Se, and PCPC DATStream each use a compact 3.5-inch Archive mechanism with plenty of high-grade metal to shield the drive's electronics from the power supply and the tape-transport mechanism. Such high-quality protection also shields the heads from radio-frequency interference. The hefty Tecmar DAT-Vault also has a lot of shielding.

The ADIC MacBack DAT has a large cabinet that holds a 105-watt power supply, even though the DAT drive requires no more than 20 watts. Fortunately, the MacBack's fan keeps the air moving, so the drive runs cool.

All the units we tested are shipped as complete packages: drive, SCSI cable, and software. Installing a DAT drive is as simple as finding a free spot on your desk and cabling the drive to your Mac. If the DAT drive is the only external SCSI component of your system, just use the Mac-to-drive cable — with a 25-pin connector on one end and a 50-pin connector on the other — supplied by the manufacturer. If you

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**Compression Drives**

Data compression typically almost doubles or triples the amount of data a DAT drive can squeeze onto a given length of tape. A compression algorithm, stored in the DAT drive's hardware, replaces multiple patterned bytes — in text, spreadsheet, or graphics files, for example — with shorter code, thus saving space. Different algorithms achieve varying levels of compression, but capacity is usually doubled or tripled. The composition of the file also plays a part in how much it will actually be compressed: If there's a lot of redundant data — such as a large area of the same color in a graphics file — compression will be greater. If the data has already been compressed — by StuffIt or another such program, for example — the algorithm might not be able to shrink it further.

Two compression standards have emerged in the data-DAT world. The DDS-DC (Digital Data Standard-Data Compression) format is endorsed by the DDS Manufacturers’ Group. The alternative is Group Compression, as implemented in the Stac compression chip used in the Archive, WangDAT, and WangTek compression mechanisms. The WangDAT 2600 uses a Stac compression chip that can double the amount of data that fits on a DAT cartridge. The newer Mystic chip, used in HP/Sony mechanisms, can squeeze data into as little as a third of the space it would normally occupy.

The two algorithms are not compatible — if you compress files on an HP/Sony mechanism, you won't be able to restore the tape on a WangDAT 2600 mechanism. But backups made with compression turned off can be restored by either mechanism. The next generation of DAT drives is expected to enable all mechanisms to read and decompress tapes, using either algorithm, although non-native-format reading and decompression will occur more slowly.

In addition to increasing capacity, compression increases throughput. MacUser Labs ran the same suite of backup and restore benchmark tests on the MicroNet MD-5000 and the TTI CTS-4M Plus, which use the WangDAT 2600 mechanism with on-board compression. We averaged the results and compared them with the average of all the WangDAT 1300-based drives. Overall throughput for our tests was about 15 percent faster with compression. This increase is not a hard-and-fast number, though — depending on the files being compressed, more data or less can get squeezed onto the tape.
DAT Drives

Figure 1: Costs of Backup Systems

Because inexpensive 8-millimeter Exabyte and DAT cartridges can store so much data, each additional gigabyte costs relatively little.

Beyond about 500 megabytes, removable cartridges are no longer cost-effective.

Figure 1: The more files you need to store, the more you should consider DAT. We compared the costs of various backup systems — the cost of a single drive plus media — and found that DAT drives are the most cost-effective backup devices if you need to store more than 8 gigabytes.

Already have an external hard-disk drive, scanner, or other SCSI device, you'll need to get a drive-to-drive cable with 50-pin connectors on each end — unless you buy a DynaTek DAT 1300 or an EMAC Metro DAT, which also include a drive-to-drive cable.

All the drives have an external switch for setting the appropriate SCSI-ID number. Most use external SCSI-bus terminators, except for the HDI POWERDrive 1.3 Giga DAT, MacTel INDEX 2.0 GB DAT, and Third Wave DAT drive 2.0 GB — these must be the last device in your SCSI chain. (Third Wave offers external termination for an additional $19.) The MacProducts MagicTape 1.3 GB drive housing includes a convenient feature — switched outlets for connecting your Mac and other peripherals.

After you've connected the cables and set the SCSI ID, you can turn on your Mac and the DAT drive — the DAT drive first, as with any SCSI peripheral. No icon appears on your desktop, because the DAT DDS format is not desktop-mountable. You need backup software to use the drive; simply drag the software from the installation floppy disk to your Mac's hard disk, or run the installation program.

Solid Software

Although you might think 1,331 megabytes is impossible to fill, it isn't if you back up all your files (do a complete backup) or a complete network every time. Fortunately, all the backup software bundled with the DAT drives lets you save media — and time — by making incremental backups of your files — backing up only new or changed files, once you have a complete backup on tape.

None of the software is difficult to use, but HammerBackup 1.1E, bundled with the FWB HammerDAT 1.3G, and Nightshift 1.5, bundled with the TTI CTS-4M, although limited in features, get extra credit for ease of use. Nightshift is designed for backing up many Macs over an AppleTalk network (see "Overnight Success: Network Backup," August '91, page 112), but it can also back up a single Mac connected to any TTI tape drive.

AD-Mac Backup 1.1, bundled with the CMS Platinum DAT, has a few shortcomings. It has no activity log, nor does it have a dialog box to notify you of the success or failure of a backup — basic features that should be part of every backup application. Fortunately, a new release of AD-Mac Backup that
addresses these problems should be available by the time you read this.

Of the 19 drives we tested, 13 are bundled with a version of Retrospect 1.2, from Dantz Development. Retrospect’s sophisticated feature set makes it hard to beat. As you select the files you want to back up, Retrospect saves your commands in a default script so that the next time you back up, your settings are waiting for you. It also lets you create and name other scripts, so you can build a library of backup procedures. You can also use Retrospect’s Calendar and Auto Launch features to automate backups completely.

The EMAC Metro DAT, FWB HammerDAT L3G, MicroNet CPKD-2000, and Peripheral Vision PV-DAT are bundled with a four-user version of Retrospect Remote 1.2, enabling backup over a network. ADIC’s MacBack 2.02, bundled with the ADIC MacBack DAT, and PCPC’s NetStream 2.0.4, with the PCPC DATStream, also let you back up several Macs over a network. Tecmar’s QTBackup 2.04 is nearly as powerful as Retrospect, having extensive file-selection and scripting capabilities. With the addition of the QTShare utility, QTBackup can also back up over a network. For a limited time, Tecmar is bundling QTShare with QTBackup at no extra charge.

**Some Twists on Tape**

To perform a backup, insert a fresh DAT cartridge into the drive, label side up and with the write-protect switch in the correct orientation—moved to the right. Each drive vendor recommends certain types of cartridges for use with its drive, and to be safe—and also to avoid warranty hassles—you should follow the recommendation of the vendor.

Two grades of DAT cartridges are available: audio-grade-DAT cartridges are designed for sound recording, and data-grade cartridges are specially made for DAT drives that will be used for data storage. Many vendors ship audio-grade-DAT cartridges with their drives, and if you follow their recommendations for using these tapes, you’ll save money in the long run (see the “Audio-Grade Versus Data-Grade DAT” sidebar).

The tape inside data-grade-DAT cartridges is available in two lengths—60 meters and 90 meters. Until recently, all digital audiotaope was .5-millimeter thick, and 60 meters was the maximum length of tape that would fit in a cartridge. A 60-meter tape can
DAT Drives

Figure 2a: Of the 19 drives we tested, 13 come bundled with Retrospect, which features scripting, a calendar, and automatic launching.

Figure 2b: The Relax Tape Vista DAT is bundled with Diversified I/O's SoftBackup II backup software. As with Retrospect, you can create scripts that run when scheduled.

hold a maximum of 1.3 gigabytes without compression and 2.5 gigabytes with compression. So that 90 meters of tape would fit into the cartridge, the tape was made thinner - .4 millimeters thick. With a 90-meter cartridge, you can store 2.0 gigabytes without compression, 3.7 gigabytes with standard compression, and theoretically - more than 5 gigabytes with advanced hardware compression techniques. Because the thickness of the tape is different and the delicate DAT mechanisms must be able to adapt, not all drives can accommodate both 60- and 90-meter tape. But if a drive accepts 90-meter tape, it will also accept 60-meter tape. Just about all vendors are modifying their mechanisms to support both lengths.

As you slide the cartridge into the drive, the mechanism grabs the cartridge and pulls it into the slot, much as a VCR pulls in a videocassette. When you insert a blank cartridge, the DAT drive typically locates the beginning of the tape and places header information there. Some of the backup software refer to this process as initialization; some call it formatting. Regardless of what the process is called, it shouldn't take very long — say about 30 seconds — to prepare a new blank tape. The TTI CTS-4M, however, takes about 3 minutes, because it also checks the tape's quality.

You use the backup software to select the files you want backed up and to specify when you want the backup to occur. All the software lets you schedule backups, so you don't have to babysit the drive (see Figures 2a and 2b). But don't leave the cartridge in the drive for too long — leaving the tape pressed against the heads of the mechanism can result in deposits building up on the heads.

DAT-Drive Maintenance

Just as with your VCR, the heads of your DAT drive require occasional cleaning to keep them working properly. Be sure to find out early on how to clean your drive's heads: Some are self-cleaning, and others require cleaning after a given number of hours of operation. The FWB HammerDAT 1.3G, PLI PLI DAT Drive, Tecmar DATaVault, and Third Wave DATaDrive 2.0 GB are self-cleaning, but instructions on the others vary as to occasional cleaning. Be sure to check the manual for particular cleaning requirements.

If you do have to clean a drive, use only a DDS cleaning cartridge such as the Sony DG-5CL; audio-grade cleaning cartridges are not the same and can cause excessive wear of the DAT drive's read and write heads. Label your cleaning cartridge, keep track of the number of cleanings, and discard the cartridge when you reach its limit — usually about 25 cleanings, but check the cartridge manufacturer's specifications.

Speedy Backup

We connected each DAT drive to a Mac IICI with 30 megabytes of files tucked into folders on its hard disk. We then ran each drive through a battery of backup-and-restore benchmark tests: We timed a complete backup and a complete restore and then modified a file three times in succession, each time performing an incremental backup. We also timed how long it took each DAT drive to restore a single file and to restore the last file in the backupset. After each restore, we used our ComparesFolders utility to confirm that the data was intact. We repeated these tests with at least three cartridges provided by the drive vendors.

All DAT drives have a fixed data-transfer rate of 183K per second, but actual performance is affected by how well the software manages the catalog, or directory of files, and by the tape-positioning technology within each of the drive mechanisms. The nine fastest performers each use an Archive mechanism, and seven of these use Retrospect software (see Figure 3). Next in line come the FWB HammerDAT, Tecmar DATaVault, Procom MDAT1300/M, EMAC Metro DAT, and CMS Platinum DAT; all but the Tecmar DATaVault use a WangDAT.
mechanism. WangTek mechanisms are used in the three slowest performers — the PLI PLI DAT Drive, Third Wave DATdrive 2.0 GB, and MacProducts MagicTape 1.3GB.

In the test that consisted of a complete backup of a 30-megabyte folder, the Peripheral Vision PV-DAT ranked first, at a bit over 3 minutes — impressive speed, given that copying the same files from one hard disk to another in the Finder took about 15 seconds more. The Third Wave DATdrive 2.0 GB came in last, at 5.5 minutes.

Retrospect is optimized to work with MultiFinder. By and large, most of the drives fared better under MultiFinder than under the Finder, with the exception of the PCPC DATStream, Relax 1.2 Gig Tape Vista, CMS Platinum DAT, TTI CTS-4M, and MacProducts MagicTape 1.3GB. The Tecmar DATaVault was equally slow under both the Finder and MultiFinder, turning in times of close to 5 minutes.

Times for restoring the files were not as wide-ranging, because the Mac can accept only so much data at a time.

The ADIC MacBack DAT — the only drive in the group that uses an HP mechanism — stands out as being much slower than the others in the complete-restore test.

In addition to restoring files when disaster strikes, you may also want to selectively restore (retrieve) files that have been removed for permanent storage, or archived. You may, for example, want to retrieve all the graphics and financial files from last year’s annual report for use as a starting point for this year’s annual report.

### On the Horizon

Even though DAT backup and storage is only now gaining acceptance in the Mac marketplace, vendors are already rushing to upgrade their drives. For example, most mechanisms can now use 60- or 90-meter tape interchangeably and many include compression as a standard feature.

DynaTek recently announced the DAT 2600 ($3,295), which uses a new 3.5-inch ARDAT 2600 compression mechanism that can handle 60- and 90-meter tapes. With compression and 90-meter tape, the DAT 2600 can hold as much as 8 gigabytes of data; the drive will be bundled with Retrospect 1.3. DynaTek Automation Systems, Inc., 15 Tangiers Road, Toronto, Ontario M3J 2B1, Canada (416) 636-3000.

Liberty Systems is packaging the compact Archive 3.5-inch mechanism in a sleek black case and calling it the Liberty DAT ($1,995). The drive weighs just 3 pounds and is bundled with Retrospect 1.3. Liberty Systems, 160 Saratoga Avenue, Suite 38, Santa Clara, CA 95051; (408) 983-1127.

Lovič Computers is now shipping the Maxcess 1300D ($2,295) and the Maxcess 2600D ($2,695). The Maxcess 1300D uses the WangDAT 1300 mechanism, and the Maxcess 2600D uses the WangDAT 2600, which has on-board compression. Both are bundled with Retrospect 1.3. Lovič Computers, 250 Park Avenue S., New York, NY 10003; (212) 979-8824, ext. 280.

MacDirect is now bundling a WangDAT 1300 DAT drive ($1,698) with Diversified I/O’s SoftBackup II. It doesn’t offer compression, but the price is certainly right. MacDirect, 5251 W. 73rd Street, Suite I, Edina, MN 55439; (800) 621-8461.

By the time you read this, Microtech’s T1200 ($2,799) DAT drive, based on the WangDAT 1300 mechanism, will have been replaced by the Microtek T2000. No price is known yet, but the T2000 isn’t expected to cost much more than the T1200. The T2000 uses the new WangDAT 2000 mechanism, which features support for 60- and 90-meter tapes as well as compression, so its storage capacity will range from 1.3 to 5 gigabytes. The compression scheme is WangDAT’s own, but the drive will also be able to decompress and read data that has been compressed with DDS-DC compression. Included in the package is Microtek’s new RunningBack tape-backup software. Microtek is bundling RunningBack with all its drives, including streaming-tape and optical drives. Microtek International, 135 Commerce Street, East Haven, CT 06512; (203) 468-6223.

Tallgrass Technology, a familiar name to PC users, is moving into the Mac market with its FS1300 DAT drive ($4,595). It uses a WangTek mechanism and is bundled with Retrospect 1.3. Tallgrass Technology, 11100 W. 82nd Street, Lenexa, KS 66214; (800) 736-6002.

Tecmar will be shipping a new version of the DATaVault, featuring on-board compression, support for 60- and 90-meter tape, and new QTBackup 3.0 software — and at the same price as the earlier DATaVault. For a limited time, Tecmar is bundling QTShare with all of its drives, including the new DATaVault. Tecmar, Inc., 6225 Cochran Road, Solon, OH 44139; (800) 624-6550 or (216) 349-0600.

Backup software is advancing as well. Dantz Development released Retrospect 1.3 ($449) just as we finished testing. This version is System 7-compatible and expands the maximum amount of data you can back up in a single session from 2 gigabytes to 4,096 gigabytes — 4 terabytes — enough room to store 1,500,000,000 pages of single-spaced text. Of course, no drive exists that can take full advantage of this astounding capacity — yet. Vendors bundling Retrospect with their DAT drives should be offering the newer version by the time you read this. Dantz Development Corp., 1400 Shattuck Avenue, Suite 1, Berkeley, CA 94709; (415) 849-0293.

Retrospect’s expanded storage capacity is going to come in handy if you manage a large network and plan to use a DAT stacker, or jukebox, to help snap all your data. In August PLI announced the DAT Stacke, built around a WangTek mechanism and with the ability to hold up to eight 90-meter DAT cartridges. The Stacke is expected to retail for less than $10,000 and is bundled with Retrospect 1.3. PLI, 47421 Bayside Parkway, Fremont, CA 94538; (800) 288-9754.

Expect to see other vendors packaging Archive’s PythonSLE DAT Auto Loader, which has a five-cartridge magazine, uses either 60- or 90-meter DAT cartridges, and features optional magazines that hold as many as 16 cartridges. Archive Technology, 1650 Sunflower Avenue, Costa Mesa, CA 92626; (714) 641-1230.

CMS Enhancements should be shipping AD-Mac Backup 1.2 backup software, a completely revamped version featuring compression as well as System 7 compatibility, by the time you read this. CMS has also announced the CMS Platinum DAT 2600 ($3,999), which is based on the WangDAT 2600 and features on-board compression. CMS Enhancements, 2722 Michelson Drive, Irvine, CA 92715; (714) 222-6000.

— Darryl Gahn
**Figure 3: DAT-Drive Speed**

<table>
<thead>
<tr>
<th>Drive Type</th>
<th>Overall Time</th>
<th>Complete Backup</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCCP</td>
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<tr>
<td>DATstream</td>
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<td>Peripheral Vision</td>
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<td>PV-DAT</td>
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<td>MacTel</td>
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<td>INDEX 2.0 GB DAT</td>
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<td>MicroNet</td>
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<td>CPKD-2000</td>
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<td>HDI</td>
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<td>POWERDrive 1.3 Gig DAT</td>
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<td>APS</td>
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<td>Archive Python</td>
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<tr>
<td>DynaTek</td>
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<td>DAT1300</td>
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<td>Irwin</td>
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<td>9131Se</td>
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<td>Relax</td>
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<td>1.2 GigTape Vista</td>
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<td>Precon</td>
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<td>MDAT1300/M</td>
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<td>CMS</td>
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<td>Platinum DAT</td>
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<td>ADIC</td>
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<td>MacBack DAT</td>
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<td>TTI</td>
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<td>CTS-4M</td>
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<tr>
<td>PLI</td>
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<tr>
<td>PLI DAT Drive</td>
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<td>Third Wave</td>
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<tr>
<td>DATdrive 2.0 GB</td>
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<tr>
<td>MacProducts</td>
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<tr>
<td>MagicTape 1.3GB</td>
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**Figure 3:** Good DAT-drive performance is a combination of powerful hardware and efficient software.

**Overall Time:**
We tested each drive with a 4-megabyte Mac IICi and a Quantum 80-megabyte hard drive holding 30 megabytes of files. A drive’s performance is linked to its mechanism and the software it uses — the top nine performers use the Archive mechanism, and seven of these use Retrospect software.

**Complete Backup:**
We backed up a 30-megabyte folder under the Finder and under MultiFinder and found that most software is optimized for running under MultiFinder. The Peripheral Vision PV-DAT was the fastest drive here, taking only about 3 minutes to back up the 30 megabytes.

**Complete Restore:**
The restore speeds don’t vary much from drive to drive, showing that the bottleneck is the speed at which the Mac can read the
Incoming data. However, the ADIC MacBack DAT — the only drive that uses an HP mechanism — was noticeably slower than the rest.

Incremental Backup:

An incremental backup saves time — and tape — by backing up only those files that have changed since the complete backup. This test highlights how well the software and hardware work together to keep track of what's on the tape, because the backup software must refer to the catalog of files that make up the complete backup and figure out which files need to be added. The MicroNet CPKD-2000 was almost 7 times as fast as the Tecmar DATaVault.

Incremental Restore:

The time it took the Tecmar DATaVault to perform an incremental backup was compensated for during incremental restore — the DATaVault’s speed on this test was impressive, despite the drive’s use of the slower WangTek mechanism. The Tecmar DATaVault was almost 15 times faster than the fastest Archive/Retrospect combo.
DAT Drives

Depending on the indexing methods the software uses, selectively retrieving a file can take a lot longer than restoring all the files or restoring an incremental-backup session. Because Retrospect is optimized for the two functions that DAT-drive users perform most frequently — backing up and restoring — it can take much longer to retrieve a single file — up to six times as long in extreme cases.

DAT to the Rescue

The Mac has earned its reputation as a great graphics workstation, but as a result, large 24-bit-color files, scanned images, and other such megafles abound — 20-, 30-, and 40-megabyte Photoshop files are not uncommon. With the advent of multimedia, enormous sound and video files are also becoming commonplace. Large files translate into large, jam-packed hard disks. For most users, the days of backing up onto a fistful of floppies are long gone. Quarter-inch tape and other media don’t offer the same high capacity and low cost in as small a package as digital audiotape. DAT drives bring fast, reliable, and competitively priced backup to your desktop — or to your network.

All the drives we looked at are complete hardware and software packages that you can begin using today to safely store your hard-earned data. DAT’s large storage capacity and tiny cartridges save you time and money, especially when you’re working with high-capacity hard disks. Speed differences form clear-cut lines behind the different drive mechanisms, and software plays a role in how easy backup can be.

Stephen Satchell is a consultant and writer. H. B. J. Clifford is a former InfoWorld editor and coauthor of DBXl and Quicksilver Programming: Beyond dBASE.

### The Bottom Line

Using digital-audiotape (DAT) cartridges is a fast and economical way to store large amounts of data. Each 60-meter DAT cartridge holds 1.3 gigabytes without compression, making DAT ideal for multimegabyte hard-disk and network backup. You can direct your DAT drive to automatically back up your hard disk completely once a week and to perform incremental backups twice weekly — and keep all the data on the same DAT cartridge.

The 19 DAT-drive packages we tested use mechanisms from four manufacturers — Archive, Hewlett-Packard/Sony, WangDAT, and WangTek — and 13 bundle Retrospect backup software. The top 9 performers use Archive mechanisms, and 3 — the APS Archive Python ($1,499 direct), Irwin 5131Se ($3,695 list, $3,400 street), and PCPC DATStream ($3,995 list, $2,195 street) — use Archive’s compact brick-sized case. In addition to the APS Archive Python, a few other price-busters are among the top drives: the DynaTek DAT 1300 ($1,795 list, $1,495 street), HDI POWER Drive 1.3 Gig DAT ($1,495 direct), MacTel INDEX 2.0 GB DAT ($1,799 direct), and Relax 1.2 Gig Tape Vista ($1,448 direct).

Seven of the top nine performers are bundled with a version of Dantz Development’s Retrospect software; the MicroNet CPKD-2000 ($2,295 list, $2,000 street) and the Peripheral Vision PV-DAT ($2,295 list, $1,799 street) come bundled with a four-user version of Retrospect Remote for backing up small networks.

The PCPC DATStream is also designed for network backup, but it ships with PCPC’s NetStream software rather than with Retrospect — if you’re considering this one for your network, be sure to check out our August ’91 network-backup story: In our tests, NetStream was fine in stand-alone mode, but the software was cumbersome to use on a network and network speed results weren’t the greatest. PCPC promises that a new version of the software will be shipping by the time you read this — we recommend that you wait until it is.

The Relax 1.2 Gig Tape Vista is the only other of the top nine performers that doesn’t have Retrospect bundled; its software, SoftBackup II, from Diversified I/O, isn’t as powerful as Retrospect, but we didn’t have any problems with it. Speed differences among the top performers are insignificant, and we wouldn’t hesitate to recommend any Archive/Retrospect bundle.

### Table 1 Criteria

| List price | The list price is the vendor’s suggested retail price. |
| Street price | The street price is a typical actual price charged by dealers or mail-order companies during June 1991. |
| Mechanism | The manufacturer and model of the mechanism in the drive. |
| SCSI ID selector | The control used to set the SCSI ID for the drive. |
| SCSI termination | Whether the SCSI-bus terminator is inside the case or outside it. |
| Recommended media | The class or brand of tape the vendor suggests you use with the drive. |
| Acceptable media | The brand or class of tape the vendor doesn’t object to your using if the recommended media are unavailable. |
| Formats supported | The data-storage format the drive supports. DDS (Digital Data Standard) is the common format for DAT data storage. |
| Compression drive price | The model name and price of a drive with compression built in, if the vendor offers one. |
| Cleaning frequency | The number of hours between necessary cleanings, if required. |
| Cleaning indicator | Does the drive have an indicator light to keep you aware of the drive’s need for cleaning? Self-cleaning drives don’t require such an indicator. |
| Read after write | Does the drive immediately read the data it has just written, without reversing the travel of the tape? |
| 90-meter-tape support | Does the vendor approve of use of this longer but thinner tape in the drive? |
| Fan | Does the drive contain a cooling fan? |
| System 7 support | Is the drive’s backup software compatible with System 7? Retrospect 1.2 isn’t, but Retrospect 1.3 is — and the upgrade is free. |
| Backup software | Can the software and hardware read server-based data on a client machine (as opposed to backing up the entire server or doing client/server backup on the network)? |

Backup software — Bundled software for backing up and restoring files.
<table>
<thead>
<tr>
<th>Feature</th>
<th>ADIC MacBack DAT</th>
<th>APS Archive Python</th>
<th>CMS Platinum DAT</th>
<th>DynaTek DAT 1300</th>
<th>EMAC Metro DAT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>List price</strong></td>
<td>$4,995</td>
<td>$1,499</td>
<td>$3,399</td>
<td>$1,795</td>
<td>$2,995</td>
</tr>
<tr>
<td><strong>Street price</strong></td>
<td>$4,495</td>
<td>$1,499</td>
<td>$2,899</td>
<td>$1,495</td>
<td>$2,085</td>
</tr>
<tr>
<td><strong>Pros</strong></td>
<td>Solidly built, Easy-to-use software.</td>
<td>Fast, Inexpensive, Compact case.</td>
<td>Excellent hardware manual.</td>
<td>Fast, Inexpensive.</td>
<td>SCSI Sentry protection also provides termination power for Mac Plus.</td>
</tr>
<tr>
<td><strong>Cons</strong></td>
<td>Slow, Expensive. Heavy, Oversized case and power supply.</td>
<td>Limited software. No activity log.</td>
<td>Poor performance in incremental-restore tests.</td>
<td></td>
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</tr>
</tbody>
</table>

**Hardware**

- **Mechanism**
  - ADIC: HP 35450-67901
  - APS: Archive 4330
  - CMS: WangDAT 1300
  - DynaTek: Archive 4520NT
  - EMAC: WangDAT 1300

- **SCSI-ID selector**
  - ADIC, APS, CMS: dial
  - DynaTek, EMAC: push button

- **Recommended media**
  - 3M
  - Sony, Maxell
  - Maxell

- **Acceptable media**
  - Sony, TDK (data-grade)
  - any premium-brand DAT
  - Sony
  - any 60-meter DAT
  - Maxell

- **Formats supported**
  - DDS, Data/DAT
  - DDS
  - DDS
  - DDS

- **Compression drive and price**
  - None
  - WangDAT 2600, $1,999
  - DAT 2600, $2,095

- **Cleaning frequency**
  - 25 hours
  - 10 hours
  - 20 hours
  - 20 hours

- **Cleaning indicator**
  - ○
  - ◯
  - ○
  - ○

- **Read after write**
  - ●
  - ○
  - ●
  - ●

- **Fan**
  - ●
  - ○
  - ●
  - ○

**Software**

- **System 7 support**
  - ○
  - ●
  - ◯

- **Backup AppleShare vols.**
  - ●
  - ○
  - ●

- **Backup software**
  - MacBack 2.02
  - Retrospect 1.2
  - AD-Mac Backup 1.1
  - Retrospect 1.2
  - Retrospect Remote 1.2

**Other**

- **Dimensions (L x W x H)**
  - 14.5 x 10.5 x 5.5 in.
  - 9.3 x 5.3 x 3.4 in.
  - 11 x 10 x 3 in.
  - 9.8 x 9.8 x 2.3 in.
  - 10.7 x 8.7 x 2.8 in.

- **Weight**
  - 12 lb
  - 4.7 lb
  - 7 lb
  - 7 lb

- **Case material**
  - Metal
  - Plastic
  - Plastic
  - Plastic

- **Warranty**
  - 1 year
  - 2 years
  - 1 year
  - 1 year
  - 2 years

**Company**

- **ADIC**
  - 14737 N.E. 87th St.
  - Redmond, WA 98073
  - (800) 336-1233
  - (206) 881-8004

- **APS**
  - 2900 S. 291 Hwy.
  - Independence, MO 64057
  - (800) 233-7550
  - (816) 478-8300

- **CMS Enhancements**
  - 2722 Michelson Dr.
  - Irvine, CA 92715
  - (714) 222-6000

- **DynaTek Automation Systems, Inc.**
  - 15 Tangiers Rd.
  - Toronto, Ontario M3J 2B1
  - (800) 821-0806

- **EMAC Automation**
  - 48431 Milmont Dr.
  - Fremont, CA 94538
  - (415) 683-2155

*Most mechanisms will support 90-meter tape by the time you read this.*
The only thing missing from our new spreadsheet is the learning curve.

So, You Want It All Now.
With a billion cells and 149 advanced business functions, Resolve is powerful enough to meet your spreadsheet needs now and in the future. Yet its power is readily accessible—for example, zooming, so you can choose to see the forest or the trees.

Effortless Graphs.
Making charts and graphs with new Resolve is so easy it makes your head spin. Select your data. Select one of 25 chart types and the results appear before your eyes.

The Ultimate Scripting Tools.
For power users, the Resolve scripting language provides a fully structured development environment, to create ingenious, customized applications. For new users, Resolve automatically writes a script by recording your actions. One click on the assigned button automatically triggers the script.
Finished in a Flash.
Create graphics and handle text with tools you're already comfortable with. Select colors from the 81-color palette. Your important presentations have never been easier to prepare.

The System 7 Spreadsheet

Introducing Claris Resolve.

A spreadsheet was never the sort of thing to inspire fantasies. But then along came the new Claris® Resolve™ spreadsheet.

For the first time, Resolve lets spreadsheet power flow to your fingertips freely and intuitively. It utilizes interfaces, tools and commands familiar to anyone who's ever used a Mac. Nothing comes between you and complete spreadsheet performance.


But lurking just beneath the surface are enough tricks to inspire any power user. 149 built-in functions to help solve any business problem. 25 kinds of charts and graphs to excite the most jaded audience. Elegant, built-in database functions so you can swiftly access your data. And advanced analytical solutions to impress the math wizards.

Here's just one example of the outstanding design of Resolve. With Resolve, you can modify graphs directly in your spreadsheet. You don't have to switch back and forth between spreadsheet and chart modes. Think of the time savings. Not to mention the ease.

Yet, perhaps the most shining quality of Resolve is how it exploits System 7's most powerful functionalities — Publish & Subscribe and Inter-Application Communication. With Resolve, you can put charts in other documents and files and link them dynamically — so when you change any information in the spreadsheet, all the linked charts change as well. What's more, you can create hybrid solutions, like creating a HyperCard® program to access a database, send data to Resolve, and create and display a chart. All automatically.

New Resolve is the latest addition to the Claris family of software for System 7 — a new generation of applications that work together more simply, more powerfully, more gracefully than any software for the Macintosh ever has before.

Special offer for owners of other spreadsheets*: Get Claris Resolve for only $99. Call 1-800-544-8554, ext. 97.

Simply powerful software™


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## Table 1: Features of DAT Drives, continued

<table>
<thead>
<tr>
<th>Company</th>
<th>Hardware</th>
<th>Software</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>FWB</td>
<td>WangDAT 1300</td>
<td>档案4520NT</td>
<td>Dimensions (L x W x H) 9.8 x 9.5 x 2.3 in.</td>
</tr>
<tr>
<td>HDI POWERDrive</td>
<td>Archive 4520NT</td>
<td>档案4330</td>
<td>Weight 6 lb</td>
</tr>
<tr>
<td>Irwin</td>
<td>WangTek 6130FS</td>
<td>档案4520NT</td>
<td>Case material metal</td>
</tr>
<tr>
<td>MacProducts</td>
<td>HDI</td>
<td>Retrospect 1.2</td>
<td>Warranty 1 year</td>
</tr>
<tr>
<td>MacTel INDEX</td>
<td>Retrospect Remote 1.2</td>
<td>Retrospect 1.2</td>
<td>Company FWB, Inc.</td>
</tr>
</tbody>
</table>

*Most mechanisms will support 90-meter tape by the time you read this.*
MORE JASMINE BREAKTHROUGH FEATURES!

CLIPPER:
• External pocket clip for mobility
• External SCSI selection switch
• No Termination required
• Termination plug available for other peripherals
• Two-year warranty
• Sub 20-millisecond access time

REMOVABLE:
• Includes cartridge and cables
• 24-hour factory burn-in
• Dust-free • Reliable • Designed for reliability • Fast front bezel for dust-free environment and filtered air intake • New software corrects 99% of bad sector problems through on-the-fly relocation • Over engineered auto switching power supply with externally accessible fuse • Exclusive active Termination automatically adjusts the settings • SCSI address switch adjustable from push button • New init allows mounting of cartridges from all competitive vendors including Mass Micro, Rodime and PLI

PORTABLE:
• Fast (from 19ms) • Exceptionally quiet (less than 35db) • 40-120MB • 2 SCSI 50-pin connectors
• Exclusive active Termination • External SCSI switch • Low power insures Mac compatibility

COLORVUE:
• 14" high-resolution color monitor • 640 x 480 resolution • Palette of 256 simultaneous colors • Swivel/tilt base • Power-on and control switches on front • Non-glare screen

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AND MONITORS!
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• DiskDoubler from Salieni.

LIBRARY B • “Office Productivity”
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• Business Letters and Sales Letters from Lightning Word; ClickArt Sampler by T/Maker.

LIBRARY C • “Fonts”
• Fluent Laser Fonts from Casady & Greene (79 fonts)

LIBRARY D • “Entertainment Package”
• Crystal Quest; Mission Starlight; Sky Shadows.

OPTIONS
• After Dark; DiskDoubler; Virrex: Retrospect
• May be added to any of the above libraries.

* Jasmine libraries are available only at the time of
Driver/Monitor purchase.

MEMORY
1 Meg SIMMs
$39.95

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1-800-347-3228
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1225 Elko Drive, Sunnyvale, California 94089.
Featured products and pricing are valid in the 50 United States.
For international inquiries call (408) 752-2900 or fax (408) 752-2916.
## DAT Drives

### Table 1: Features of DAT Drives, continued

<table>
<thead>
<tr>
<th>Company</th>
<th>DAT Drive</th>
<th>List price</th>
<th>Street price</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLI</td>
<td>PLI DAT Drive</td>
<td>$2,995</td>
<td>$2,450</td>
<td>Well-organized manual.</td>
<td></td>
</tr>
<tr>
<td>Procom Technology, Inc.</td>
<td>MDAT1300/M</td>
<td>$3,795</td>
<td>$2,500</td>
<td>Brief, easy-to-read manual.</td>
<td></td>
</tr>
</tbody>
</table>

### Hardware

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Archive 4320NT</th>
<th>Archive 4390</th>
<th>Archive 4520NT</th>
<th>WangTek 6200HS</th>
<th>WangDAT 1300</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCSI-ID selector</td>
<td>push button</td>
<td>push button</td>
<td>push button</td>
<td>dial</td>
<td>dial</td>
</tr>
<tr>
<td>SCSI termination</td>
<td>external</td>
<td>external</td>
<td>external</td>
<td>external, switchable</td>
<td>external</td>
</tr>
<tr>
<td>Recommended media</td>
<td>TDK</td>
<td>Sony</td>
<td>Peripheral Vision</td>
<td>WangTek, DicDat</td>
<td>Procom</td>
</tr>
<tr>
<td>Acceptable media</td>
<td>data-grade DAT</td>
<td>data-grade DAT</td>
<td>Maxell</td>
<td>WangTek/Sony, JVC,</td>
<td>Fuji</td>
</tr>
</tbody>
</table>

### Formats supported

<table>
<thead>
<tr>
<th>Compression drive and price</th>
<th>DDS</th>
<th>DDS</th>
<th>DDS</th>
<th>DDS</th>
<th>DDS</th>
</tr>
</thead>
</table>

### Cleaning frequency

<table>
<thead>
<tr>
<th>Cleaning frequency</th>
<th>once a month</th>
<th>30 hours</th>
<th>10 hours</th>
<th>self-cleaning</th>
<th>200 hours</th>
</tr>
</thead>
</table>

### Software

| System 7.0 support                   | ⚪               | ⚪           | ⚪            | ⚪             | ⚪         |
| Back up AppleShare vols.             | ⚪               | ⚪           | ⚪            | ⚪             | ⚪         |
| Backup software                      | NetStream 2.0.4  | Retrospect Remote 1.2 | Retrospect Remote 1.2 | Retrospect 1.2 | Retrospect 1.2 |

### Other

<table>
<thead>
<tr>
<th>Dimensions (L x W x H)</th>
<th>7.8 x 6.3 x 2.3 in.</th>
<th>9.3 x 5.3 x 3.4 in.</th>
<th>10 x 10 x 2 in.</th>
<th>9.8 x 9.8 x 2.4 in.</th>
<th>10.3 x 9.7 x 2.3 in.</th>
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</thead>
<tbody>
<tr>
<td>Weight</td>
<td>3 lb</td>
<td>4.7 lb</td>
<td>9 lb</td>
<td>6 lb</td>
<td>10 lb</td>
</tr>
<tr>
<td>Case material</td>
<td>plastic</td>
<td>plastic</td>
<td>plastic</td>
<td>plastic</td>
<td>metal</td>
</tr>
<tr>
<td>Warranty</td>
<td>1 year</td>
<td>2 years</td>
<td>2 years, 30-day MBG</td>
<td>1 year, 30-day MBG</td>
<td>1 year</td>
</tr>
</tbody>
</table>

### Company

| MicroNet Technology, Inc. | PCPC               | Peripheral Vision Storage | PLI | Procom Technology, Inc. |
| Irvine, CA 92718         | Bldg. A-4           | Philadelphia, PA 19130 | Fremont, CA 94538 | Costa Mesa, CA 92626 |
| (714) 837-6033           | Tampa, FL 33634     | (800) 800-7868      | (800) 288-3754 | (800) 800-8600 |

*Most mechanisms will support 90-meter tape by the time you read this.

PCPC plans to bundle NetStream 2.1 in the near future.
How to Master 20 Popular Macintosh Programs Without Ever Reading The Manuals

Macintosh Programs Can Be Learned in a Few Hours With the Right Training

Over the past four years I've been associated with over 50,000 people attempting to learn the Macintosh computer. I've watched as each person wages their own personal, private battle to master the computer and the most popular Macintosh programs. I've seen their frustration, have empathized with their confusion, and understood their computer fears. I've talked to workers who have had new computers and new programs simply dropped on their desk with the directive to, "learn this." I've listened to people who have struggled night after night trying to read and understand a computer manual. Can you imagine trying to underst and and master 4th Dimension from the manual?

You would be surprised at the number of people who have confided with me the fact that they've given up trying to learn some of the programs. They put the box on the shelf and write the expenditure off as a bad investment.

Hard Earned Money Wasted

Can you imagine how much money has been wasted on programs and computers that are sitting abandoned? Right now think to use, and effective.

An Excellent, Low Cost Training Answer

Four years ago I founded MacAcademy. My purpose was to create a training organization that provided training similar in nature to the Macintosh itself - simple, easy to use, and effective.

Now, four years later the concept has proven to be a great success. Right now people are benefiting from MacAcademy training in over 100 cities in the U.S., in Canada, Great Britain, Australia, Japan, Hong Kong, and 22 additional countries throughout the world.

MacAcademy training is successful for one reason - it works!

The Video Answer

Two years ago we introduced the MacAcademy Video Training Library. This library now includes over 45 different titles. Each video is 2 hours long and offers clear, concise, effective training for the Macintosh and over 20 popular programs. In many cases you can purchase up to 6 hours of training for one program.

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The MacAcademy reputation is excellent. Our guarantee is simple: If you're not happy we'll give your money back. No hassles or problems.

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Here is a current list of MacAcademy Video training tapes now available. To order, simply send check, credit card information, or purchase order to MacAcademy Video Dept. MU1091 477 S. Nova Rd. Ormond Beach, FL 32174 or call the numbers listed below. Now is the time to start training. Thank you for allowing MacAcademy to help you in that effort.

To Order: Call Toll Free
1-800-527-1914
FAX Orders Call
1-904-677-6717
48 Hr. Delivery

Please circle 77 on reader service card.
### Table 1: Features of DAT Drives, continued

<table>
<thead>
<tr>
<th></th>
<th>Relax 1.2 Gig Tape Vista</th>
<th>Tecmar DATaVault</th>
<th>Third Wave DATadrive 2.0 GB</th>
<th>TTI CTS-4M</th>
</tr>
</thead>
<tbody>
<tr>
<td>List Price</td>
<td>$1,448</td>
<td>$4,995</td>
<td>$1,650</td>
<td>$2,595</td>
</tr>
<tr>
<td>Street Price</td>
<td>$1,448</td>
<td>$3,900</td>
<td>$1,650</td>
<td>$2,595</td>
</tr>
<tr>
<td>Hardware</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanism</td>
<td>Archive 4520NT</td>
<td>WangTek 6130FS²</td>
<td>WangTek 6130HS</td>
<td>WangDAT 1300</td>
</tr>
<tr>
<td>SCSI-ID selector</td>
<td>push button</td>
<td>push button</td>
<td>push button</td>
<td>dial</td>
</tr>
<tr>
<td>SCSI termination</td>
<td>external</td>
<td>external</td>
<td>internal; external, $19</td>
<td>external</td>
</tr>
<tr>
<td>Recommended media</td>
<td>Maxell, Verbatim</td>
<td>Tecmar</td>
<td>Maxell, TDK, Sony</td>
<td>TTI</td>
</tr>
<tr>
<td>Acceptable media</td>
<td>Maxell, Verbatim, Sony, 3M</td>
<td>Maxell, TDK</td>
<td>data-grade DAT</td>
<td>Maxell, TDK</td>
</tr>
<tr>
<td>Formats supported</td>
<td>DDS</td>
<td>DDS</td>
<td>DDS</td>
<td>DDS</td>
</tr>
<tr>
<td>Compression drive and price</td>
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<td>none</td>
<td>none</td>
<td>CTS-4M Plus, $2,995</td>
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<td>Cleaning frequency</td>
<td>50 hours</td>
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<td>self-cleaning</td>
<td>30 days</td>
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<td>Cleaning indicator</td>
<td>•</td>
<td>NA</td>
<td>NA</td>
<td>•</td>
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<tr>
<td>Read after write</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>90-meter-tape support*</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Fan</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Software</td>
<td></td>
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<tr>
<td>System 7 support</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>Backup AppleShare vols.</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>Backup software</td>
<td>SoftBackup II 4.06</td>
<td>OTBackup 2.04</td>
<td>Retrospect 1.2</td>
<td>Nightshift 1.5</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Dimensions (L x W x H)</td>
<td>11 x 10 x 2.5 in.</td>
<td>14.8 x 7.1 x 4 in.</td>
<td>9.5 x 9.5 x 2.5 in.</td>
<td>11 x 6 x 2 in.</td>
</tr>
<tr>
<td>Weight</td>
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<td>14 lb</td>
<td>6 lb</td>
<td>15 lb</td>
</tr>
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<td>Case material</td>
<td>metal</td>
<td>metal</td>
<td>plastic</td>
<td>metal</td>
</tr>
<tr>
<td>Warranty</td>
<td>2 years</td>
<td>2 years</td>
<td>1 year, 30-day MBG</td>
<td>1 year, 90-day swap</td>
</tr>
<tr>
<td></td>
<td>(415) 471-6112</td>
<td>(800) 624-8560</td>
<td>Austin, TX 78758</td>
<td>Anaheim, CA 92807</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(216) 349-6600</td>
<td></td>
<td>(714) 693-7707</td>
</tr>
</tbody>
</table>

*Most mechanisms will support 90-meter tape by the time you read this.

*Will be upgraded soon.
On MacAvenue, "Street Price" Means Great Value

We design quality into each of our products and services. Then we set the Street Price so you get the best deal. And since our price always includes support services and an extended warranty, you not only get the best price, you get the best value.

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Our MacAvenue line of hard drives, monochrome and color displays and modems gives you a value-priced alternative for Mac peripherals. Our hard drive is more than just another pretty case. Its metal interior and plastic exterior — designed like the Mac's — control air flow and buffer the drive noise. But don't take our word for it. Ask Robert Wiggins, MacUser's longtime business columnist, who gives the MacAvenue drive his "highest recommendation." On top of that, MacUser magazine awarded our 40MB Quantum drive 4.5 mice. To make your MacAvenue drive an even better value, we give you Now Utilities, a useful collection of a dozen productivity-enhancing programs, FREE!

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Scrolling up and down or waiting for your screen to refresh takes the joy out of graphic design. MacAvenue rescues you from the creative doldrums with a larger and sharper image of your whole design. No scrolling!

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Call Today! 800-395-6221

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Because it's lighter and less expensive than the Mac Portable, the Outbound Laptop System is the best choice for Mac users on the go. The Outbound offers 15MHz, 68000-powered performance with a sharp 640x400 pixel LCD screen and a selection of useful accessories and peripherals.

Outbound Laptop System w/ 512K ROMs, 2MB RAM and 40MB Drive $2,299

Outbound Laptop System w/ 512K ROMs, 1MB RAM and Floppy Drive ... $2,201 $1,999

Outbound System Bundle ...22216 $2,599

Call for more information about other Outbound accessories and options.

STORAGE DEVICES

<table>
<thead>
<tr>
<th>Product Details</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kodak M150 Mac Portable</td>
<td>$399</td>
</tr>
<tr>
<td>MicroTek-IMS Color Scanner</td>
<td>$2735</td>
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<tr>
<td>Microtek 3002 Color Scanner</td>
<td>$1929</td>
</tr>
<tr>
<td>Orchid CommodoreV.32 bis External</td>
<td>$485</td>
</tr>
<tr>
<td>Relisys Telax RA2110</td>
<td>$2700</td>
</tr>
<tr>
<td>Seiko Label Printer</td>
<td>$2285</td>
</tr>
<tr>
<td>Texas Instruments microtuner Toncartridge</td>
<td>$1811</td>
</tr>
<tr>
<td>Umax Umax Color Scanner</td>
<td>$2768</td>
</tr>
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PRINTERS, SCANNERS AND FAXES

<table>
<thead>
<tr>
<th>Product Details</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>TI microLaser XL</td>
<td>$2987</td>
</tr>
<tr>
<td>TI microLaser</td>
<td>$2989</td>
</tr>
</tbody>
</table>

Fire the Typists!

The Dest Personal Scan system lets you input and format virtually any printed document. Works as a full-page hand scanner or automatically scans up to 10 documents. Bundled with Recognize, an OCR package that works beautifully with desktop publishing or word processing applications.

Dest Personal Scan w/ Recognize...22762 $685

800-395-6221

COMMUNICATIONS

<table>
<thead>
<tr>
<th>Product Details</th>
<th>Price</th>
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<td>DaynaPORT E/30</td>
<td>$2254</td>
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<tr>
<td>DaynaPORT E/31-T</td>
<td>$2254</td>
</tr>
<tr>
<td>DaynaPORT E/31-LC</td>
<td>$2254</td>
</tr>
<tr>
<td>DaynaPORT E/SE-T</td>
<td>$2254</td>
</tr>
</tbody>
</table>

Dove's Fax Performance

Save money on a high-end fax. The DoveFax operates at 9600 baud for fax and 2400 baud for data. Redials, schedules multiple fax transmissions and automatically receives incoming calls in the background.

DoveFax ...22701 $297

Enhanced microLaser

Texas Instruments has added 16-page-per-minute printing speed to their popular line of microLasers, the printer that was awarded 45 mice from MacUser. The microLaser XL offers the same quality output as the original microLaser and it offers added upgrade flexibility. Bundled with Adobe Type Manager.

TI microLaser XL

35 font w/ AppleTalk ... $2859 $2889
17 font w/ AppleTalk ... $2858 $2689

TI microLaser

35 font w/ AppleTalk ... $2851 $1689
17 font w/ AppleTalk ... $2856 $1389

Epson ES-500C Color Scanner w/ I/F ...22765 $1824

Call for more information about other Outbound accessories and options.
### Customer Service Is Our Most Important Product

**Dayna's Ethernet Connection**

DaynaPORT™ network interface cards give you all the benefits of Ethernet with Dayna's proven performance and reliability.

- **DaynaPORT E/SE**
  - Price: $2542
- **DaynaPORT E/30-T**
  - Price: $2545
- **DaynaPORT E/II**
  - Price: $2546
- **DaynaPORT E/LC-T**
  - Price: $2549
- **DaynaPORT E/Lite-T**
  - Price: $2550

**MONITORS AND VIDEO CARDS**

<table>
<thead>
<tr>
<th>Brand</th>
<th>Model</th>
<th>Price</th>
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</thead>
<tbody>
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<td>Micron</td>
<td>SE/30 8-Bit 640x480</td>
<td>$2354</td>
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**RasterOps**

- Grey Scale 19" monitor CS for Mac II: $22007
- RasterOps 24L: $23555
- Seiko & RasterOps
  - 14" Trinitron w/ RasterOps 24Si Card: $20203
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<tr>
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EDUCATION AND ENTERTAINMENT

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BUSINESS SOFTWARE

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<td>Nolo Press</td>
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<td>Central Point Mac Tools Deluxe v1.01</td>
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<td>DOS Mounter v2.0</td>
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For 30 years 3M has provided its business customers with recording products for audio, video and data. During that time we’ve introduced innovative products in all three areas—including the data cartridge which we invented in 1970.

Certainly, digital audio and video tapes are important technological advancements—ones with very promising futures in sound recording and home entertainment.

However, considering reliability, compatibility, efficiency and cost-effectiveness, with most installed QIC-formats. 4mm is still evolving toward a standard format.

**Data cartridge technology is designed for data.**

Each data cartridge is a fully-enclosed tape transport system. You can feel the difference in construction. From its rigid, stippled metal baseplate to the durable plastic shell, the data cartridge is ideally suited for the demands of daily use—no matter how rugged the environment.

The difference in drive construction is even more significant in terms of simplicity and reliability.

A data cartridge system uses one motor compared to both 4mm and 8mm systems which have at least three motors, far more parts and a rotating head that spins faster than 1,800 rpm. While average head life expectancy on a gigabyte data cartridge system is well over 8,000 hours, the head life expectancy for a digital audio tape system is significantly less.

**Why give up faster transfer speed for the same file access speed?**

Backing up one gigabyte of data on a QIC-1350 system is three times faster than on a 1.3 Gb 4mm digital audio tape system. Twice as fast as a 2.3 Gb 8mm video system.

And since data cartridge tape is always in a ready standby mode, the file access speed is about the same for 4mm and much faster than 8mm tape.

**Backward compatibility shouldn’t be an added expense.**

Backward compatibility will continue to be a strength of data cartridge technology. As it evolves, your existing data cartridge files will continue to be easily accessible—with no need to convert old files to a new format. Converting to a digital audio tape system means copying old tape files to hard disk; then from hard disk to tape—at a rate of 90 minutes per gigabyte. Not only is the extra file conversion time involved an added expense, the cost of a digital audio tape drive is significantly more than a QIC-1350 drive.

**Data cartridge is here to stay.**

For 20 years major manufacturers have endorsed data cartridge technology through new product introductions like the IBM AS/400, the COMPAQ SYSTEMPRO and the Sun Microsystems family of workstations. No other tape technology has anywhere near as large a support group of manufacturers.

**Compatible, cost-effective and ready when you are.**

Large or small, as your needs grow and you consider which format is best for storing and protecting your data, take a good look at what has proven to be a better long-term solution—data cartridge.

**Find out more. Ask your 3M representative about the best solution for you—and see where you can grow with our new 3M Magnus135 data cartridge. Call 1-800-888-1889, ext. 1 for more information.**

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**Data Cartridge Or 4mm/8mm Tape Technology: One is a better solution.**

we believe data cartridge storage systems offer a better solution for data back-up and storage applications.

Here’s why.

**The full potential of data cartridge technology is still expanding.**

Data cartridge technology has an industry endorsed potential migration path to 12 gigabytes and beyond.

Our new 3M Magnus1.35 gigabyte data cartridge is the next step into a whole new decade of capacity and speed increases. A positive step—taken without the loss of backward compatibility or the cost of converting to an entirely new format.

**The preferred standard by over 6 million users.**

When it comes to storing and protecting important data, there are more data cartridge drives in use around the world than all other types of tape drives combined. Over 6 million users expect the continued compatibility of data cartridge technology—now and in the future.

You can, too, because of the standardization efforts of an organization called Quarter-Inch Cartridge Drive Standards, Inc. (QIC).

As a result, the new QIC-1350 systems will be backward compatible like the IBM AS/400, the COMPAQ SYSTEMPRO and the Sun Microsystems family of workstations. No other tape technology has anywhere near as large a support group of manufacturers.

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Please circle 80 on reader service card.
Is your screen in color but your printer still limited to black-and-white? We tested four printers that prove that price is no longer a barrier to colorful output.

BY PAUL YI AND THE MACUSER LABS STAFF

You can do wonders with your color Mac: cook up eye-popping pie charts, spruce up full-color photos, create multihued layouts that leave USA Today in the shade. But even your most blinding color creations look like the Wall Street Journal when they emerge from a monochrome printer. Without a color printer, you're using only half of your color potential — and color confined to your screen is hard to share. The most effective way to distribute your color creations is in print — and with a color inkjet printer, you don't have to give up a lot of green to get 16 million colors.
Color Inkjet Printers

Color inkjet printers also have a few advantages over other color printers such as the thermal-wax printers that use Adobe’s PostScript page-description language. They’re less expensive to purchase, for example, and thermal-wax prints are two to four times as expensive to produce (see “Easy Hard Copy: Color PostScript Printers,” May ’91, Buyer’s Guide page 38). Color inkjet printers can also be as fast as — if not faster than — thermal-wax printers, and inkjet-output quality can often rival that of thermal-wax prints. The quality of inkjet prints doesn’t come close to that of sublimal-dye and color laser prints, but the high cost of the sophisticated printers needed to produce the latter two confines them to the most-demanding art and design departments.

One significant drawback of affordable color inkjet printers is their lack of on-board PostScript — the industry-standard PDL (page-description language). On-board PostScript lets a printer — instead of the Mac — perform the page processing. The four printers we reviewed here tie up the Mac during printing.

All PostScript printers have LocalTalk built in so they can be shared easily over a network. Only one of these inkjet printers comes with LocalTalk, but because it still ties up the Mac, sharing is unlikely. PostScript’s powerful graphics capabilities are also a must for desktop publishers who need to produce color comps, or test images. But if you’re printing presentation materials and you don’t plan to share your color printer over a network, an inkjet printer offers the best bang for the buck. You can also get third-party PostScript software emulators for the inkjet printers.

We tested four color inkjet printers that each sell for much less than the $3,100 list price of the cheapest color Mac — the LC with Apple’s 12-inch RGB monitor. Two of the printers return from last year’s color-printer roundup (see “Color on the Page,” May ’90, Buyer’s Guide page 56), and the other two are improvements over last year’s models. The Sharp JX-730 Color Ink Jet and Tektronix ColorQuick return unchanged, except that the JX-730 can now print on transparencies. Last year, the Sharp JX-730 Color Ink Jet, with its resolution of 180 dpi (dots per inch) disappointed us because of its slow speed and poor paper handling. In contrast, the Tektronix ColorQuick’s excellent image quality made it last year’s top inkjet pick. The ColorQuick uses the same engine as the JX-730 but has 216-dpi resolution. Tektronix also uses its own ink formulation and includes the most sophisticated color-matching software available on any color printer, including expensive high-end ones.

Hewlett-Packard’s 180-dpi PaintWriter and PaintWriter XL are improved versions of the PaintJet and PaintJet XL printers. The PaintWriters ship with newly formulated inks that produce brighter, more saturated output, especially on transparencies. HP is now shipping its own software that provides color matching between your monitor and the printer — last year’s models used a software driver from Palomar. The PaintWriter is the lowest-priced Mac color printer, at less than $1,000. Its much larger sibling, the PaintWriter XL, uses a faster engine and can print on 11-x-17-inch paper. It’s also the only networkable inkjet printer — it comes with a LocalTalk and a serial connection.

We tested the inkjet printers for printing speed and image quality. To compare these printers with the low end of Mac color printing, we also ran our benchmark tests on a 144-dpi Apple ImageWriter II, using a color ribbon and Microspot’s MacPalette software — the cheapest way to get color prints. Although we were surprised at the quality of the dot-matrix output (see the “Really Cheap Color” sidebar), the output isn’t very likely to impress your boss or clients. Also, an ImageWriter II can’t print on transparencies — a fatal flaw for a business-presentation printer.

Finally, to compare the inkjet printers’ performance with that of color PostScript printers, we ran the benchmark tests on the average-speed, 300-dpi Tektronix Phaser IIIPX, a new version of this year’s thermal-wax-image-quality champ. A color PostScript thermal-wax printer such as the Phaser IIIPX offers good image quality on paper as well as on transparencies, and it prints LaserWriter-quality text. However, most thermal-wax printers cost around $8,000. The inkjet printers in this report compare quite favorably in many categories, and you can buy several for your department for the cost of one thermal-wax printer.

Ink Shots

The name inkjet describes how these printers work: They squirt ink onto paper. There are, however, two different ways to do this. The two HP
Really Cheap Color

Our search for affordable color printing led to an almost forgotten printer: the venerable Apple ImageWriter II. When equipped with a four-color ribbon and linked to Microspot's MacPalette II driver software, the ImageWriter II can pass as a pretty decent low-cost dot-matrix color printer.

Like all color-printer drivers, MacPalette II ($69) uses dithering, a method of laying down dots of cyan, magenta, yellow, and black to create the illusion of many colors. Your eye mixes these patterns of dots into a color image.

MacPalette uses a Bayer dither, an orderly dot pattern. Considering the low 144-dpi resolution of the ImageWriter, the results are remarkable: You can create ranges in color tone from light to dark. The results are less impressive for a complex color image such as a scanned photo, but for a simple business graphic such as a pie chart, what you get is amazingly close to what you see on-screen.

To use MacPalette II, simply select it in the Chooser and access the driver through the Page Setup and Print commands in any Mac application. The interface for this printer driver is one of the friendliest around. On-line help is displayed in an information window at the bottom of the Page Setup and Print dialog boxes. As you move the mouse over a particular option button in either dialog box, information about that option appears. You can turn the instant help off at any time.


printers use a bubble-jet engine. The print head and ink reservoirs are integrated into a single compact, disposable cartridge (see Figure 1). Ink is heated and vaporized through 30 small nozzles on the cartridge head. An advantage of this system is that any clogged cartridge can be replaced with a new one. The PaintWriter uses a black cartridge and one color cartridge containing three colors. The disadvantage of this system is that you have to throw the color cartridge away if one color is depleted. The PaintWriter XL, on the other hand, uses individual cartridges for all three colors and black.

The Sharp JX-730 Color Ink Jet and Tektronix ColorQuick don't use disposable cartridges — their permanent print heads use hydraulic pressure provided by a piezoelectric diaphragm to force ink onto the page. This method uses more ink. To prevent clogging, the JX-730 and ColorQuick perform a five-minute cleaning cycle every time they're turned off — a process that also uses more ink.

As a result of their smaller print heads, the HP PaintWriters are much quieter than are the JX-730 Color Ink Jet and the ColorQuick. The larger, heavier piezoelectric heads cause a sawing noise and substantial shaking as the head changes direction. If you prefer peaceful environments, you may opt for the HP printers.

Another concern is the printer's footprint, or area of the desktop that it monopolizes. The PaintWriter is the most amenable to limited desk space, with about the same footprint as the ImageWriter II but a lower profile. The PaintWriter XL is large enough to be a nuisance — it occupies more than twice the acreage of the PaintWriter. Luckily, it can be connected to a LocalTalk network and left on its own desk. The ColorQuick and JX-730 Color Ink Jet also require fairly hefty real estate investments, but neither is as bulky as the 520-square-inch PaintWriter XL.

Drop by Drop

All the inkjet printers use four inks — cyan, magenta, yellow, and black — to create the illusion of millions of colors. Dots of these colors are laid next to each other in patterns called dithers, and the interaction of the colors fools your eye into seeing shades that aren't really there. This process is the same as that used in most color printing, including the production of every color photo and illustration in this magazine — examine any image in this article with a powerful magnifying glass, and you can see what we mean.

Dithering is very effective (see Figure 3). But given the low resolution of these inkjet printers — 180 and 216 dpi — the illusion doesn't work on fine lines and text. Images in this magazine,
by contrast, are made up of four-color negatives, each printed at 2,540 dpi. Details are sharp and defined.

The nature of inkjet technology helps dithering. Ink bleeds — very slightly — into clay-coated paper, helping to blend the colors. All four inkjet printers require clay-coated paper, because plain paper is too porous and causes too much bleeding. Unfortunately, the need for clay-coated paper increases the cost per page of inkjet prints (see the “On the Horizon” sidebar).

Dither patterns themselves can be orderly or chaotic. Different dithers work better than others for various types of images. The HP PaintWriter and PaintWriter XL driver software offers three types of dither patterns: pattern, cluster, and scatter. The pattern dither puts down dots in an orderly manner: It works best on solid colors and large color patches where you want the most uniform look. In scanned photos and more-complex color patterns, however, an orderly look makes the dither obvious, so you want a chaotic dither such as a cluster or scatter.

The Sharp JX-730 Color Ink Jet comes bundled with Cricket Expressions software, which offers eight dither patterns, ranging from the orderly Bayer to the chaotic Floyd/Steinberg. The eight dither options may be confusing initially, but once you understand their particular benefits, you’ll appreciate the flexibility.

The Tektronix ColorQuick driver software has a single all-purpose proprietary dither pattern. This may seem to be a limitation, but our jury consistently rated the ColorQuick’s images superior to those produced by the other inkjet printers. The Tektronix dither is excellent, and the ColorQuick’s brilliant inks and saturated colors also contributed to its success. The driver software doesn’t come free, however. You also have to purchase the Mac Accessory Kit ($150). Tektronix makes it worth your trouble by including manuals, 100 sheets of clay-coated paper, two vials of each of the four color inks, and a power cord in the kit (see Table 1).

Three of the inkjet printers ship with outline fonts — the Tektronix ColorQuick does not. Because Apple’s TrueType is bundled with System 7 and recognizing the popularity of ATM (Adobe Type Manager), most users will probably forgo the bundled fonts and use TrueType or ATM. In our tests, we used ATM and TrueType and their respective outline fonts.

The Hewlett-Packard PaintWriters and the Tektronix ColorQuick have color-matching capabilities built in to their driver software. Color-matching
### Presentation Graphic — Paper

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<tbody>
<tr>
<td>Apple ImageWriter II</td>
<td>4</td>
</tr>
<tr>
<td>Tektronix Phaser IIIPX</td>
<td>8</td>
</tr>
</tbody>
</table>

Despite its slower engine, the Apple ImageWriter II was faster than the Tektronix Phaser IIIPX, thanks to better driver software.

### Presentation Graphic — Transparent Media

<table>
<thead>
<tr>
<th>Printer</th>
<th>Time in minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple ImageWriter II</td>
<td>4</td>
</tr>
<tr>
<td>Tektronix Phaser IIIPX</td>
<td>12</td>
</tr>
</tbody>
</table>

ColorQuick and Sharp JX-730 simply print much more slowly so that their ink has sufficient time to be absorbed by the media.

### Page Layout

<table>
<thead>
<tr>
<th>Printer</th>
<th>Time in minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tektronix ColorQuick</td>
<td>16</td>
</tr>
<tr>
<td>Hewlett-Packard PaintWriter XL (LocalTalk)</td>
<td>20</td>
</tr>
</tbody>
</table>

Page Layout:

The 25-mega hertz 68030 microprocessor in our host Mac Iici helped the Tektronix ColorQuick speed past the thermal-wax Tektronix Phaser IIIPX, which performed its image processing with an on-board 16-mega hertz 68020. The Sharp JX-730 was slowest when printing the complex page layout, showing that its software driver is the least efficient of the group.

---

### Figure 3: Color in a Dither

Figure 3: To create the illusion of millions of colors by using only four colors — cyan, magenta, yellow, and black — inkjet printers use a process called dithering. Different dithers are suited to different types of output and can also affect the color of the final image. Each printer offers at least one dither pattern (shown at left at 100 percent and at right at 300 percent). The PaintWriter and PaintWriter XL offer three, the Sharp JX-730 Color Ink Jet offers eight, and the Tektronix ColorQuick has only one — but it's an excellent all-purpose dither.

- **Hewlett-Packard PaintWriter:** cluster (chaotic)
- **Hewlett-Packard PaintWriter XL: pattern (orderly)
- **Sharp JX-730 Color Ink Jet: Floyd/Steinberg (chaotic)
- **Tektronix ColorQuick: proprietary**
Figure 4: Image Quality

Overall Image Quality

<table>
<thead>
<tr>
<th>Tektronix ColorQuick</th>
<th>Worse</th>
<th>Better</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hewlett-Packard PaintWriter XL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hewlett-Packard PaintWriter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharp JX-730 Color Ink Jet</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Jury score 1 2 3 4 5

Text

The Tektronix ColorQuick, with its brilliant inks and saturated colors, was judged to produce the best image quality. The HP PaintWriter and PaintWriter XL produced prints of identically good quality.

Text:
The Tektronix ColorQuick, with its 216-well

software attempts to narrow the difference between the colors you see on screen and the colors that appear in print. A monitor uses additive colors and is transmissive — that is, it adds red, green, and blue together to create white and your eye views light passing through the colors. A color print, however, uses subtractive colors and is reflective — it subtracts cyan, magenta, and yellow from black to produce white and your eye views light reflecting off the colors. It's not surprising that on-screen colors often don't match what's printed.

Hewlett-Packard and Tektronix have developed algorithms that try to compensate for the differences and match their printers' output colors to those on your screen. You need to tell these printers what kind of monitor you're using, because different monitors have different color characteristics. The two PaintWriters and the ColorQuick have options in their drivers that let them accommodate several Mac monitors.

The PaintWriters simply try to match their colors to those of the chosen monitor. The ColorQuick has more-powerful options to either match what's on-screen or adjust for the white of the paper.

Matching colors requires complicated processing by your Mac, so printing slows down with complex color images. This is especially true with the Tektronix ColorQuick: Printing the scanned photo in one of our speed tests took 13 times longer with the color-matching option turned on. The PaintWriters' printing time increased by about a third. Some users may find that the color accuracy outweighs the speed penalty, but users who aren't as concerned with matching colors can opt for speed.

Mac the Host

The four color inkjet printers rely on the host Mac to perform the page processing, which ties it up during printing. Thermal-wax printers — as well as the majority of monochrome laser printers — do the complex processing without help from the host Mac. PostScript thermal-wax printers, for example, have a Motorola 68020 or a RISC processor on-board as well as Adobe's PostScript page-description language — or a clone.

These inkjet printers have a Chooser-level software driver that uses the host Mac's processor and 32-bit QuickDraw to translate the on-screen color image into the dots of four colors that make up the page. This driver uses the Mac's internal graphics language, QuickDraw, to describe the color page, and the dithering is done by the driver software. If you have a Mac II, IIX, or Ile, you need to add 32-bit QuickDraw to your System file (or to your Extensions folder if you're running System 7) before this process can work. The more recent Macs have 32-bit QuickDraw built in to ROM.

The HP PaintWriters use a serial cable to connect to the Mac. The
dpi resolution, produced the crispest text of these inkjet printers, but its output was still inferior to that of a 300-dpi laser printer. The other three printers' text quality was hampered by their 180-dpi resolution.

Color Quality:
The Tektronix ColorQuick's colors were the brightest and most saturated. The Sharp JX-730 Color InkJet's output was slightly richer than that of the HP PaintWriters.

Transparent Media:
The two Hewlett-Packard PaintWriters printed clear, sharp transparencies that had brilliant, saturated colors — as professional-looking as those produced by the Tektronix Phaser IIPX, a 300-dpi thermal-wax printer. The ink from the Sharp JX-730 Color InkJet smeared and ran, creating transparencies that were unacceptable for use in business presentations.

Transparent Media:
PaintWriter XL can also be hooked up to a network via a LocalTalk connection. The Tektronix ColorQuick uses a SCSI connection; you have to be aware of SCSI-termination and -ID problems, and you must keep the ColorQuick close to your Mac. You also have to provide your own cable — Tektronix doesn't sell any.

The Sharp JX-730 Color InkJet offers two Mac interfaces, but neither, unfortunately, is free. The Paralink serial-to-parallel converter cable, from Jonathan Freeman Technologies, sells for $125, and a slightly faster option, the Hurdler II-CPI NuBus card, from Creative Solutions, sells for $195. We used the Hurdler II-CPI interface to show the printer's fastest performance.

The JX-730 Color InkJet is sorely lacking in the paper-handling department. All the printers use a manual-feed method, and the PaintWriter XL and the ColorQuick also include automatic cut-sheet feeding. The PaintWriter lets you choose Z-fold feeding as well as manual feed. The Sharp JX-730, however, forces you to spend...
$480 extra for a cut-sheet feeder.

One distinctive feature of the JX-730 Color Ink Jet is its ability to print on an image area as large as 13.6 x 21 inches — the largest print area of all the printers. The PrintWriter XL can print on B-sized (11 x 17 inch) paper and the ColorQuick on 12-x-18-inch paper, but the PaintWriter is limited to letter-sized paper.

Surprising Speed

In our speed testing, we timed the printing of three files representing the spectrum of common color printing: a scanned photo; a presentation graphic; and a page layout containing color images, text, and color graphics. We also printed the presentation graphic on transparent media and found that all the printers take significantly longer to print on transparencies than they do to print on paper.

The Tektronix ColorQuick — without color-matching turned on — was tops in overall speed, with the HP PaintWriter XL a distant second and the PaintWriter lagging in third place. Above the Printers, the HP and Tektronix printers with and without their color-matching options turned on. We chose each printer's best-looking output for each file type — a scanned photo, a presentation graphic printed on clay-coated paper as well as on a transparency, a 32-bit color ramp, and a page layout. We then assembled a jury of color-printing experts and had it judge the quality of the presentation graphic, the color quality of the scanned photo and color ramp, and finally the text quality of the page-layout file.

When printing on paper, the ColorQuick was the clear winner overall (see Figure 4). Its prints were the most saturated and realistic of the bunch. The JX-730 prints were brighter than those produced by the PaintWriters. The PaintWriters, with their improved inks, had strong — and identical — results in the transparency-quality evaluation. The JX-730 had poor transparency performance: Its ink spreads when more than one color is laid onto the transparent media.

On the Horizon

The color inkjet printers we tested for this report produce impressive images, but they have limited resolution and require special clay-coated paper. Hewlett-Packard's new color-capable DeskWriter C printer ($1,095) removes these restrictions and ushers in a new age of affordable high-resolution plain-paper color printing.

The DeskWriter C is a color version of HP's immensely popular monochrome DeskWriter inkjet printer. Like the DeskWriter, the DeskWriter C prints at 300 dpi — a first for affordable color inkjet printers. That's LaserWriter-quality text — on paper or transparent media — in color, at a remarkably low price.

There is one slight drawback: Hewlett-Packard supplies two cartridges with the DeskWriter C: one with black ink and the other with cyan, magenta, and yellow ink. Only one cartridge can be used at a time. When printing a color page, the DeskWriter C is a three-color printer — not four-color like the inkjet printers tested in this report. When you're printing with the three-color cartridge, black text appears somewhat brown — if you're printing text, use the black-ink cartridge.

But given the obvious price and resolution benefits over existing color inkjet printers — including Hewlett-Packard's PaintWriters — the DeskWriter C might be the color-printing breakthrough everyone has been waiting for. Hewlett-Packard Co., 19310 Pruneridge Avenue, Cupertino, CA 95014; (800) 752-9900 or (201) 529-9500.

To add to the competition posed by the Hewlett-Packard DeskWriter C, Kodak has introduced a plain-paper printer: the 192-dpi Diconix Color 4 ($1,595). Although it's not as revolutionary as the DeskWriter C, the Diconix Color 4 is a compact, attractive four-color printer that can also print on transparencies. Eastman Kodak Co., 901 Elmgrove Road, Rochester, NY 14653; (800) 344-0008.

The 300-dpi Hewlett-Packard DeskWriter C introduces the next generation of high-resolution low-cost plain-paper color printing.
INTRODUCING RASTEROPS’ TEAM OF 21” GRAPHICS SYSTEMS. GAME. SET. MATCH.

RasterOps’ new two-page 21” graphics systems offer the precision, speed, and high performance you’ve come to expect from the leader in color technology. From photorealistic imagery to video capture and graphics acceleration, our five new systems offer everything you need for winning graphic design.

The RasterOps’ 8XLi and 24XLi bring graphic design to new heights. Both offer two full pages of text and graphics with on-board acceleration. What’s more, the 8XLi can quickly and easily be upgraded to 24-bit color with the VRAM expansion kit. It’s designed to protect your hardware investment by providing the ultimate in flexibility.

The RasterOps 24XLTV offers the same 24-bit True Color brilliance and onboard acceleration of the 24XLi, plus video capture so you can get all the best shots. The 8XL brings you 256 glorious colors with unequalled clarity, and is priced within reach. The ClearVue/GSXL gives you 256 shades of gray; perfect for business productivity. And when it comes to low cost, high resolution monochrome, the ClearVue/XL is a clear winner.

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RasterOps
THE ART & SCIENCE OF COLOR™
The ColorQuick’s high resolution helped it win the text-quality test, providing crisp, readable text. The PaintWriters also printed tolerable text, but the JX-730 Color Ink Jet was unable to produce letters without noticeable smudges and shadows.

**Color for Everyone**

Color printing — like high-quality color computing — is not the exclusive privilege of high-end publishing anymore. Affordable color inkjet printers have made good-quality output accessible to almost any user.

A color inkjet printer’s price is preferable to that of a higher-end color printer, and it also offers some advantages over more-expensive color technologies. Three of the color inkjet printers we tested can print on B-sized or larger paper, two are reasonably fast, and three can produce high-quality color prints and transparencies — all at a low cost for each page.

Affordable color printing doesn’t have to mean a great sacrifice in image quality or speed. Although inexpensive high-resolution plain-paper color printers are on the horizon, these four color inkjet printers offer unique features and options that make them attractive to anyone who’s in the market for an entry-level color printer.

Paul Yi is a *MacUser* associate editor.

---

**Table 1 Criteria**

- **List price** — The list price is the manufacturer’s suggested retail price.
- **Street price** — The street price is an average price charged by dealers around the U.S. in June 1991.
- **Resolution (dots per inch)** — The number of dots of ink the printer can produce per inch.
- **Maximum printable area** — The dimensions of the maximum image size.
- **Interface** — The type of connection between the printer and the Mac.
- **Driver** — The name or publisher of the driver software that ships with the printer.
- **No. of dither patterns** — The number of dither patterns the driver software can produce.
- **Outline fonts** — The number and type of outline fonts shipped with the printer.
- **Color matching** — Does the printer come with software that attempts to match printed colors to the colors on the host Mac’s monitor?
- **Spooler-software support** — Does the driver software support third-party print spooling so that you can print in the background?
- **Input** — A list of media-input options.
- **Paper sizes** — A list of paper sizes supported.
- **Tray capacity** — The number of pages the input tray or feeder can hold.
- **Options** — A list of other media-input options.
- **A-sized paper** — The capacity for and cost of A-sized paper.
- **A-sized transparencies** — The capacity for and cost of A-sized transparent media in packs that are supplied by the manufacturer.
- **Ink** — The cost of ink cartridges or vials.
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Microsoft
## Table 1: Features of Color Inkjet Printers

<table>
<thead>
<tr>
<th>Printers</th>
<th>Hewlett-Packard PaintWriter</th>
<th>Hewlett-Packard PaintWriter XL</th>
<th>Sharp JX-730 Color Ink Jet</th>
<th>Tektronix ColorQuick</th>
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<tr>
<td><strong>List price</strong></td>
<td>$995</td>
<td>$2,595</td>
<td>$2,195*</td>
<td>$2,345*</td>
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<td><strong>Street price</strong></td>
<td>$750</td>
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<td><strong>Specifications</strong></td>
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<td>Resolution (dots per inch)</td>
<td>180 dpi</td>
<td>180 dpi</td>
<td>216 dpi</td>
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<td>Maximum printable area</td>
<td>8 x 10.7 in.</td>
<td>10.7 x 16.6 in.</td>
<td>13.6 x 21 in.</td>
<td>11 x 17 in.</td>
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<td>Hewlett-Packard</td>
<td>Hewlett-Packard</td>
<td>Sharp</td>
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<td>serial</td>
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<td>serial, $125</td>
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<td>Driver</td>
<td>Hewlett-Packard</td>
<td>Hewlett-Packard</td>
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<td>Color matching</td>
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<td>Spoiler-software support</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
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<td><strong>Media handling</strong></td>
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<td>manual</td>
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<td>Tray capacity</td>
<td>NA</td>
<td>200 sheets, 70 transparencies</td>
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<td>100 sheets</td>
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<td>Options</td>
<td>none</td>
<td>none</td>
<td>cut-sheet feeder, $480 paper-roll feeder, $40 tractor feeder, $290</td>
<td>tractor feeder, $300</td>
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<td><strong>Supplies</strong></td>
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<tr>
<td>A-sized paper</td>
<td>200 sheets, $21</td>
<td>200 sheets, $21</td>
<td>500 sheets, $39</td>
<td>500 sheets, $42</td>
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<tr>
<td>A-sized transparencies</td>
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<td>50 sheets, $65</td>
<td>third party</td>
<td>50 sheets, $49</td>
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<tr>
<td><strong>Ink</strong></td>
<td>3-color, $35; black, $30</td>
<td>$30 per color</td>
<td>2 vials, $12</td>
<td>2 vials, $12</td>
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<td><strong>Other</strong></td>
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<tr>
<td>Dimensions (W x D x H, in.)</td>
<td>17.5 x 12 x 4</td>
<td>29.5 x 17.5 x 9</td>
<td>25.75 x 14 x 4.75</td>
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<td>Weight</td>
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<td><strong>Company</strong></td>
<td>Hewlett-Packard Co.</td>
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<td>Sharp Electronics Corp.</td>
<td>Tektronix, Inc.</td>
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<tr>
<td></td>
<td>19310 Pruneridge Ave.</td>
<td>19310 Pruneridge Ave.</td>
<td>Sharp Plaza, Systems Division</td>
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<tr>
<td></td>
<td>Cupertino, CA 95014</td>
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<td>Mahwah, NJ 07430</td>
<td>Wilsonville, OR 97070</td>
</tr>
<tr>
<td></td>
<td>(800) 752-0900</td>
<td>(800) 752-0900</td>
<td>(800) 237-4277</td>
<td>(800) 855-6100</td>
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<tr>
<td></td>
<td>(201) 529-9500</td>
<td>(201) 529-9500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* You must buy either a Paralink cable ($125), from Jonathan Freeman Technologies, or a Hurdler II-CPI NuBus card ($155), from Creative Solutions, for the Mac interface.

1 You must also buy the Mac Accessory Kit ($150), which includes manuals, software, 100 sheets of clay-coated paper, two vials of each of the four color inks, and a power cord.

2 You must purchase a third-party SCSI cable.
Tomorrow's Upgrade For Your Mac Is Only $59*

A MacWarehouse Expansion Kit will dramatically increase the power of your Mac. And our fast, reliable overnight service will have your Kit in your hands tomorrow!

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Never again will you have to quit your word processor just to answer a question about a spreadsheet. Install extra memory and you can leave your letter open while you refer to last month's sales figures. You can edit those monstrous scanner files with advanced graphics applications or develop your own HyperCard stacks. More memory means more power at your fingertips.

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Adding memory doesn't require technicians in lab coats. Just open your Mac, slide out the main circuit board and plug in your SIMMS. Our FREE video will give you STEP-BY-STEP installation instructions. Every type of Mac is covered and we think we've made it a breeze.

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Our helpful sales and technical staff is standing by to answer any questions and take the mystery out of memory upgrades. Memory cards come with one megabyte on each card and are usually sold in pairs - (2 at $59 ea.).

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Memory chips come factory-installed on plug-in cards, called SIMMS (Single Inline Memory Modules). Each one megabyte SIMMS card holds eight top-quality, memory chips. We carry chips by all the major manufacturers like Texas Instruments, Intel and Samsung. We also carry the full line of Dove memory products.

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Do you need 80, 100 or 120 Nanosecond (ns) chips? Nanoseconds are billions of a second, so an 80 ns chip responds faster than a 100 ns chip. The original Mac used relatively slow 150 ns memory chips. The 68020 processor reads 120 ns chips (or faster) chip, and the 68030 Macs like the Speedier model.

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Place your order by 12:00 am (E), weekdays and we'll deliver overnight for just $3.00. There's never been a better time to consider a memory upgrade. Call our toll-free number now and tomorrow morning your Mac will be off to a brand new start.

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Call toll-free
Twenty-four hours a day, seven days a week
Inquiries: 1-908-367-0440
Fax: 1-908-905-9279

MACWAREHOUSE 30-DAY MONEY BACK GUARANTEE

If, for any reason, you are dissatisfied with your MacWAREHOUSE Memory Kit, you may return it for a full refund within thirty days of purchase. All you have to do is call us for a return authorization number and return this product, postage paid, in its original condition, with the original packaging and documentation.

ONE YEAR WARRANTY. MacWarehouse also guarantees its Memory Kits against manufacturer defects for one year from the date of purchase. We will repair the item or replace it at our discretion.

* SIMMs prices vary. Call for latest information.
** Limited Offer! Free video with purchase of 2 or more SIMMs.
## ACCESSORIES

<table>
<thead>
<tr>
<th>Toner Cartridge</th>
<th>Price</th>
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<tbody>
<tr>
<td>ME00029 Disks - OS/DO</td>
<td>$1.44</td>
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<tr>
<td>ACC0348 Org/Malrc 119</td>
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</tr>
<tr>
<td>ACC0441 Classic Anlg-Glare Filler</td>
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<tr>
<td>ACC0427 Ultima:Classic SE&amp;!</td>
<td></td>
</tr>
<tr>
<td>ACC0327 Monitorware Apple RGB Case</td>
<td></td>
</tr>
<tr>
<td>ACC1070 Macugage'SE Carrying</td>
<td></td>
</tr>
<tr>
<td>ACC0341 Command Center</td>
<td></td>
</tr>
<tr>
<td>ACC0483 MacPro Plus(SE) Carrying Case</td>
<td></td>
</tr>
</tbody>
</table>

### MacPro Plus (Key Tronic)
- **Key Tronic's new MacPro Plus keyboard** is compatible with all Macintosh computers. The enhanced 105-key layout includes Period/Comma lock capability, an interchangeable Caps Lock and Ctrl keys. Also, the connecting cable you need is offered at no extra charge. The keyboard is backed by a limited lifetime warranty and unlimited toll-free product support. Includes offer for Tempo II, a keyboard macro package from Affinity Microsystems: a $149.95 value FREE INP0156 $145.

<table>
<thead>
<tr>
<th>MacPro Plus</th>
<th>Price</th>
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<tr>
<td>ACC0497 Custom Tracx(Red)</td>
<td>12</td>
</tr>
<tr>
<td>ACC0211 Keyboard Shell Compact Macs</td>
<td>39</td>
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<tr>
<td>ACC0340 Keyboard Slideaway</td>
<td>42</td>
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<tr>
<td>ACC0182 LaserStand</td>
<td>109</td>
</tr>
<tr>
<td>ACC0045 SE Anty-Fly Filter</td>
<td>52</td>
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<td>ACC0433 Mouse/Price Matt</td>
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<tr>
<td>ACC0267 Power Trip 50</td>
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<td>ACC0186 Slat/Gran Plus/Porta!</td>
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<td>ACC0185 Slat/Gran Plus</td>
<td>85</td>
</tr>
<tr>
<td>Sony</td>
<td></td>
</tr>
<tr>
<td>ME0631 Dsk - 1.44 Mb High Density (3)</td>
<td>24</td>
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<tr>
<td>ME00026 Dsk - 0.05 (box of 10)</td>
<td>13</td>
</tr>
<tr>
<td>Mobius</td>
<td></td>
</tr>
<tr>
<td>ACC0343 Mac/Pro Carrying Case (black)</td>
<td>79</td>
</tr>
<tr>
<td>ACC0325 Mac/Pro Carrying Case (black)</td>
<td>65</td>
</tr>
<tr>
<td>Varyx</td>
<td></td>
</tr>
<tr>
<td>ACC0280 Mac/Pro Exp Keyboard Carrying Case</td>
<td>79</td>
</tr>
</tbody>
</table>

### Utilities Family (Microcom)
- **Virex application program detects and repairs files infected by Macintosh viruses:** The Virex 3.1T repairs damaged files instantly before a virus can spread. 92/11 is the collection of disk and file recovery tools, protects computer-based information from loss or damage so you'll never have to worry when your Mac goes down. **Complete Undelete** maintains a "Delete Log" of files thrown in the trash and recovers them if they were accidentally thrown away. **Citadel with Shredder**, a security tool box, protects your computer from unauthorized access.

<table>
<thead>
<tr>
<th>Virex 3.0</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT00003 $59. 911 UT01091 $98.</td>
<td>Complete Undelete UT0233 $49.</td>
</tr>
</tbody>
</table>

### Utilities Family (Microcom)
- **The "ULTIMATE" SE Carrying Case** is designed with the same high quality standards as other Macnullages products. This case offers
  1. internal, padded compartments for ANY Macintosh keyboard, mouse, external hard disk and cables, also holds the new Macintosh Classic.
  2. Two additional exterior pockets for everything from disk to umbrellas.

<table>
<thead>
<tr>
<th>Moba</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black ACC0427 S85.</td>
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### Nolo Press
- **For The Record 2.0** | 32
- **Write It 4.0** | 35

### Business Presentation
- **A Lasting Impression** | 32
- **ResumPort Cover Letters** | 49
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- **Sales/Marketing** | 49
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- **TIME Out** | 48
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- **Visual Basic/DBASE** | 48
- **AEC** | 48
- **Persuasion 2.0** | 32
- **ASD Software** | 32
- **ProClnt software** | 32
- **Partial 10 pack** | 579
- **Partial 10 pack** | 579
- **Ashton-Tate** | 48
- **Ultra Mac 111 SPECIAL! | 48
- **Ultra Mac 111 SPECIAL! | 48

### ACC0034 Glare/Guard Plus 13" 85.
- **ACC0055 Fanny Case** | 22
- **ACC0247 MacPlus/SE Carrying Case** | 52
- **ACC0257 MacPlus/SE Carrying Case** | 52
- **ACC0258 MacPlus/SE Carrying Case** | 52

### MacPro Plus
- **Key Tronic's new MacPro Plus keyboard** is compatible with all Macintosh computers. The enhanced 105-key layout includes Period/Comma lock capability, an interchangeable Caps Lock and Ctrl keys. Also, the connecting cable you need is offered at no extra charge. The keyboard is backed by a limited lifetime warranty and unlimited toll-free product support. Includes offer for Tempo II, a keyboard macro package from Affinity Microsystems: a $149.95 value FREE INP0156 $145.

### MacPro Plus
- **Key Tronic's new MacPro Plus keyboard** is compatible with all Macintosh computers. The enhanced 105-key layout includes Period/Comma lock capability, an interchangeable Caps Lock and Ctrl keys. Also, the connecting cable you need is offered at no extra charge. The keyboard is backed by a limited lifetime warranty and unlimited toll-free product support. Includes offer for Tempo II, a keyboard macro package from Affinity Microsystems: a $149.95 value FREE INP0156 $145.

### TelePort, the ADB Modem (Global Village Communication)
- **Teleport, the ADB Modem** (Global Village Communication)
  - The perfect choice for powerful yet compact Mac communication. This 2400 baud modem with MNPS data compression packs Hayes compatibility and error-free communication. TelePort plugs into your mouse (ADB) port and provides a pass-through connector for other devices. It uses no external power supply, and leaves your serial port free for other uses! MOD0049 $39.
  - Also, TelePortFax includes SendFAX 9600 baud modem support. Hold OPTION as you drag FILE-PRINT to send Faxes worldwide. MOD0058 $185.

### Virex
- **Virex 3.0** UT00003 $59. 911 UT01091 $98. Complete Undelete UT0233 $49. Citadel UT0233 $93.

### System 7 Compatibility
- **ACC0340 Classic Anti-Grain Filter** | 49
The Power User's Tool Kit has quickly become a legend among Macintosh users worldwide. Now, here's the sixth edition — stuffed with 11 powerful programs that you'll wonder how you ever did without. And it's FREE* from MacWAREHOUSE!

*Brilliant is a simple but powerful spreadsheet with graphics. MemoKey 1.1 gives you the Command key equivalents for menu commands in your favorite applications at a glance. The Style: 2.0 gives you a quick way to print font style sheets for any or all of your fonts, and Area Codes/Time Zones is a handy DA that will help you keep in touch with the country.

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Connectix MODE32 (Connectix)  MODE32 software allows any Mac II, IIx, IICx or SE/30 to use standard System 7.0-32 bit addressing. Now these models can use up to 128 MB of RAM, and 1024 MB of Virtual Memory like the current machines. Make your Mac ROM's 32-bit clean, get MODE32.

MCK3 PPMU  The MCK3 PPMU chip lets you roll your original Mac II use System 7.5 standard Virtual Memory. Mac IIx lacks the PPMU built into other machines, but have the socket for one. Includes detailed instructions and grounding strap.

UT0125 $159.

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Turns on your Macintosh and provides protection from the keyboard.

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**DayStar** RAM PowerCard

DayStar's 512 MB per card. Chain multiple cards together for even larger amounts of RAM. Create larger RAM disks which work together for even larger amounts of RAM. Create a large RAM disk which can be used for photo retouching, database sorts, or memory. DRI0416 $32.

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**Bridge 6.0**

Play a rubber of Bridge 6.0 with the Mac’s three players. Play with either the Stammen or Blackwood conventions. Bridge 6.0 handles all the bookkeeping and tactfully informs you of any mistakes in bidding or play. It saves hands for later replaying and analysis. EN10305 529.

**QuickSCI**

Boost the SCI performance of your Mac and Macintosh and boosts your video card for two hours less! Super SCI and enhanced memory image backups. Allows your hard drive to work at its maximum speed as high as 4.4 MB per second. Other features include: Disk Mirroring, Disk Encryption, multiple SCI ports. DRI0406 $479.

**Accountant Inc.**

(Softsys/BLOC) • "Accountant Inc. is a complete integrated accounting and financial management package for the Mac" says MacUser Magazine 3/91. Starting up with Accountant Inc. is quick and easy. Combines exceptional power with an elegant and simple user interface to provide precise flexibility and better reporting. DRS048 $349.

**V-Series Ultra Smart Modern**

(Hayes) Bundled with Hayes award winning Smartcom II software. RS/232 cables and HayesConnect network server software. Offers the best combination of connectivity and data throughput available in a high speed modem such as 100% error control through both the V.42 and standard MNP protocols and the option of 1 to 1 data compression. HayesConnect users to share some settings such as plotters or printers across and AppleTalk network. MOD0045 $689.

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GR0301 10 Meg External Hard Drive $325
GR0302 44 Meg Removable $590
GR0303 40 Meg External Hard Drive $340
GR0304 60 Meg External Hard Drive $450
GR0305 80 Meg External Hard Drive $490
GR0306 100 Meg External Hard Drive $490

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(Interactive Data) • Provides the tools you need to create accurate drawings on your Mac. It supports PostScript output, has a removable geometric design tool palette, multiple layers (limited only by available memory), on-line symbol libraries, 44 different scales, custom line styles, dimensions, Bezier and spline curves, automatic area calculation, and smoothing of finished shapes. MacDraft supports 32-bit QuickDraw and custom pull-down menus in both black and white and color. Beads TETT and MacDraw II files. CAR0039 $278.
**FileGuard 2.7**

(A & D) "It's sleek, fast, and safe... I highly recommend it" MacUser April 1991. Protect your Hard Drives and Folders from unauthorized access (including security bypass with a system diskette). Copying and ensuring Applications and FileFurniture (including system folders) from unauthorized access, deletion, and for illegal copying. Desktop (including system folder) from alterations by unauthorized users. Keep an eye on System Usage with the system users log which continuously tracks user/group activity. System 7 compatible.

- Single: UT0103 $139.
- Office 5 Pack: UT0103 $499.

**SOFTWARE**

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- GRA0018 Images with Impact Accents & Borders 1.65
- GRA0017 Images with Impact Business 1.65
- GRA0057 Images with Impact People 1.65
- Abroadcast
   - CA00103 Design Your Own Home Architecture 1.65
   - CA00033 Design Your Own Interior/Exterior 1.65

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- UT0104 Illustrator 2.1 with ATM 2.0 $39
- UT0104 Illustrator 2.1 $99
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- Adobe Type Set for Business (Adobe) Create higher quality, more effective documents and presentations with new Adobe Type Sets for Business. Selected for specific needs and bundled with Adobe Type Manager software the 4 new packages contain typefaces especially chosen for business, letters, memos and faxes, overheads and slides, spreadsheets and graphs, and invitations and awards. Each package also contains a 32 page guide including suggestions for effective usage $99 ea.

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  - UT0199 PostScript 2.0 $125
  - UT0199 PostScript 2.0 $125
  - UT0199 PostScript 2.0 $125
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- Letters, Memos & Faxes

- The UnMouse (Microtouch) The UnMouse does everything a mouse can—only faster, easier, and in less space. To move the cursor, simply slide your finger over the glass surface. To make a selection merely press down. The UnMouse also serves as an extended keyboard. Tap the large red button and you have a complete Keypad with 10 keys instantly available to execute macros (60 in advanced mode). With its one million touch points the UnMouse also performs as a small graphics tablet. INP0084 $169.


- After Dark 2.0 After Dark 2.0 displays over 35 screen savers including classics Flying Toasters and Fish! Includes sound, password protection, logo and message display. UT0119 $29.

- Buy both and save UT0121 $45.

- Creative Software
  - Graffiato Easy Color Paint 2.0 $47
  - Debeza Software
    - GRA0075 Canvas 2.1 $189
    - GRA0076 UltraPaint $125
  - Dream Maker
    - GRA0075 Canvas 2.1 $189
    - GRA0076 UltraPaint $125
    - GRA0076 UltraPaint $125
  - Electronic Arts
    - GRA0075 Canvas 2.1 $189
    - GRA0076 UltraPaint $125
  - Farallon Computing
    - GRA0124 Methyl+K-9 $219
    - GRA0124 Methyl+K-9 $219
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  - Innovative Data Design
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    - GRA0099 MacWrite 2.1 $595
    - GRA0099 MacWrite 2.1 $595
  - Letterset
    - FL0023 PhotoImage $419
    - FL0023 PhotoImage $419
    - FL0023 PhotoImage $419
  - MacPaint
    - GRA0075 Canvas 2.1 $189
    - GRA0076 UltraPaint $125
    - GRA0076 UltraPaint $125
    - GRA0076 UltraPaint $125
    - GRA0076 UltraPaint $125
  - Metro Image Base (Full line available) UT0169 Newsletter Maker $45

- Adobe Type Set

- More Adobe Type for Business

- The UnMouse (Microtouch) The UnMouse does everything a mouse can—only faster, easier, and in less space. To move the cursor, simply slide your finger over the glass surface. To make a selection merely press down. The UnMouse also serves as an extended keyboard. Tap the large red button and you have a complete Keypad with 10 keys instantly available to execute macros (60 in advanced mode). With its one million touch points the UnMouse also performs as a small graphics tablet. INP0084 $169.
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Classic users: Gemini Classic™ can transform the way you work! 20-50 MHz 68030 CPU has enough power to leave Macs users chooing in your dust! Races through large documents with full or dual-page display options. 4MB or 16MB total RAM for opening all your heavy-used applications together (supports 1 or 4 MB SIMMS). Virtual memory available, uses Classic RAM as a RAM disk.

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See line listings for prices.

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M000020 SupraModem 2400 139

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M000043 IP4.6 549

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MUS0044 Deluxe Music Construction 2.5 55

Fontana™ Computing
MUS0036 MacRecorder 2.0 174

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Repositore
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OUT1019 Fireguard 2.7 129

OUT1030 Fireguard 2.7 - Office Pack 6 498

OUT1031 Fireguard 2.7 - Office Pack 10 799

OPT0059 MacCopyCard Reader 299

Fifth Generation System
OUT1020 DiskLock 118

Kensington
ACOH2825 App Security Kit 34

PassPort 69

Kant Marsh
M000033 MacLock 6 167

M000046 NightWatch 1.0 3 86

Microcom
M000090 Vir3 3.0 59

M000050 Vir3 10-pack 429

Symantec Corporation
M000014 Symantec Antivirus for Mac 3.0 (SAM) 65

UTILITIES & PROGRAMMING

Abbott Systems, Inc.
OUT0005 Calc... 39

OUT0112 CardSorter 62

Advanced Software
OUT0007 IconPrint 39

Affinity
OUT0125 Time 8 Plus 165

Aladdin Systems
OUT0145 Stuff Deluxe 2.0 62

AUSoft
OUT0100 DiskExpress 2.2 60

OUT0101 MasterJuggler 1.5 155

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OUT0119 Mac Dark 2.0 29

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- Makes your Macintosh sizzle with a performance boost up to six times that of an SE, giving you speed and power in the Mac IIx class for a fraction of the cost. With NewLife Accelerations, you not only get the computing power to process large spreadsheets and complex graphics, but you can add the optional video adapter and a larger monitor to display them as well. See line listings for prices.

- SuperMac
  - UT0003 DiskFit 2.0
- Symantec Corporation
  - UT0187 Norton Utilities for Mac II
- Zedcor
  - CD: Norton Utilities for Mac II

New! Stuffy Deluxe 2.0
(Aldus/Systems) Stuffy Deluxe is faster, and offers new choices in compression methods. Containing optimizers for text and MacPaint files, Stuffy Deluxe also has the ability to create Self-Unstuffed files that you can send to others. It includes HyperCard XCMDs and DAs for compressing and expanding files from within applications, plus QuickKeys 2 and Microphone II extensions.

- Dubl-Click
  - UT0174 Dubl-Click
- Fifth Generation Systems
  - UT0103 Fastback 2.5
- University of California
  - UT0102 SunRail II 2.2
- Insight Development
  - UT0006 MacPaint II
- Kent Marsh
  - UT0102 FolderBell
- Magic Software
  - UT0102 Autosave II
- Mainstay
  - UT0102 MacFlow 3.5
- Microcom
  - UT0123 Citadl
- University of Houston
  - UT0104 Complete Unstuff
- Microsoft
  - UNIQ0000 QuickBASIC

Now Software
- UT0107 Now Utilities 2.0
- UT0106 Screen Lock

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- UT0101 Hand-Dll
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Dantz Development
- UT0101 Retrospect 1.2
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If you do PostScript blends, you need the Blender DA. This shareware goody calculates the minimum number of steps necessary to produce a smooth transition between two colors. All you have to do is tell Blender the screen frequency, the output resolution, and the CMYK percentages of the end colors. This simple yet indispensable utility for graphic artists and designers is available from user groups and on-line services such as Zmac.

By Aileen Abernathy

Database publishing: If Timeworks continues to cram innovative features into Publish It! Easy, the Eddy Award winner will be hard-pressed to maintain its standing as an entry-level product. Version 2.1 sounds like a minor upgrade, but it adds two major features: System 7 compatibility and File It!, a built-in database manager that supports mail-merge capabilities. File It! holds as many as 32,000 records per file and 255 fields per record. Data can be entered from within Publish It! Easy or imported, and database files can be integrated directly into page layouts. All this, and Publish It! Easy still lists for $250; upgrades are $50. Timeworks ([800] 323-7744) also has an aggressive new pricing program: Owners of other Mac page-layout programs can buy Publish It! Easy for a mere $100; user-group members can get a copy for $125.

System 7 update: Kudos to Adobe, which released a 32-bit-clean version of ATM as we went to press — months ahead of the official release date. Quark has resolved its font differences with Apple, and QuarkXPress 3.1 will support TrueType after all — now it’s balloon help that’s on the ropes. Quark says that balloon help would add another disk’s worth of data to the program and that it can’t justify the overhead. Publish-and-subscribe seems safe so far. Most page-layout vendors will ship the System 7-ready versions of their programs before year’s end — even Aldus, which has been extremely evasive about System 7 plans for its products. PageMaker 4.x will reportedly support balloon help, TrueType (using the Aldus driver), subscribe, and IAC (including hot links to PageMaker’s Table Editor and to FreeHand).

Instant art: If you’re bored with 2-D clip art, you might want to use Paracomp’s latest SwivelArt packages to jazz up your next publication, presentation, or animation. The five new collections ($250 each) provide sophisticated 3-D images of maps, human anatomy, vehicles (below), and air and sea subjects. The renditions are smoothly shaded, and you can position, rotate, and color them in Swivel 3D (a limited version of the program is bundled with the clip art). Many objects have hinged or linked parts, so, for example, you can open the doors and trunk on a car image. (415) 956-9525.

Wish you had some innovative dingbats? Check out the PostScript picture fonts from U-Design Type Foundry ([203] 278-3648). The latest entry is Bill’s DECoRations, a collection of 140 art-deco symbols. Eight previous fonts (all named for designer Bill Tchakirides) include ornaments, ampersands, bullets, and universal symbols. They’re priced at only $29.95 each, and you get a free copy of Bill’s Dingbats, the font that started it all.
All things being equal, they’re not.

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Dueling Font Standards

TrueType is unequivocally here, but can it unseat the reigning font standard, PostScript Type 1?

By Kathleen Tinkel

In September 1989, Microsoft and Apple shocked the computer industry by announcing a new page-description language and font format — TrueImage and TrueType, respectively — that would compete with the reigning standards, Adobe’s PostScript page-description language and Type 1 fonts. Although TrueImage has suffered some setbacks (Microsoft recently reassigned the development team to Windows printing projects), the first TrueType fonts shipped last March and TrueType technology is an integral part of System 7 (it’s also an INIT for Systems 6.0.5 and 6.0.7).

Adobe hasn’t been sitting on its hands, however. Presented with the first serious challenge to its monopoly, Adobe finally released the long-secret specifications for its PostScript Type 1 format, enabling other font vendors to create Type 1 fonts without paying licensing fees. As a result, Type 1 is now more entrenched than ever as the Mac’s font standard, with thousands of typefaces available. Most recently, Adobe announced its Multiple Master technology, an extension to the Type 1 specs in which a single font file can contain several sets of character outlines, enabling you to create a variety of intermediate fonts (see “The Future of Type?”, July ’91, page 187). All of this has led some industry wags to say, “TrueType is the best thing that ever happened to Adobe.”

Because Type 1 is the de facto font standard, you may wonder whether TrueType is something to ignore, avoid at all costs, or welcome with open arms. If you don’t own any Type 1 fonts and most of your work is output on a non-PostScript printer such as the DeskWriter or Apple’s new StyleWriter, you’ll gain a great deal with TrueType. It’ll replace your jagged-looking type with sharp, smooth text at any size, both on-screen and on paper.

TrueType won’t seem so special, however, if you’ve been printing Type 1 fonts on a PostScript printer and using Adobe Type Manager to produce sharp text on-screen. In fact, if you have a sizable investment in Type 1 fonts, use a PostScript illustration program such as FreeHand or Illustrator, or prepare documents for output on high-resolution imagesetters, you may think that TrueType attempts to solve problems you don’t have.

Apple says that we don’t have to choose, that TrueType and Type 1 fonts can coexist happily on the Mac. Apple also claims that TrueType is a technically better font format than PostScript Type 1 is, that text created with TrueType fonts looks better than that created with analogous Type 1 versions, and that TrueType will make fonts easier to use on the Mac. One thing is certain: TrueType is unequivocally here, and it isn’t merely convenient; it’s intrusive — when you install System 7, TrueType versions of Times, Helvetica, Symbol, and Courier are automatically placed in your System file. With all this in mind, it’s a good time to compare TrueType with Type 1, both in technology and appearance, and see whether TrueType lives up to its press.
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American Text
Baskerville
Embassy
Gatsby Demi
Goudy Extra Bold
Meath
Memphis medium
Present
Times New Roman

Figure 3: These TrueType faces are among those currently available from Bitstream (American Text, Baskerville, and Embassy), Casady & Greene (Gatsby Demi and Meath), Linotype (Memphis medium and Present), and Monotype (Goudy Extra Bold and Times New Roman Extra Bold). The 24-point samples were output at 300 dpi on a LaserWriter IIINTX.

Figure 4: Type 1 and TrueType take different approaches to hinting, the instructions that determine which bits are switched on whenever there aren’t enough pixels to show the character accurately. Here, Letraset’s FontStudio shows the hinting differences for a 9-point character that will be output at 300 dpi. The rasterized bit map for the Type 1 character (left) looks dramatically different from the one produced by TrueType (right). In both cases, the bit map is superimposed over the original character outline.

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6.0.5 and 6.0.7, where TrueType is implemented as an INIT too. (The TrueType INIT ships with Apple's StyleWriter and Personal LaserWriter LS printers and is also available free from many dealers, online services, and user groups.)

TrueType fonts are easier to install and use than Type 1 fonts, because they don't require bit-mapped screen fonts. A single outline-font file provides all the information necessary for both screen display and output, in every point size and at every resolution. To install a TrueType font in System 7, just drag the font icon over the System Folder icon — the font is automatically installed in the System file. You can even see a type sample by double-clicking on the font icon. To install TrueType fonts in Systems 6.0.5 and 6.0.7, you need version 4.1 of Font/DA Mover (see Figure 2).

If you plan to use TrueType fonts in documents that were originally composed as Type 1 fonts and you don't want slight differences in character spacing to cause lines of text to break differently, you should install the original bitmap fonts that come with the Type 1 fonts, along with the TrueType versions of the fonts. The font metrics stored in the bitmap files will then control character widths, kerning, leading, and other formatting details.

There are other reasons why you might want to install one or two-bit-mapped fonts (say 10 and 12 points). First, a hand-tuned bitmap often looks better on-screen, particularly at small point sizes. Second, the Mac can display a bit map much faster than it can rasterize a font from an outline. However, some TrueType vendors such as Bitstream and Monotype are not (yet) providing bit-mapped fonts with their TrueType releases, so you may have to live without the benefits of bit maps.

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TYPE

Hints and Other Mysteries

Both Type 1 and TrueType put type onto the page in an elegant process that involves the outline fonts and a rasterizer - a collection of software routines that performs the three steps necessary to interpret (rasterize) the outlines: scaling, hinting, and scan conversion. The rasterizer can be stored in the printer (as with a PostScript RIP raster-image processor), in the Mac's System file (in the case of TrueType), as a separate, external application (as with ATM, Freedom of Press, or the TrueType INIT), or within the font file itself (as with TrueType again). A key difference between TrueType and Type 1 fonts is that the TrueType fonts themselves contain part of the rasterizing code whereas Type 1 rasterizers are always separate programs. Apple claims that putting some "intelligence" into the fonts gives designers more control over how a font will display and print; Adobe says that keeping the rasterizer separate makes it easier to update the technology - to upgrade, you just replace ATM, for example, not your entire font library.

No matter where the rasterizer is, it works the same way. When you display a document on-screen or send an application to print it, the scaling software fetches the scaling software fetches each character's outline and sizes it to your specifications. Next, the hinting routine matches the resized outline to a theoretical grid of pixels that's been scaled to match the resolution of the specified monitor or printer. Finally, the scan converter turns the outline into a bit map by switching on just those bits that fall inside the character outline. (Remember, a monitor or printer can produce only pixels or dots.)

The most complex part of the process is of course — are releasing fonts in TrueType format (see Figure 3), although it will be some time before a substantial TrueType library is available. (For sources of TrueType fonts, see "TrueType Arrives," July '91, page 181.) You can also convert Type 1 fonts into TrueType format (and vice versa) with a font-conversion utility such as Metamorphosis Professional or Fontographer or a font-creation application such as Fontographer, FontStudio, or ATF Type Designer I. The quality of the converted fonts won't match that of a font created by a type designer, but when printed at small sizes on a 300-dpi laser printer, converted TrueType fonts are often more legible than the Type 1 originals.
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Apple claims that putting intelligence into the fonts gives designers more control; Adobe says keeping the rasterizer separate makes it easier to update the technology.

The hinting routine. Paradoxically, this is the most discussed element of output fonts yet it remains the most mysterious. Hints are instructions for adjusting a character's outline to achieve the most accurate, legible image at every resolution. Each character has its own set of hints, which are stored in the font file. Hints are particularly important at small point sizes and at low resolutions. When there are only a few pixels available, the character's outline must be moved or altered to fit the pixel grid, a technique called grid fitting. Without hints, a character's stems could bend between two pixels and not print at all, or nearly identical stems might print in different weights. Hints specify the type and amount of grid fitting that can be applied to a character. As the type size and/or the output resolution increase — providing more pixels for displaying the character — the effects of hinting dwindle until there's no discernible effect. Hints thus mainly affect small type sizes at low resolutions and are rarely needed at resolutions above 600 dpi.

Probably the most significant difference between Type 1 and TrueType fonts is in their hinting languages (see Figure 4). Type 1 hints are simple declarative instructions that define the extent to which character elements can be distorted for low-resolution output. They affect such features as the position and weight of stems; the position of terminal parts of characters; the relationship of characters to baseline, x-height, and cap-height measurements; dropouts (missing pixels); and boldness. TrueType hints (or instructions, in Apple terms) are much more complex and give greater freedom to the type designer, who can choose to alter more parts of each character with greater specificity. For example, TrueType hints can not only control stem width but can also preserve the logical symmetry in the arches of a lowercase m.

The TrueType format also supports more-sophisticated instructions that go beyond the hints that preserve character shapes at low resolution. For example, TrueType fonts could be optically scaled — that is, instead of just being resized, outlines could be re-proportioned to make characters more graceful, better fitted, and easier to read in different type sizes. Unfortunately, optical scaling and other advanced features cannot be implemented until Apple adds the necessary typographic-support features (called Line Layout Manager) to the operating system, which may not be for a year or more. Type vendors will then need to rework existing TrueType fonts to support the new features. Meanwhile, as mentioned earlier, Adobe has announced the Multiple Master technology, which offers a slightly different approach to optical scaling and other typographic niceties. Adobe plans to ship the first Multiple Master fonts by early 1992, which puts Type 1 ahead of TrueType in this technological race.

Putting It on Paper

When you print a document containing Type 1 fonts, the printer driver checks first to see if the requested fonts are in the printer's ROM or RAM or on an attached hard disk. If so, the fonts are rasterized and printed by the printer's PostScript RIP. If the fonts aren't available in the printer, the driver downloads the necessary printer fonts from your Mac's hard disk. If you use ATM and have the printer fonts on your hard disk, you can also print Type 1 fonts on non-PostScript printers (ATM will do the rasterizing).

Printing TrueType fonts is also straightforward — as long as you aren't using a PostScript printer. For a 72-dpi printer (an ImageWriter, for example), the printer driver sends the TrueType screen image straight to the printer. For QuickDraw or TrueImage printers with higher resolutions (the Apple StyleWriter or Microtek TrueLaser, for example), the font is first rasterized at the printer's resolution and then the driver sends the image to the printer.

If you're using a PostScript laser printer or imagesetter, however, the printer driver will do almost anything to avoid rasterizing the TrueType outlines. (Note that version 6.1 or 7.0 of the LaserWriter driver is required for outputting TrueType fonts.) The printer driver first assumes that a Type 1 font is being printed; only as a last resort does it actually use the TrueType outline. Here's a synopsis of the driver's activities, which are handled transparently.
once you’ve issued the Print command:

- The driver searches the printer’s ROM, RAM, and any attached hard disk for a Type I outline or cached bit map with a matching name. If it finds one, the PostScript version will be printed.
- Next, the driver checks the Mac’s System Folder for a matching Type 1 printer font. If found, the Type 1 font will be downloaded to the printer, where the PostScript RIP can rasterize and print it.
- If all Type 1 searches fail, the driver will check to see if a TrueType font was used in the document. If so, it will send the TrueType outline and rasterizing software (the TrueType Scaler) to the printer.
- But wait — the driver also checks to see whether the printer has enough memory available to rasterize and print the TrueType font. If it doesn’t (a possibility with older LaserWriters), the clever TrueType software converts the font into an unhinted Type 1 outline (!) and has the printer’s PostScript RIP print that.

There is one situation in which a PostScript printer can’t print a TrueType font at all: if you use the TrueType version of a Type 1 font that’s burned into the printer’s ROM. Times Roman is a good example. Regardless of what you see on screen, the Times Roman stored in the printer is what will appear on paper. In all of these scenarios, of course, the TrueType and Type 1 names must match — the software will not substitute a completely different Type 1 face for the TrueType font you’ve specified.

Finally, there’s the speed issue. TrueType fonts take much longer to print on a PostScript printer, and you can’t use as many fonts on a page without running into memory errors. Both problems arise because the TrueType rasterizer is downloaded, used, and flushed out of memory along with each TrueType font.

**Beauty Contest**

At this point, you may be asking: Why should I insist on printing a TrueType font? Are TrueType fonts really better-looking and more typographically “correct,” as Apple claims? These are tough questions to answer, because so few commercial samples of the new format are available, but the TrueType faces released thus far certainly appear to be every bit as good as their Type 1 counterparts.

Individual characters may look slightly different between TrueType and Type 1 versions of the same typeface, because the two formats use different types of curves to draw letterforms. Type 1, like other PostScript graphics, is based on cubic curves (Bezier splines), whereas TrueType uses quadratic curves (B splines). A Type 1 outline usually has fewer control points,
because cubic curves calculate each point with greater precision. TrueType fonts have more points that are described less precisely (theoretically, this makes them faster to render). Although the two types of curves may produce small differences in character outlines, these discrepancies are rarely visible or significant.

TrueType does have the edge over Type 1 at low resolutions (see Figure 5). TrueType fonts printed at small sizes (say, 4 to 8 points) by 300-dpi laser printers or the 360-dpi StyleWriter are more legible than the Type 1 versions, with relatively open counters (openings within characters) and finer strokes. This edge in readability persists well into normal text sizes (10 to 12 points). If you produce your documents at 300 dpi, TrueType will give you visible advantages. When we sent output to a 1,270-dpi imagesetter, however, there were no visible differences between the TrueType and Type 1 versions of the same font.

Character spacing is another important typographic quality. Well-spaced type makes text more attractive and easier to read, but there are practical aspects too. If the spacing in the TrueType version of a font is different from that in the Type 1 version, documents created in one format may re-compose with different line endings and column lengths when opened with the other. This can be a headache if, say, you have already completed page layouts but need to switch font formats.

Type vendors say they are matching character widths and spacing between Type 1 and TrueType versions of their fonts, but even so, Type 1 fonts seem to have better built-in spacing controls than their TrueType cousins. Most page-layout programs — PageMaker and QuarkXPress, for example — are typographically savvy and compensate automatically for these differences by using all the spacing data built in to the fonts. Our Type 1 and TrueType test pages looked almost identical when printed from PageMaker, with no differences in line endings and only minor leading changes.

Unfortunately, applications such as word processors are generally not type-trained and take only minimal data from the font file (often just type size and width). Because of this, you are likely to see significant differences in line endings and spacing when switching between Type 1 and TrueType fonts (unless you keep the bit-mapped fonts originally used to format the document). We found Microsoft Word to be particularly troublesome in this regard, because of its auto-spacing feature (see Figure 6).

The Bottom Line

It’s too soon to tell whether TrueType will become a big success and validate Apple’s enormous investment. Despite its potential for high typographic quality, TrueType seems to be aimed at Mac users who don’t have a professional interest in typography, whereas Type 1 is well entrenched at the high end — the designers, ad agencies, service bureaus, and color-prepress houses who work extensively with type, day in and day out. We could end up with a dual font standard, split between professional (Type 1) and casual (TrueType) type users.

Ironically, the Mac community may not really have a say in TrueType’s fate. Windows 3.1 also has TrueType built in, and it brings to the PC world a major benefit Mac users have long enjoyed — one font format for all applications. Thus, hordes of PC users may cast the deciding votes on TrueType. If they are ready to support the format with their checkbooks and credit cards by buying additional fonts and sending documents to output services, Mac users — even diehard Type 1 supporters — may be swept along with the tide.

So, should you embrace TrueType or eschew it? TrueType is the obvious and sensible choice if you’re just starting to use a Mac, don’t own many Type 1 fonts, or will be printing most of your documents on non-PostScript printers. TrueType is easy to install and use, and it really shines at low resolutions. Under those conditions, TrueType could simplify the Mac part of your life. (If you’d like to bone up on Mac typography, get The Macintosh Font Book, second edition [Berkeley, California: Peachpit Press, 1991].)

The choice is equally clear for type-oriented users who rely on PostScript for graphics and page layout, own a PostScript printer, send files to service bureaus for output, or have a sizable investment in Type 1 fonts. If this is you, avoid TrueType for the time being. Wait until a wide selection of typefaces is available, until service bureaus are supporting output of TrueType fonts, and until others have discovered and solved the day-to-day problems of working with two type formats.

Contributing editor Kathleen Tinkley is a type-loving graphic designer and co-publisher of MacPrePress, a weekly faxed newsletter.
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While we’re waiting for Apple to come out with a portable portable, NEC has shipped a portable that weighs more than the Mac boat anchor. The NEC ProSpeed 486SX/C does have a good excuse, though. That C stands for color — 8-bit, 640-x-480-pixel, Super VGA Thin Film Transistor active-matrix color, to be precise. Oh, yes, the weight: 16.8 pounds.

By Henry Bortman

Hubs, hub: Nuvotech is offering the first 24-port, rack- or wall-mount LocalTalk hub, dubbed NuvoStar, for $1,495. This is good news for people with large networks. Previously, LocalTalk hubs were limited to 12 or 16 ports. Meanwhile, newcomer Rad Advanced Networks ([201] 587-8822) is marketing its MiniStar 8-port LocalTalk hub for the VLP (very low price) of $850.

Ether hubs: The field for 10BASE-T Ethernet hubs is expanding too. For example, NRC ([408] 263-8100) is offering the innovative 24-port MultiGate Hub. One of the hub’s ports can be configured as a “learning/filtering bridge,” so that in large networks with multiple hubs connected to a corporate backbone, traffic between nodes on the same hub can be kept off the backbone. In addition, protocol-based filtering can restrict backbone access to only certain types of protocols, such as TCP/IP. It also offers extensive Mac-based management capabilities. $3,495. Asante’s hub has less smarts and fewer ports (twelve 10BASE-T ports plus one each for thin coax and AUI), but at its new price of $995 (down from $1,395), it costs significantly less. And, if you’ve been thinking about making the switch to 10BASE-T but haven’t figured out how to support users with more than one network device in their offices, check out Shiva’s Hublet. It enables each 10BASE-T run, which normally can support only a single device, to support up to four devices. Think of it as the equivalent of an AC power strip for 10BASE-T. $399. One more cute 10BASE-T device: Dayna’s $399 DaynaPORT E/Z, an Ethernet interface that connects to the Mac’s serial port. A real lifesaver for users of Macs (such as the Classic) without a card slot or whose slots are filled with other cards. The box also supports thin-coax, AUI, and fiber-based Ethernet connections.

Mail call: For the user or network manager who collects mail gateways, here are a couple of new ones. Solutions ([802] 865-9220) will soon ship CommGATE/QM, which lets QuickMail users exchange mail messages — and files — with MCI Mail users. $395 for five users, either Mac or DOS. Information Electronics ([607] 257-5840) is offering SMTP/QM, a gateway between UNIX-based SMTP (Simple Mail Transfer Protocol) and QuickMail. With TCPack, a TCP/IP connection tool that’s included in the bundle, you can use your QuickMail server as an FTP (File Transfer Protocol) server as well. $749 per QuickMail server, regardless of number of users.
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Maximum Mac Management

You already use the Mac to keep track of your network. Here's how to use the network to keep track of your Macs.

By John Rizzo

Seated Mac veterans sometimes look back wistfully to the good old days of Mac networks, when resource management was simple. The ten Macs on the network were almost identical and contained three user applications: MacWrite, MacPaint, and Excel. These days, network administrators deal with scores of users; a dozen Macintosh models; and hundreds of versions of peripherals, drivers, INITs, and applications—all of which may or may not work with each other or with System 7.

Fortunately, you don't have to rely on shoe leather alone to keep track of everyone's workstation setup. Network-management software exists that tells you what NuBus boards, System software, fonts, applications, and other software and hardware is running on every machine on the network. These are not the type of applications that look at the network infrastructure—the traffic, events, and packets that cross the wires (for more on such utilities, see "Networks: Under New Management," August '90, page 226). Rather, network-management programs give you a higher-level look at the network, probing and recording the resources at the end of the wires. They enable you to collect data in a few minutes that would otherwise take weeks. You can use this data to provide faster and better technical support for users and to troubleshoot a problem without leaving your desk.

Most of these products are already into their second-generation versions. Pharos has released version 2.0 of Status-Mac, which no longer requires a mail or file server for sending messages across the network, as it did in the original version. GraceLAN, from Technology Works, is also in version 2.0, and Radar, from Sonic Systems, was scheduled to go to its 2.0 version this summer. Network SuperVisor 1.0.6, from CSG Technologies, hasn't been updated recently.

We tested all four products on MacUser's multizone internet, which contains Macs running under both System 6 and System 7. The programs are all System 7-compatible; two of them—GraceLAN and Status-Mac—including balloon help.

An Inside Look

The four programs share similar features: They all come with a special Responder INIT (not to be confused with Apple's Responder) that you put into the System Folder of each Mac on the network. The network administrator's Mac runs the network-management software, which gathers information by sending a request over the network, asking the INIT to do a scan (also called a profile) of the resources on each user's Mac. Information about INITs, versions of System and application software, hard drives, monitors, and other hardware is sent back to the administrator's Mac. The applications differ in how they gather the information and what happens to the
information when it returns to the network administrator’s Mac. Let’s consider what happens when the data is gathered.

If you’re not careful, collecting data with network-management software can turn you into your colleagues’ enemy. On the surface, the issue seems to be merely a matter of philosophy: Should Big Brother be allowed to snoop on everyone, or do companies have the right to know what is going on with their resources? However, these questions are moot in this case, because none of these programs can read data files, so no one is going to see the letters to your congressman that you may have on your hard disk.

The real issue is that these programs can hamper office productivity by interrupting users at a critical moment in their work. Scanning a Mac can interrupt it for anywhere from five seconds to several minutes, depending on the program you use and the configuration of the user’s Mac — the more volumes and software on the target Mac, the longer the interruption. If interruptions become a nuisance, users may remove the network-management software’s responder INIT from their System Folders, forcing you to go back to using your feet to collect data.

One way to avoid antagonizing your colleagues is to use a program that scans quickly and doesn’t boggle down the target Mac. Radar’s scan was the quickest of the four products in our testing and causes the least slowdown of the user’s Mac during a scan (see Figure 1). Part of the reason for the speed is that it doesn’t scan for applications — which is a problem if you need that information. Status•Mac came in second in terms of speed, but, unlike Radar, it takes over the user’s Mac completely in the process. GraceLAN’s scan took twice as long as Status•Mac’s, but it doesn’t take over the scanned Mac. Network SuperVisor has the slowest scan, but it takes over the user’s Mac only when looking at INITS and applications.

One of the reasons Radar and Status•Mac are faster than the other two products is that they use ADSP (AppleTalk Data Stream Protocol), which enhances AppleTalk’s data-transfer capabilities. ADSP comes in the form of an INIT for System 6 users and is built into System 7 (the ADSP INIT is included with both Radar and Status•Mac). ADSP provides network applications with a direct pipeline from one Mac to another, making data transfers fast and reliable. Neither GraceLAN nor Network SuperVisor uses ADSP.

How each of the applications gathers data also influences its speed. For example, Status•Mac’s responder INIT gathers information only when a request from the network administrator’s Mac comes over the network. In contrast, Radar’s responder INIT gathers its information each time the target Mac boots up. As a result, the user waits a few seconds at startup, but the data is ready to be sent over the network when the Radar application on the network administrator’s Mac sends a request for information. Although

![Figure 1: Scanning Speed](image1)

<table>
<thead>
<tr>
<th>Software</th>
<th>Seconds to Complete a Scan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radar</td>
<td>2</td>
</tr>
<tr>
<td>Status•Mac</td>
<td>4</td>
</tr>
<tr>
<td>GraceLAN</td>
<td>6</td>
</tr>
<tr>
<td>Network SuperVisor</td>
<td>8</td>
</tr>
</tbody>
</table>

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Figure 1: How fast network-management software gathers information from Macs on the network is important, because you want to disrupt users’ work as little as possible. MacUser tested the four programs’ scanning speeds with a 13i running under System 7 scanning a 13i running under System 6.0.7.

![Figure 2: Dealing with a scan’s interruptions and performance limitations can be a real annoyance to a network administrator’s colleagues. To alleviate this, Status•Mac gives the administrator the option of scanning Macs at a time that will be most convenient for everyone. The Send Request window lets the administrator send a scan request immediately, at a set time (during a lunch break, for example), or at shutdown. Status•Mac also lets users delay a scan to a more convenient time.](image2)
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GraceLAN gathers most of its information after it’s requested, it uses Radar’s technique to a lesser degree by gathering application information at startup. This is one reason it’s faster than Network SuperVisor, which, like Status•Mac, gathers all of its information only when it’s requested to do so.

Radar’s method of gathering information at startup has its price. Radar doesn’t recognize any removable volumes, such as SyQuest or erasable optical cartridges unless they were inserted before startup. (GraceLAN scans cartridges inserted after startup but doesn’t collect their application information because it gathers this information only at startup.) In addition, in MacUser’s tests, Radar could not see fonts stored by Fifth Generation’s Suitecase II. Because INITs load alphabetically, the Suitecase II INIT loads after Radar has collected its data. Sonic Systems should have a fix for this problem by the time you read this. (Alternatively, you can change the name of the Suitecase II or Radar INIT so Suitecase II loads before Radar.)

Network SuperVisor’s responder INIT conflicts with version 1.2.9 of Suitecase II, causing interference with AppleTalk and preventing the Network SuperVisor application from seeing the Mac. A later version of Suitecase II may avoid this conflict (1.2.10 is now available).

**Scheduling Scans**

Although a Status•Mac scan takes over a Mac for a short time, it has the most useful set of solutions to prevent interruptions of users. Status•Mac is the only program that warns users before a scan takes place and gives them the option of delaying it. When the network administrator’s scan request (which Status•Mac calls a Profile Request) appears on the user’s screen, the user can choose to approve the scan or delay it for any length of time. If the Profile Request gets no response, Status•Mac assumes that the Mac is unattended and conducts the scan after a certain time interval. In addition to setting this interval, the network administrator can also set Status•Mac to do the scan when the user shuts down (after the user chooses Shut Down, the scan takes place and then the Mac automatically shuts down) or at a specific time (see Figure 2). Status•Mac’s Profile Request also allows the network administrator to send a message of any length; these messages can be stored in a pop-up window.

Although the other programs don’t

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**Figure 3:** Certain network-management tools give users some control over what information the network administrator can access. Network SuperVisor’s control panel can prevent the network administrator from scanning certain information such as INITs or applications. Users can also prevent the network administrator from doing such things as shutting down or restarting their Macs or taking screen shots.

**Figure 4:** Gathering data with network-management software is only one step — you then need a database manager for organizing and analyzing the information. Status•Mac provides 75 templates that let you filter and import data for a variety of analyses. This template found the Macs on a network that are able to make use of System 7’s virtual-memory capability. Each template contains a paragraph explaining the filter criteria.
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automatically warn users of impending scans, GraceLAN and Network SuperVisor have a message-sending feature so the network administrator can send a one-line message to selected users to warn them of an imminent scan — the users can’t delay the scan, though. You can also use this message capability for sending messages such as “The mail-room printer will be down for the day” or “The mail server will restart at noon.” Sonic Systems is planning to incorporate a similar message feature in its 2.0 version of Radar, which should be available now.

Only Status•Mac lets users delay a scan, but GraceLAN and Network SuperVisor give users the option of preventing scans or parts of scans by using a control panel that’s part of the responder INIT. GraceLAN’s control panel has four settings: Name and Machine Type, which allows GraceLAN to see only the Chooser name and type of Mac; System Info, which lets the program see System files and hardware information; All Info, which removes all scanning restrictions; and Make Changes, which lets the administrator make some minor changes, such as resetting the Mac’s clock or updating the responder INIT. For those administrators who don’t want users to be able to lock them out of their Macs, GraceLAN also provides another version of the control panel that doesn’t include these options.

Network SuperVisor has even more such options, allowing users to prevent Network SuperVisor from seeing one or more of nine categories, such as fonts, applications, or System files (see Figure 3). Radar has none of these options.

**Database Management**

What happens to the information once it’s been gathered? All the programs can print out reports, using templates that come with the program or that you design yourself. But to get the most out of your data, particularly on a large network, it’s best to use some type of database manager for storing and cross-referencing information. One benefit of using a database manager is that the Macs you want to profile don’t all have to be on at the same time — if some are having problems or are shut down and in locked rooms, you can scan those Macs later and then add the information to the database. Status•Mac and Network SuperVisor have built-in database managers. GraceLAN, which doesn’t have a database manager, has templates for Claris’ FileMaker Pro and Microsoft Excel, to which you can export collected data. Radar is the weakest in this respect — it has neither a database manager nor an export command, although you can save reports as text. However, you can’t perform any database functions, such as sorts, on the text reports.

A unique feature of Status•Mac’s database manager is its peer-to-peer store-and-forward architecture, which lets you send Profile Requests to Macs that are turned off. In such cases, the network

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**Instant Updates**

Although future versions of network-management applications will let you update software over the network, one product available now — VersionTerritory 1.7, from SoftWriters — is specifically designed to do this. VersionTerritory uses ADSF to update applications, data files, or entire folders as well as delete old files. There is no way to warn users of an impending upgrade, so you’ll have to tell them yourself. VersionTerritory sells for $495.

Version 2.0 of VersionTerritory, expected now, will allow users to upgrade Apple System software from System 6 to 7. It does everything that Apple’s Installer does, including moving fonts and DA’s from the old System to the new. It also does something the Apple Installer doesn’t do — install System 6 on top of System 7. Users may find themselves doing this after discovering that their favorite application is not System 7-compatible.

SoftWriters also sells the 7•UpDater, a cheaper version of VersionTerritory specifically designed for updating to System 7 over a network. Unlike Apple’s Network Installer, which requires users to log on to a server and upgrade their own Macs, 7•UpDater upgrades multiple Macs over the network by itself after the network administrator has launched it. 7•UpDater installs the new System software; moves the System 6 DAs, fonts, control panels, and INITs into the appropriate folders; and restarts the Mac. 7•UpDater costs $99 for six users and $249 for an unlimited number of users.

SoftWriters, Inc., P.O. Box 1308, Round Rock, TX 78680; (512) 244-3999.

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**Figure 5:** GraceLAN, Network SuperVisor, and Radar can all see printers on the network, but only Radar can update them by uploading or downloading fonts or renaming the printer. Radar has a built-in printer utility that can move fonts between a printer’s memory and your Mac’s hard disk.

**Figure 6:** Several products do more than just gather information on the Macs or PCs on a network — they also provide some troubleshooting features.

GraceLAN’s Topology window creates a logical map of the network, showing users, file servers, printers, and other network devices. The tray icon attached to the right side of several of the Macs indicates that these Macs have AppleShare volumes that are available to the network via System 7’s file-sharing feature.
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network management administrator’s Mac stores the request until the target Mac has been turned on. The request is then automatically sent in the background to that Mac without interrupting the network administrator.

A database is helpful for analyzing selected information. Let’s say you’re planning to purchase memory for users’ Macs, so you need to know which machines contain 2 megabytes or less of RAM. If you used GraceLAN — which doesn’t have a database manager — you would have to sort the list of Macs by the amount of memory they contain and then the program would have to go out over the network and collect the data again, even if you’d already done a general scan. With a database, however, after you’ve gathered all your information, you can compare specific data off-line without worrying about network traffic or needlessly interrupting users.

Status•Mac is particularly well suited for data analysis. It comes with more than 75 report templates you can use to sift through the data for the facts you want. You can also build your own templates. With just the press of a button, Status•Mac filters and exports data from the master database (which contains all the information from your scans) into a template. Some of the templates display text on how to use and interpret the data you’ve gathered (see Figure 4). Pharo plans to expand Status•Mac’s usefulness by introducing a product that uses artificial intelligence to act on the data gathered — to update programs, for example (see the “On the Horizon” sidebar).

One group of templates that Status•Mac 2.0 includes is the System 7.0 Readiness Kit, designed to help you convert the Macs on your network to System 7 (see “System 7.0 on a Network,” July ’91, page 199). New to the kit is the Status Checker, a HyperCard stack that works with Status•Mac and Apple’s Compatibility Checker. Status•Mac’s Status Checker takes the information in Apple’s Compatibility Checker and makes the same type of upgrade recommendations for all Macs in the database at one time.

Network SuperVisor, which was built with ACIUS’ 4th Dimension, sports a beefy database manager with many of 4D’s data-manipulation features, such as powerful search and sort capabilities (the 4D application is not required to run Network SuperVisor). Network SuperVisor can also import and export a variety of file formats, including text, SYLK, 4D, and DIF (a DOS format). You can add non-network user information to the database, such as user phone numbers, purchase dates, and equipment prices. You
can even add graphic data, such as photographs of users and floor plans.
CGS offers a version of Network SuperVisor that doesn’t include the database manager. SuperVisor Jr. ($249) offers increased speed and ease of use in return for its lack of a database manager. Sonic Systems also offers a cheaper version of its product, Radar Junior ($299), that works the same as the more expensive version but without the reporting features.

**Look and Feel**
How easy these programs are to use and obtain information from is an important consideration. Network SuperVisor suffers from a complex and somewhat convoluted user interface. There are more menus than seem necessary, and you have to click through several windows to accomplish most actions such as scans. In addition, many of the windows are modal, so you often have to close several windows before you can switch to the Finder or other applications under MultiFinder.

GraceLAN’s interface is much better than Network SuperVisor’s, but it still requires you to go through several steps to get to the detailed information. First you select zones to scan, next you select users, and only then can you double-click on a field to get more-specific information. Radar has the best interface of all the four products: It’s simple and intuitive and requires few steps to get at information. Status-Mac is a more complex program than Radar, but it also has a good interface, with easy access to data. Status-Mac’s Browse window gives you all the information about individual Macs that GraceLAN provides but requires fewer steps to access it.

**Action at a Distance**
All of these products have features that let you do more than just collect data. Both GraceLAN and Network SuperVisor let you synchronize the clock on a user’s Mac with your own and update responder INITs over the network. Network SuperVisor also lets you shut down and restart a Mac as well as take a snapshot of the user’s screen — useful if you have to describe problems over the phone. GraceLAN and Network SuperVisor users can prevent the network administrator from accomplishing any of these tasks by using the control panel that’s part of each product’s responder INIT.

Radar includes features of several network utilities. Like Apple’s Inter-Poll, it gives you a list of network sockets, useful for seeing what AppleTalk processes are running on the network. Radar also lets you update your printers (see Figure 5). It shows you the fonts in a printer’s memory and hard disk and lets you move fonts between your Mac and the printer. You can also rename a printer. Network SuperVisor and GraceLAN can both see printers but not update them.

GraceLAN has some built-in network utilities too. One command runs tests signals from your Mac to another and reports the average response time and error.
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BRIEFS

NETWORK MANAGEMENT

Any of these programs is an improvement over the old method of gathering information by running around your office, opening up Macs, and annoying your colleagues.

count to check the network's physical connections. The Topology window displays a logical diagram of the structure of your network, which can be handy for troubleshooting (see Figure 6). GraceLAN is also the only program that can collect information from DOS machines as well as Macs on AppleTalk — useful if you have a mixed Mac/PC network. DOS users have to install a TSR (terminate and stay resident) program, the equivalent of a Mac INT.

Although StatusMac doesn't have any specific troubleshooting options, it does give you a lot of flexibility when gathering information. Its peer-to-peer store-and-forward architecture can scan Macs connected remotely to the network via a modem. It can also scan Macs that are not connected to a network — users can initiate a scan of their Mac from the control panel and pass the resulting file to the administrator on a floppy disk. At press time, Pharos was planning to add a separate application, called Personal Status, to StatusMac that would let users scan their own Macs and view the data. The one feature that none of these products yet offer is the ability to act on the information gathered — by updating applications or INITs, for example. However, products already exist that do this exclusively (see the "Instant Updates" sidebar), and future versions of Radar and GraceLAN should be able to update across the network too.

The Bottom Line

The days of opening up all the Macs on a network to see what cards they hold are over — now you can buy network-management software to do it for you. The key points in looking for a package are how little it interrupts users; whether it has a solid, easy-to-use database manager for doing quick analyses; and how thoroughly it gathers data. Troubleshooting features — such as the ability to list network devices — are useful but are usually available in other network utilities. See Table 1 for a comparison of the products' features.

StatusMac 2.0, from Pharos Technologies, has overcome the weaknesses of its first version (which required a dedicated mail server or file server to send messages) and now offers the best features. Its quick scans and well-thought-out Profile Request minimize annoyance to both the scanner and the scanner. Its peer-to-peer store-and-forward architecture guarantees that every Mac will eventually be scanned, regardless of when it is turned on. You can even scan Macs that are not on the network.

StatusMac's database manager works well, and its bundled templates bring all kinds of cross-related data to your fingertips. In addition, the bundled System 7.0 Readiness Kit greatly enhances Apple's Group Upgrade Kit by allowing you to see the System 7.0 readiness of Macs across a network.

If you also need to scan PCs on your network, GraceLAN 2.0, from Technology Works, is your only choice at this time. Its topological diagram of the network is useful for troubleshooting network problems. Although GraceLAN doesn't have a built-in database manager, its ability to export information directly to databases is helpful.

On the low-cost scale, Radar 1.0, from Sonic Systems, is a real bargain for large networks. At $499 for unlimited users, it costs less than half as much as its competitors. Radar sports a very intuitive interface, and it's the only product that lets you upload fonts to and download them from a printer. It also does very fast scans. Unfortunately, Radar doesn't include applications in its scans, and the only way to export gathered information to a database is indirectly, through reports saved as text.

At press time, CGS Technologies' Network SuperVisor 1.0.6 was the oldest program of the group, and its age shows. Although it's built around a powerful database manager with good sorting and reporting capabilities, Network SuperVisor is marred by a cluttered interface and slow scanning.

These programs are an improvement over the old method of gathering network information by running around your office and opening up Macs. Now that's the way to annoy your colleagues.

John Rizzo, MacUser's technical editor, is a former network manager.

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Physical Fitness

Electronic troubleshooting tools are all the rage, but to keep your network in peak condition, you'll still have to burn some sneaker tread.

By Kurt VanderSluis

In the olden days of networking (a year or two ago), troubleshooting was a fairly physical job. In addition to checking the software and hardware configurations on devices all over the network, most of us spent lots of time trying to locate network troubles by crawling under desks, tracing wires in phone closets, and climbing into ceiling crawl spaces. Today, electronic tools such as network-management programs let us gather detailed information about a network without leaving our desk (see “Maximum Mac Management,” elsewhere in the Bridges section). The troubleshooting tools in this new generation are so proficient, in fact, that they may lull you into a false sense of complacency, tempting you to do all your network diagnostics from a seated position.

Don’t do it! High-tech tools are extremely useful, but they’ll never completely replace the low-tech, physical aspects of troubleshooting. Electronic troubleshooting tools are designed to find specific problems, so if your network troubles fit the preprogrammed scenarios, you’ll be in luck. But if your problem falls outside the programs’ scope, you’ll still have to revert to traditional troubleshooting procedures such as crawling under desks looking at cable connections.

One important low-tech technique that can’t be replaced is component swapping, or replacing the pieces of your network setup one at a time until you locate the trouble spot. Not long ago, component swapping helped me locate a problem that couldn’t be detected by any of the electronic tools I had available. This incident illustrates the importance of combining high-tech tools with a low-tech physical approach.

The Network Setup

The problem I was experiencing — no network zones — occurred when I was setting up a test to look at recovery mechanisms in routers. Some Ethernet routers are intelligent enough to recover from certain kinds of configuration errors, and I wanted to see what sorts of misconfigurations the routers could (and could not) handle.

I built a simple Ethernet network that consisted of a Mac IIEC connected to a Shiva FastPath router through a Farallon StarController EN (see Figure 1). The StarController is a multiport repeater — also called an Ethernet hub — that creates an Ethernet network in a star configuration. If you use a LocalTalk hub, note that an Ethernet hub is similar in concept, the major difference being that it requires two pairs of wires for the network signal — one pair to transmit and one pair to receive. The StarController also uses 10BASE-T Ethernet; 10BASE-T is an Ethernet standard that specifies how to build Ethernet networks using unshielded twisted-pair wire (popularly known as telephone wire) and RJ-45 ports (which are like phone jacks).

Unfortunately, neither the Ethernet card in my Mac nor the FastPath router supports...
10BASE-T. Instead, they provide ports for two older Ethernet standards: thick coaxial wire (AUI port) and thin coaxial (BNC port). To make the two devices compatible with a 10BASE-T Ethernet network using twisted-pair wire, I connected the AUI port of each device to a Farallon StarConnector EN, an external transceiver that provides the electrical interface for 10BASE-T, including an RJ-45 port.

Like most 10BASE-T transceivers, the StarConnector has several lights that relay information about the status of the network connection. These include a power light, a link-status light that shows that the transceiver is communicating with the StarController hub, and three other lights that indicate when the Mac (or router) sends or receives a data packet or experiences a collision (sending or receiving data over the network simultaneously with another device). Likewise, each of the StarController’s 12 ports has lights for power, link status, and incoming traffic (packets received). (For more on 10BASE-T choices and configurations, see “Instant Ethernet: 10BASE-T,” September ’91, page 174.)

After setting up the Mac and making sure its Ethernet card and transceiver were working, I set up the FastPath router and configured it to be a Phase 2 router with extended Ethernet addressing. That is, I assigned a range of network numbers and a list of zone names to the Ethernet port, instead of the one network number and one zone name used by a nonextended network such as LocalTalk or AppleTalk Phase 1.

Once the Mac and the FastPath were both ready for action, I plugged the transceivers in to their respective RJ-45 wall outlets and went to the telephone closet (the nerve center of the network, where all the wires meet) to make the corresponding connections on the punch-down blocks. Finally, the entire Ethernet network was in place—Mac, router, transceivers, StarController, wiring—so I turned the FastPath on and let it go through its startup routine. I could tell when the FastPath was ready, because the transmit light on its transceiver began blinking every ten seconds—like all AppleTalk routers, the FastPath is required to broadcast routing information (called RTMP packets) every ten seconds.

I then turned on the Mac and selected the Phase 2 Ethernet driver from the Network control panel. I opened the Chooser, but no zones appeared in the Chooser window. I closed the Chooser and repeated the selection process—still no zones. Obviously, the Mac was not communicating with the FastPath; otherwise, I would have seen the zone list I entered when I configured the router.

Electronic Inspection
OK, what was wrong? I first checked all the obvious things. The transceiver cables were plugged all the way in, and the power and link-status lights on both transceivers were lit. All the network wiring connections were solidly in place, and I double-checked in the phone closet to make sure the wires were cross-connected correctly in their punch-down blocks. The jumper setting on the Mac’s Ethernet card was correctly set for the AUI port, as was the selector switch on the FastPath.

The Mac’s transceiver periodically blinked its transmit light, which I could relate to all the normal stuff that happens when a Mac boots up on Ethernet: transmitting node-address data; registering sockets for network applications such as Timbuktu, DataClath and electronic mail; and so on. The same was true for the FastPath—the transmit light on its transceiver blinked every ten seconds, indicating that the router was sending out RTMP packets on schedule. The blinking of the traffic lights on the StarController matched that of the transceivers. Clearly, the two Ethernet devices were sending and receiving. This proved that the network had both electrical continuity and Ethernet-link continuity.

I ran diagnostic tests on the Ethernet card, and all of its functions checked out perfectly, with one exception—it wasn’t
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receiving any data packets from the network. I let the test continue for 30 seconds, and still it received no packets. This was strange: The electrical circuit was complete and the router could send packets, but the Mac wasn’t receiving them.

I reinstalled the Ethernet driver on the Mac, making sure that it was the correct one for the card. Still no luck. Then I ran the AG Group’s EtherPeek, a network-monitoring program that uses its own Ethernet drivers instead of those installed in the Mac. If EtherPeek could receive a packet, then I would suspect that my Ethernet drivers were conflicting with the System software. But EtherPeek didn’t receive any packets either, although the FastPath was still sending them out. In desperation, I changed the configuration on the FastPath so that it routed both Phase 1 and Phase 2 Ethernet — just in case there was a software-configuration problem. Still no packets, still no zones.

Next, I used Farallon’s StarCommand 2.2.1 software to check the integrity of the StarController and see whether data was moving through it. The StarCommand statistics showed that the StarController had received several packets each from ports 1 (the Mac) and 2 (the FastPath) with virtually no errors. Now I was really confused: Everything was connected, both the Mac and the FastPath were sending valid packets, and the router was receiving packets just fine — but it was a one-way connection, because the Mac couldn’t receive data from the router.

Getting Physical

None of my high-tech tools could locate the problem, so it was time for some manual labor. I swapped Ethernet cards, transceivers, twisted-pair line cord, and the Amphenol cable that connected the StarController to the punch-down block. I moved the Mac and the router to different ports on the StarController, but nothing helped. There was only one thing left to swap out — the StarController itself.

I didn’t have a spare StarController, so I decided to get rid of the 10BASE-T network setup altogether — transceivers, twisted-pair wiring, wall jacks, punch-down blocks, the works — and directly wire the FastPath to the Mac’s Ethernet card. I ran a piece of thin coaxial wire from the FastPath’s BNC port (and changed the port-selector switch setting) to the Ethernet card’s BNC port. I changed the card’s jumper setting from the AUI to the BNC port and switched the Mac back on. Lo and behold, everything worked! The Mac could receive packets, I could see zones in the Chooser, I could print through the FastPath to a LaserWriter, I could see the RTMP packets with EtherPeek. I concluded that there must be something wrong with the StarController itself.

I called Farallon’s tech support and told them my story. The technician agreed with my diagnosis and sent me a new StarController. When it arrived, I changed the network back to its original setup and installed the new StarController — and the packets (and zones) disappeared all

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over again, although everything still seemed to be working fine. It wasn’t the StarController after all.

I decided to swap the only things left — the wall outlets where I connect the line cords. I didn’t really suspect that the wall plates were a problem, but I’d tried everything else. Much to my surprise, however, when I replaced the wall plate where the FastPath was connected, my 10BASE-T Ethernet network was finally operational, with all devices talking to each other and zones showing up in the Chooser.

Looking more closely at the errant wall plate, I found the reason for my network headaches: When I wired the wall plate a few months earlier, I had mistakenly reversed the polarity on the transmit pair of wires. Because I’d never used that wall plate before, I hadn’t discovered the problem. All the tools I used to check it during installation — an ohm meter to measure the line resistance, a TDR (time-domain reflectometer) to measure the impedance characteristics, a tone test to trace the distribution wires back through the wall to the phone closet — showed that the wall plate was fully functional. None of these tests detected the crossed polarity.

When I tried to establish the Ethernet network, my network-diagnosis tools also failed to pinpoint this fatal flaw. The FastPath was sending out valid packets, but the reversed polarity in the wall plate’s transmit wires turned the packets into electronic gibberish, rendering them unreadable to the Mac. The blinking lights on the StarController and transceivers indicated that they were sending and receiving, because they see only electrical pulses, not necessarily the presence of packets. Likewise, the StarCommand statistics reported a normal network, because reversed polarity is not one of the errors the program can detect. (More-expensive Ethernet hubs, such as those made by Cabletron and Synoptics, can detect polarity errors; you can also buy handheld wiring testers for around $100 that detect this problem.)

In short, my high-tech troubleshooting tools failed to detect a very simple problem, and I was able to locate the trouble spot only by using a low-tech approach, component swapping. And although component swapping located the problem, it was an even lower-tech procedure, visual inspection, that identified the cause.

I have a healthy supply of electronic tools in my troubleshooting arsenal, but the moral of this story is not that we need more tools but rather that we must understand the limitations of these tools and be prepared to go back to basic troubleshooting techniques. Now that I know that StarCommand can’t check for correct polarity, I won’t interpret “error-free” packets as a sign that the polarity is correct.

Likewise, I’ll remember that low-tech procedures such as component swapping are still important, no matter how fancy the electronic tools become.

Kurt VanderSluis is president of The Network Group, a training and consulting firm in Seattle.

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Afraid your Mac SE/30, IIcx, IIx, or II is obsolete because you can’t break the 8-megabyte memory barrier? Connectix has a solution — MODE32, a $169 software ROM patch that turns older 68020 and 68030 Macs running System 7 into lean, clean, 32-bit machines, giving them access to up to a gigabyte of memory and the speed of 32-bit programs. (800) 950-5880.

**Key technologies:** Ever wish the 15 function keys on the Mac’s Extended Keyboard were the same for all applications? Apple has standardized F1 through F4 in System 7 as Undo, Cut, Copy, and Paste; now Go Technologies, maker of Hot Keys keyboard macros, wants Apple and other software manufacturers to standardize the rest. According to Go’s plans, F5 and F6 would define type specs and tab settings; F11 through F15 would activate Find, Select All, Print, Save, and Open; and F7 through F10 would be left to the user’s discretion. CE Software’s QuicKeys 2 ($149) now supports Apple events under System 7. So? Well, for example, with a single keystroke, you can grab data from your database, plot it in a spreadsheet, and import the chart into your word-processing program. (800) 523-7638.

**Hot fusion:** For those who find the IIfx too slow, Fusion Data Systems — maker of the TokaMac 68040 accelerator cards for the LC, IIsi, SE/30, and IICl — should have a 68040 IIfx accelerator soon. The board features a screaming 33-megahertz 68040 processor, with connectors for the IIfx’s NuBus slot as well as the faster PDS (processor-direct slot). (512) 338-5326. For the rest of us, Fusion plans to offer a new TokaMac card for the LC for less than $2,000. The new board will use a cheaper 68040 chip, which has no built-in floating-point coprocessor (used by applications such as spreadsheet programs) or paged-memory-management units (needed if you want to use virtual memory). Still, it promises a significant speed improvement over a stock LC or even a IIfx.

**Programming news:** Need to create stand-alone HyperCard stacks for users who don’t have HyperCard? StackRunner ($99), from Symmetry Software, installs run-time engines in HyperCard stacks, increasing stack size by a mere 150K to 200K. (800) 624-2485. With its Think Reference CD, Symantec brings *Inside Macintosh* inside Think C and Pascal. This on-line tool lets you search for IM info from within C and copy toolbox calls directly into your own program. A steal at $99. (408) 253-9600.

**Sound advice:** While most of us are still figuring out what to do with the microphone on the new Macs, audio professionals can now use their Mac to analyze telecom signals and measure noise levels. National Instruments turns the Mac into a low-cost (around $8,000) spectrum analyzer for taking a closer look at audio with a hardware/software package called the Audio Frequency Fourier Analyzer. It includes DSP (digital signal processor) and input cards as well as modules for LabVIEW software. (800) 433-3488.

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*By John Rizzo*
The Best Backup Strategies

By Laura Brown

Nobody ever said that backing up your data was fun. It's a tedious chore that people tend to put off if it takes a lot of time. But backing up regularly is crucial — fire, floods, earthquakes, and other natural disasters can wipe out your data, as can more-mundane events such as power cuts and plain old human error. You can ease the time spent and the tedium of backing up by choosing a storage medium that's large enough to accommodate the data in one unit, scheduling backups so they cause the least inconvenience, and storing the backups in a safe place.

Before you decide which medium to use for backing up, look at your data. If you have a 20-megabyte hard-disk drive with applications that seldom change and a couple of dozen word-processed text files, you can probably easily back up those files onto floppy disks. On the other hand, if you're doing a daily backup of a 300-megabyte file server, floppy-disk storage would involve hundreds of disks and a huge amount of time — backing up to DAT (digital audiotape) would probably be more practical.

Here's a description of the most common storage media. For details on how much data these media can hold and how much they cost, see Table 1.

Floppy Disk. This is certainly the least expensive solution, because you're bound to have a floppy drive, but as mentioned earlier, your storage needs should be modest. If you're not going to use software specifically designed for backup (such as Redox or FastBack II), compress the files first with a program such as DisksDouble, Stufflt Deluxe, or Compacto. Choose a program that can write large files across more than one floppy.

Tape. This is a convenient and often very economical medium for backing up large amounts of data (see "Getting It on Tape," December '89, page 189). Depending on how many megabytes you're backing up, you can choose from several types of tape: 8-millimeter videotape; DAT (see "Less Is More: Digital Audiotape" elsewhere in this issue); DC 600 and DC 2000 cartridges; and data cassettes, such as Teac 60 and Teac 150 cassettes.

Removable Cartridges. This category includes everything from removable magnetic drives (SyQuest, Bernoulli) to erasable optical drives. In an emergency, you can re-create the contents of your hard disk if you've done a complete backup.

Mirroring and Duplexing Systems. If you need data protection that is absolutely current, mirroring and duplexing systems (such as Golden Triangle's Disk Twin) let you write data to two hard disks at once. Then if one hard disk fails, you can use the second disk, which will contain identical data. This is not a substitute for backing up, however; because the second disk is written to immediately and there is no previous version of the disk to go back to, you're not protected if you mistakenly trash an important file or if a virus infects your system.

Backup Frequency

How often you back up is determined by how often your data changes. Which files change daily, weekly, monthly, or more frequently? How serious would it be if you lost any of the data? Make a tentative schedule, and then imagine worst-case scenarios to see if you can live with the schedule you've mapped out. Figure out which files almost never change (applications and fonts, for example). You may want to back up these files less frequently.

The backup software you use will determine how much you can automate the procedure. Most programs let you write scripts for different sessions that specify what you want to copy in any given backup. Many also let you specify the time and date when you want the backup performed. Popular programs include Retrospect (Dantz), DiskFit (SuperMac), FastBack II (Fifth Generation Systems), and Redox (Micosoft). (If you're backing up a network, see "Overnight Success: Network Backup," August '91, page 112, for software suggestions.)

Backup Strategies

Once you've determined what needs to be backed up and how often you need to do it, you can choose one of the following two basic backup strategies:

Incremental Backup. This method requires you to back up every file occasionally (say, once a week), but most days you copy only those files that have changed since the last full backup. This approach saves time and storage space, but with some backup programs, there is a price to pay — to restore your data, you must first load the full backup and then load each incremental version up to the present. And if one of the tapes, disks, or cartridges you are restoring from is defective, you will have lost some of your data.

Full Backups. This method requires that...
you back up every file each time. This takes longer and requires more storage space than do incremental backups. If you have enough storage space and software that can run automatically when demands on the server are low, the safest bet for a busy server is to do full backups daily.

**Generational Backups**

No matter how religiously you back up, if you have only one copy of your backed-up files and there's something wrong with that copy, you're out of luck should you need to restore the data. Doing generational backups overcomes this problem. With this strategy, you keep the last three full backups so that you always have access to the last three generations of your data.

Here's how to set up a generational backup schedule. Say you're doing nightly full backups onto DAT cartridges. To do generational backups, you'd need to start a log book with columns for tapes labeled A, B, and C. The first night, take a new tape, label it A, and do your backup. Put the date and your name under column A in the log book. The second night use another new tape, labeled B, copy your data, and enter your name and the date in the B column. The third night, label another tape C and repeat the process.

You now have three complete backups that represent the last three versions of your data. The oldest backup, tape A, is the grandparent, B is the parent, and C is the child. On day 4, reuse tape A and make a note in the log that A is now the most recent version, or the child (B is now the grandparent and C the parent). Continue rotating the tapes, backing up to the grandparent cartridge every night and recording the details.

When you need to restore data, use the most recent version. If that tape is defective or if the data is corrupted, you'll have two previous versions to fall back on.

**Archives and Storage**

If your data isn't stored in a safe place, it's not going to do you much good. At least one copy of your data should always be stored off-site, preferably in a fire-safe compartment. If you're rotating tapes, using generational backup, the grandparent of the day should be carted away and yesterday's grandparent (today's child) should be brought back on-site. If you've chosen to make two copies of each backup, one copy should be stored elsewhere.

Most of us have data on our disks that isn't used on a day-to-day basis but will be needed in the future — for example, a quarterly tax form. Not only does this data take up valuable space on disk but also backing it up over and over wastes both time and storage space. The best way to deal with such files is to put them in storage (also known as an archive). Make two copies of the data on separate tapes or disks at separate times. Store one copy off-site. Once you've made your copies, delete the files from your hard disk.

Label the media carefully with the date (including the year) and what files they contain. Your backup software should allow you to print a list of the filenames on the archive. Keep a log with the names and dates of your archives and a listing of the files in each one. Keep a list with your off-site copy as well.

Name files so their content is obvious. Good filenames may include the client or project name, the time period covered, and some description of the file.

**Backup Plans**

Backing up is one of those procedures in which the only route to success is a slavish adherence to the plan. Devise a workable strategy, streamline the procedures as much as possible, and then follow your plan like a zealot.

- Allow for absences and vacations by training several people in the procedures.
- Clearly label backup media, archives, and logs, and keep them in a designated place.
- Establish a routine for getting the storage media off-site.

Laura Brown is a San Francisco-based freelance writer and consultant.

---

**Table 1: Storage Media — Capacity and Cost**

<table>
<thead>
<tr>
<th>Media Type</th>
<th>Capacity</th>
<th>Media cost*</th>
<th>Drive cost*</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floppy disk</td>
<td>800K (double-density), 1.4 MB (high-density)</td>
<td>$12 - $20 per ten-disk pack</td>
<td>NA</td>
<td>Best for backing up occasional files or hard-disk drives with fewer than 20 megabytes.</td>
</tr>
<tr>
<td>Tape 8-mm video</td>
<td>2.2 GB</td>
<td>$10 - $75</td>
<td>$4,000 - $7,500</td>
<td>Can use inexpensive consumer-grade videocassettes. Good for network or file-server backups.</td>
</tr>
<tr>
<td>DAT</td>
<td>1.3 GB</td>
<td>$18 - $25</td>
<td>$1,500 - $5,000</td>
<td>Good for very large hard-disk-drive, network, or file-server backup.</td>
</tr>
<tr>
<td>DC 600</td>
<td>150 - 525 MB</td>
<td>$150 per two-cassette pack</td>
<td>$1,000 - $3,500</td>
<td>Good for backing up large personal hard-disk drives.</td>
</tr>
<tr>
<td>DC 2090</td>
<td>40 - 120 MB</td>
<td>$16</td>
<td>$1,000 - $1,500</td>
<td>Slow, Good for personal backup.</td>
</tr>
<tr>
<td>Removable magnetic disk</td>
<td>40 MB</td>
<td>$60 - $80</td>
<td>$400 - $1,100</td>
<td>Cartridges very delicate; shouldn't be used as primary backup medium.</td>
</tr>
<tr>
<td>Erasable optical disc</td>
<td>up to 1 GB</td>
<td>$160 - $250</td>
<td>$2,800 - $8,000</td>
<td>Expensive but has long shelf life.</td>
</tr>
<tr>
<td>Mirroring/duplexing</td>
<td>Second hard-disk</td>
<td>NA</td>
<td>Depends on drive cost.</td>
<td>For up-to-the-minute data protection. Should be used in addition to normal backups.</td>
</tr>
</tbody>
</table>

*All prices are approximate.
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The Organized Mac

Use System 7's tools to organize your hard disk, and even if the rest of your life is a mess, at least the disk will be in good shape.

By Bob LeVitus

One of the nice things about the Mac's interface is that it doesn't force a particular organizational style on users. You can — for the most part — put any file into any folder. The problem with this freedom is that files can be hard to find if you don't have some kind of structure or plan. System 7 provides several tools to help you keep your Mac organized, including labels, aliases, the Apple Menu Items folder, and the Finder's new Find function. By combining the power of these tools, you can organize your hard disk better than ever before. This month we'll examine several ways to organize your files and folders, methods of finding them after you've put them away, and third-party tools that make getting (and staying) organized easier.

There's a Place for It

System 7's cool tools won't help you a bit if you don't begin with a good foundation — a folder structure designed to help you find things quickly and easily. Ask yourself if your current folder structure lets you find a file quickly. If it doesn't, consider implementing a different structure.

Some people prefer a set of folders based on the type of document — a separate folder for correspondence, memos, spreadsheets, and so on. Others like having an individual folder for each client or job. Another common structure is to save files in folders based on their creation date: an October '91 folder, a November '91 folder, and so on. Some users assign folders based on applications: a Word-files folder, a MacDraw-files folder, and so on. Many people like to keep their applications in a single folder.

Whatever system you use, set it up in advance. Most Save and Save As dialog boxes don't let you create a new folder, so if the proper folder doesn't exist when you save a file for the first time, you have to back up through several time-consuming steps (go to the Finder, create a folder, find the proper place for it, and drag the file into the folder or return to the application and save the file into the folder).

Folders are only one part of organizing your Mac, however. If you're like most people, there's probably a lot of deadweight on your hard disk — duplicated files, seldom used applications and utilities, outdated Preferences or Default files, and so on. Spend some time weeding out your hard disk, trash the files you don't need, and move archival material (backups and duplicates) to floppy disks, backup tapes, or removable cartridges. Take a look at what's left on your hard disk. If you have a lot of programs and documents that you want to keep accessible but use only occasionally, consider partitioning your hard disk with a program such as FWB's Hard Disk Partition. You can set up a partition for files you use regularly and another for the ones you use once in a while.

Aliases and the Apple Menu

Aliases are one of System 7's best organizational features. Let's say you create a memo to the marketing department about Joe Client. Do you store it in the Memo folder, the Marketing
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folder, or the Joe Client folder? With aliases you don’t have to decide — simply store the actual file wherever you like, and put aliases into the other folders. Then, no matter which of the folders you look in, you’ll be able to find and open the memo.

Creating aliases is easy: Select the file that needs the alias, go to the Finder’s File menu, and choose Make Alias. Then you can move the alias to the desired location. Although this is easy, it’s not exactly a one-step procedure. To streamline alias creation, MacUser has developed the Nom de Plume utility, which lets you create, name, and place aliases in one step (see the “System 7 File” sidebar for details).

There are many ways to use aliases. Here are some of my favorites:

- Keep aliases of frequently used files and folders on the desktop or in the Apple Menu Items folder (or in both places — aliases consume only 3K each). I keep aliases of folders on my desktop that pertain to projects I’m currently working on as well as aliases for my contacts database and my to-do list. Although the actual folders and files are buried three or four levels deep, I use the desktop aliases to get at them with a double-click. Items on the desktop are also easy to find when you’re in an Open or Save dialog box — simply click on the Desktop button or type Command-D.

- Keep an alias of the Apple Menu Items folder somewhere convenient such as on the desktop or inside the Apple Menu Items folder itself. This lets you add files and folders to the Apple menu by putting them into the folder. Conversely, you can weed out the folder without having to wade through the System Folder to find it.

- Keep an alias of the Apple Menu Items Folder in the Startup Items folder so that it opens automatically at startup. This gives you two ways to access items that are on the Apple menu. You can use the mouse to choose them directly from the Apple menu, or you can use either the mouse or keyboard commands to select them in the Apple Menu Items folder.

- Because System 7 lets you launch files by dragging them over an application’s icon (or an alias of an application’s icon), keep aliases of frequently used applications on the desktop. That’s where I keep my graphics program (Canvas), because it lets me open several file types even if they weren’t saved in Canvas. Now I can open a paint. PICT, TIFF, MacDraw, or EPS file by dragging it over the application’s icon. Back in the pre-System 7 days, I had to launch the program first and then use the Open command to access the file.

- If you’re on a network and frequently access an AppleShare volume or a shared folder on another Mac, make an alias of that volume or folder. Whenever you need to access that volume or folder, all you have to do is double-click on its alias — you don’t have to go to the Chooser first to mount it.

Finally, a Finder That Finds

Despite all your careful planning and aliasing, eventually you won’t be able to find a file. In the old days, searching for a file by any attribute other than its name required a utility such as DiskTop or DiskTools, but now your faithful System software has an excellent built-in Find function that can bail you out in a jiffy.

To invoke the Find function, choose Find from the File menu or use the keyboard shortcut, Command-F. To find a file by its name, simply type the name in the dialog box and click on the Find button.

But wait — there’s more. By clicking on the More Choices button in the Find dialog box, you can look files by size, kind, label, creation date, modification date, version number, comments in the Get Info box, or locked or unlocked status. You can search all disks or limit your search to a specific disk, selected folders, or just the desktop. You can search for files one at a time or have the Finder display all found files at once.

The Find function also lets you perform multiple-criteria searches. For example, to find all the filenames that contain the word doc: are smaller than 10K; and were created after June 4, 1991, all you have to do is press Command-F and click on the More Choices button. Choose the volume you want to search from the Search pop-up menu, check the All at Once box, and click on OK. When the search is complete, and without clicking in the window containing the found items, choose Size from the Find pop-up menu, choose Is Less Than from the Criteria pop-up menu, and type 10 in the size field. Choose Select Items from the Search pop-up menu, and click on OK.

When this search is complete and without clicking in the window containing the found items, choose Date Created from the Find pop-up menu, choose Is After from the Criteria pop-up menu, and set the date to 4/4/91. Choose Select Items from the Search pop-up menu, and click on OK.

October 1991 MacUser
The System 7 File: Aliases Anonymous

You don't have to be a rocket scientist to create aliases. You do, however, have to go through a few steps to create an alias and then put it where you want it. Wouldn't it be nice to have a one-step method of creating an alias and placing it anywhere? You can do this, and it's not rocket science.

To create an alias, you first need to open a file, folder, or disk. Then, while the file, folder, or disk is open, you can select the file, folder, or disk you want to make an alias of and press Command-A (to select the entire contents) and Command-C (to copy it). Then, go to the location where you want to create the alias and press Command-V (to paste the copied content). This creates an alias of the original file, folder, or disk.

This method is useful, but it's not always the best way to create an alias. For example, if you have a folder with a lot of files, you might not want to create an alias of the entire folder. In this case, you can create an alias of a single file, folder, or disk.

Another way to create an alias is to use the Aliases feature in System 7. To do this, you first need to open a file, folder, or disk. Then, while the file, folder, or disk is open, you can select the file, folder, or disk you want to make an alias of and press Command-A (to select the entire contents) and Command-C (to copy it). Then, go to the location where you want to create the alias and press Command-V (to paste the copied content). This creates an alias of the original file, folder, or disk.

This method is useful, but it's not always the best way to create an alias. For example, if you have a folder with a lot of files, you might not want to create an alias of the entire folder. In this case, you can create an alias of a single file, folder, or disk.

When the search is complete, all the files that meet all your search criteria are selected. The only limitation is that multiple-criteria searches can be performed on only one volume at a time.

Once you've gotten the hang of this technique, it's almost impossible to lose files—if it's somewhere on your hard disk, you'll find it easily.

For a Few Dollars More

System 7 provides excellent tools for getting (and staying) organized, but it doesn't give you everything. One feature I would like to see is hierarchical menus, which let you access files from within folders on the Apple menu without making you open the folder first. Fortunately, there are third-party products that give you this capability and a few others too.

One of my favorites is Connectix's HandOff II, which includes SuperMenu — hierarchical support for folders on the Apple menu. Two other nice features of HandOff are on-the-fly substitution, which lets you open documents even if you don't have their creation application, and automatic color-depth and sound-level switching. Do you, for example, have a game that requires your monitor to be set to 16 colors? No problem. Tell HandOff, and it switches your monitor to the 16-color mode when you launch the game.

Another product that has hierarchical support for folders on the Apple menu is Now Menus, part of Now Software's Now Utilities package. Now Menus is more configurable than HandOff II's SuperMenu — you can choose which folders will be hierarchical, for example.

Now Utilities also includes Super-Boomerang, a dialog-box enhancer that helps you find the file or folder you need when using an Open, Save, or Save As dialog box. It also lets you create new folders from within the Open, Save, and Save As dialog boxes.

Although the new Find command is useful, there will be times when you can't remember a filename but might remember some of the text within the file. For such situations, there's GOfer, from Microlchemy, and On Technologies' ON Location, which can locate files quickly by searching for words within the file. ON Location 2.0, which should be available by the time you read this, will support Boolean searches and be fully compatible with System 7.

So there you have it: the fundamentals of using System 7 to organize your hard disk. Experiment with System 7's tools as well as with third-party products (including those you used with System 6) to find the right system for you.

Bob LeVitus has just finished updating Dr. Macintosh as well as Son of Stupid Mac Tricks, both published by Addison-Wesley (Reading, Massachusetts, 1981).
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Taming HyperCard Stacks

With all of HyperCard 2.0's new features, it's more important than ever to create well-behaved stacks — and to be prepared for those that aren't.

By Danny Goodman

In the old days of HyperCard, the very rare overlapping global variable was about as much conflict as one stack had with another. As a byproduct of the great new features added to HyperCard 2.0, however, stack conflicts can get out of hand. These new features let you create more-professional-looking applications with fewer XCMDs (external commands), but they also place a greater burden on authors. Stacks must cooperate with other open stacks as well as with stacks that use common resources at the same time.

Three primary elements — custom menus, shared code libraries, and multiple stack windows — play interrelated roles in such conflicts. I'll discuss the implications of each one and then tie all three together into a bare-essentials template (available from MacUser's on-line service, Zmac) that you can use as a model for your own scripts. Adopt the template as a starting point to make your stacks behave as good citizens on the streets of HyperCard City while they also accommodate stacks that don't adhere to the local customs.

Custom Menus

HyperCard lets you modify the menu bar in several ways. The simplest method is to add a new menu to the right of the existing HyperCard menus, as the HyperCard Home stack does. Other methods include adding items to an existing menu, modifying the contents of an existing menu, and even creating an entirely new menu bar.

Before your stack modifies a menu bar, it needs to reset it, because the only menu bar you can be sure about prior to modification is the default HyperCard menu bar. To start with a pure HyperCard menu bar, insert the `reset menu bar` command before your menu-modification script.

If you fail to reset the menu bar before changing the menus, you run several risks. The most dangerous is that the menu bar in your stack may display custom menus left over from another stack. Choosing menu items from other stacks' menus can trigger script errors in your stack. Or if your stack attempts to modify a menu that was deleted by the previously opened stack, an error will appear — even though your scripts are fine.

Your stack should be well behaved when it's closed too. Whenever the user exits from the stack, your stack should reset the menu bar. In the case of a menu added to the standard HyperCard menus, you can achieve the same result faster simply by deleting your custom menu whenever the user leaves the stack. Unfortunately, there is a performance penalty for resetting the menu bar. On a Macintosh II, for example, it takes almost one second to restore HyperCard's menus.

Shared Scripts and Resources

Gone, thankfully, are the days when the only way to give related stacks common scripts and resources was either to install those items into the user's Home stack or to duplicate them in all stacks. In a multiple-stack environment (which I call a stack system), you can now...
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Example 1: Shared-Preferences-Stack Handlers

```
on setStartupInfo
  global saveLevel
  if saveLevel is empty then
    put the userLevel into saveLevel
    set userLevel to 5 -- or other desired setting
  end if
  if "Preferences" is not in the stacksInUse then
    start using stack "Preferences"
    if the result is not empty then
      answer "Sorry, cannot initialize properly." &&
      "Try quitting HyperCard and starting over."
      go back
      exit to HyperCard
    end if
  end if
end setStartupInfo

on setGlobalMenus
end setStartupInfo

on setGlobalMenus
  -- Test first for presence of something unique about
  -- the custom menus. Here we'll look for our global
  -- menu called Preferences. If it's there, then we can
  -- bypass resetting and rebuilding our custom menus.
  if "Preferences" is not in the menus then
    set cursor to watch
    lock screen
    reset menubar -- start with clean slate
    delete menu "Go" -- don't want these HyperCard menus
    delete menu "Tools"
    delete menu "Objects"
    create menu "Preferences" -- our new menu
    -- finish putting menu items into Preferences menu
  end if
end setGlobalMenus

on cleanup -- for use by other stacks
  global sameSystem,saveLevel
  if sameSystem is not true then -- leaving our system
    set cursor to watch
    set userLevel to saveLevel
    put empty into saveLevel
    lock screen
    reset menubar
    stop using stack "Preferences"
  end if
  put false into sameSystem
end cleanup
```
current stack must send messages to receive them. An inserted stack does not receive an openStack message just by being inserted into the hierarchy.

Removing a stack from the hierarchy requires the stop using stack command, as in stop using stack "Preferences". At this point, the current stack immediately loses all shared resources. If, for example, the current stack relies on icon resources in a shared stack, the instant you pull that stack from the hierarchy, the button icons will go blank.

You can add as many as ten stacks, although available memory or the number of open files (as determined by the operating system) will eventually determine how many you can insert at any one time. When you insert a stack, HyperCard also does some checking to make sure no more than

---

**Example 2: Main-Stack Handlers**

```
on openStack
  checkSetup
  setLocalMenu
  localStartup -- stack's local initializations
end openStack

on resumeStack
  checkSetup
  setLocalMenu
end resumeStack

on closeStack
  localCloseDown -- stack's local shutdown process
  removeLocalMenu
  -- call cleanup only if shared stack is present
  if "Preferences" is in the stacksInUse then cleanup
end closeStack

on suspendStack
  removeLocalMenu
  if "Preferences" is in the stacksInUse then cleanup
end suspendStack

on checkSetUp
  -- see if global menus are set and stack is in use
  if "Preferences" is not in the menus then
    if "Preferences" is not in the stacksInUse then
      start using stack "Preferences"
      if the result is not empty then
        answer "Sorry, cannot initialize properly." & &
        "Try quitting HyperCard and starting over."
        go Home
        exit to HyperCard
      end if
    setStartupInfo -- reinitialize system
  end if
end if
end checkSetup

on setLocalMenu
  if "Main" is not in the menus then
    create menu "Main"
    -- rest of code to build "Main" menu
  end if
end setLocalMenu

on removeLocalMenu
  if "Main" is in the menus then
    delete menu "Main"
end removeLocalMenu
```
An Alias by Any Other Name . . .

Aliases, which are part of System 7, create duplicate versions of files, folders, and volumes. What if you don’t want to open folders on the desktop to create an alias? Nom de Plume is a utility that lets you create an alias and choose where you want to save it from within one dialog box. Nom de Plume was written by MacUser’s alias expert, programmer Bill Monk, of Birmingham, Alabama. Nom de Plume is available exclusively on Zmac in the MacUser Forum, Library 3 (Utilities). The filename is PLUME.SIT.

How to Join Zmac

Here’s how you can get access to Zmac:
• If you’re a Compuserve (CIS) user, just type GO ZMAC at any ! prompt.
• If you’re not a CIS subscriber, you can sign up for Zmac by following these directions:
  1. Call (800) 635-6225 (voice) to find your local access number.
  2. Set up your modem and telecommunications software with the following standard Mac settings: 8 bits, one stop, and no parity.
  3. Dial your local access number. When connected, press Return. You’ll see the following prompts on-screen. Your responses are printed in boldface type.
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    User ID: 177000.5200
    Password: ZMAC
    Agreement Number: 21209014
  4. You will then be prompted for additional information, including a credit-card number for billing purposes. If you cannot bill to a credit card, call the CompuServe customer-support line listed below. Sign-up is free, but normal access time is billed at $12.50 per hour.
  5. Call CIS again with your user ID and password. A new password will arrive in the mail within ten days.

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system) and a local menu (one that's used by a single stack within the system).

The three stacks are Main, where most of the user activity takes place; Help, accessible by a click on a Help button; and Preferences, which is shared by the other two stacks but is never visible to the user.

Example 1 shows the framework for essential handlers in the shared Preferences stack. setStartupInfo, the first handler, initializes whatever global variables or other settings the visible stacks depend on. The first task it performs is to save the current userLevel property to a global variable so the original user level is restored when you leave the stack. Next, by examining the results of the stacksInUse function, it looks to see if this Preferences stack is part of the message hierarchy. This function presents a return-delimited list of pathnames to whatever stacks have been inserted into the hierarchy (that is, stacks in the hierarchy other than the current stack or Home). If the stack isn't in the hierarchy, the handler will insert it, checking the

It used to be that when you opened a stack, you closed any other stack that was open. With HyperCard 2.0, there's a world in between, in which a stack is neither fully open nor fully closed.

result function for a successful operation (as described earlier). Finally this handler calls another handler, setGlobalMenus, to set up the menu barelements shared by all the stacks of the system.

setGlobalMenus performs its menu building job only if the job is necessary. It looks for a unique element in the system's menus (a menu name, for example) that indicates that global menus have already been installed. When you use this template, you can even check for the existence of a particular item within a menu, in case your menu names are not unique.

The last handler, cleanUp, is called by the Main and Help stacks whenever those stacks are suspended or closed. Under strict script control (for example, when you have a button that leads from one stack to another within the system), you can set a value for a global variable, called sameSystem, that allows cleanUp to bypass rebuilding the menu bar and removing the Preferences stack from the message hierarchy. The more you can leave intact, the faster will be the shift from stack to stack within the stack system.

Example 2 shows the essential handlers from the main stack. (The Help stack has the same handlers, except that the local menu handlers refer to a menu called Helper instead of Main.) The only difference between the openStack and resumeStack handlers is that the openStack handler contains a message

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to a stack-specific startup handler. The local startup handler may lead the user through a title sequence, perform some calculation based on time or date, or do any of thousands of stack-opening tasks, depending on your stack’s design. Because a resumed stack is already in the middle of things, the local startup sequence isn’t necessary in the resumeStack handler.

Opening and resuming a stack, however, requires that a handler checks to make sure that the supporting parts of the stack system—the message hierarchy and the global menus—are in place. If you’ve clicked on this stack window from a nonsystem stack, all the shared materials need to be set properly. That’s what the checkSetup handler does. It puts Preferences into the message hierarchy and then lets the shared stack’s handlers do their magic. Once the global menus are in place, the handlers create the local menu on the far right of the menu bar. When it closes or is suspended, the stack removes the local menu. The cleanUp handler in the Preferences stack then “unsets” the rest of the global items.

If you program a button to navigate directly to another stack (for example, from Main to Help), you can specify this cleanUp work by setting the sameSystem global to true, as shown in the mouseUp handler of the button leading to the Help stack in Example 3. As HyperCard shifts to the other stack, the resumeStack handler removes the local menu and calls the cleanUp handler. If the sameSystem global is true, the cleanUp handler won’t reset the menu bar or respond to commands to do other time-consuming functions. The global is reset to false (in the cleanUp handler) after the operation, in anticipation of future navigation from this system to nonsystem stacks.

A Loophole

Although this template has proven workable in most situations, the methodology is not perfect. If on your way from someone else’s stack to yours, a script error gets in the way, your stack won’t receive its resumeStack or openStack message, so your menus and message hierarchy won’t be in effect—a flaw I believe Claris should correct. You can get around this by invoking the checkSetup handler before issuing shared commands or by navigating to any other stack in your system.

You can get a copy of this template from Zmac—look for the filename HCTIP.SIT in the MacUser Forum’s Library 3 (Utilities)—or by sending a check ($5 in North America, $10 outside North America) to Concentrix Technology, Inc., 1875 S. Grant Street, Suite 760, San Mateo, CA 94402. Whether you use these ideas or develop your own version, be sure to spread the word to your fellow stack authors. Let’s be nice to each other and create stacks that are good citizens in the HyperCard community.

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Tip of the Month

Word 4.0
If you use System 7 and Microsoft Word 4.0 or a later version, you’ve probably already discovered that you can’t use the Word Finder thesaurus DA that comes bundled with Word. Because of the way System 7 handles DAs, Word Finder gets confused when it looks to see if Word is running.

There is a workaround for this problem, however. (Note that this procedure should be performed only on a copy of the Word application — never experiment with the original program.)

First, open the Font/DA Mover utility. (You need version 4.1 if you’re running System 7. If you have only an earlier version, boot from a System 6 floppy disk and follow the rest of the directions.)

Open the Word Finder DA suitcase file on the left side of the Font/DA Mover dialog box. Hold down the Option key while clicking on the other Open button, and open Microsoft Word on the right side of the dialog box. Select Word Finder, and copy it into the Word application. Now quit Font/DA Mover.

Now, whenever Word is the active application, the Word Finder DA will appear on the Apple menu and function properly. Your writing will remain clear and creative, not to mention lucid and artistic.

Rick Sonntag
Media, PA
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Power Tools

Tip Sheet

exactly 45 characters, including spaces. Save your changes.
7. Quit ResEdit, shut the Mac down, and restart from a floppy disk.
8. Save a copy of your original System file on a floppy disk. Replace the hard disk’s System file with the duplicate copy, and change the copy’s name to System.
9. Restart your Mac from the hard drive, and choose Shut Down from the Special menu.
10. Your message should appear the way you typed it. If you did something wrong, the Shut Down screen will flash, but that shouldn’t cause any major problems. Simply retrace these steps, and make sure that you typed exactly 45 characters.

Dave Jagger
East Grand Rapids, MI

PageMaker

Don’t erase your old PageMaker master disks when you get a new version, because the program recognizes only documents created with the current or previous version of PageMaker. In other words, PageMaker 4.0 can open and use documents created with version 3.0 or version 4.0, but it can’t open documents created with PageMaker 2.0 or earlier.

You can upgrade all of your PageMaker documents each time a new version is released (and hope that you don’t overlook a critical document!), but the safest solution is to keep all the master disks so that you can reinstall older PageMaker versions when necessary.

Robert Leahy
Tustin, CA

If you use a lot of fractions in your PageMaker documents, it’s a good idea to define a macro that transforms a typed fraction such as 1/8 into a more professional-looking typeset fraction. To do this, you need a macro utility such as MacroMaker or CE Software’s QuickKeys. (These instructions work for fractions that have one-digit denominators and numerators, such as 1/4 and 1/8.)

Type the fraction normally, place the cursor in front of the numerator, and open the macro program. Record the following steps:
1. To highlight the numerator, hold the Shift key and press the right-arrow key once.
2. Press Command-Shift-+ to invoke the superscript text attribute. Press the right-arrow key so the numerator is no longer highlighted.
3. To highlight the slash between the numbers, hold the Shift key and press the left-arrow key once.
4. Press Option-Shift-1 to replace the highlighted slash with the printer’s slash character (/). This character works better with fractions than does the normal slash.
5. Highlight the denominator by holding the Shift key and pressing the right-arrow key once. Press Command-Shift-hyphen to invoke the subscript text attribute.
6. Press Command-T to access PageMaker’s Type Specifications dialog box, and click on the Options button.
7. Tab three times to the Subscript position box, and type 0. Press Return twice.
8. Press the right-arrow key once to move the cursor off the denominator.

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But what good is all of this if we can't get in touch with you... because we don't know your name and address? That's why we're asking you to fill out one of these brief little Microsoft Word registration cards. And why we're willing to part with our beloved Mouse Pads. We know there's over a million of you out there. We just don't know where. So mail us a card today. And let's keep in touch, okay?
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And here's a little background on me as a Microsoft Word user:

The version of Word I use is: ______________________.

My signature below certifies that I am a Microsoft Word user and have not yet registered my copy of Word.

User's Signature: ______________________ Date: ________________

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- Microsoft Works
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9. Press Command-Shift-hyphen. This combination deactivates the subscript attribute so the subsequent characters after the fraction are not subscripted.

10. Stop recording, and save the macro.

If you use fractions with double-digit numerators and/or denominators, simply create another macro and press the right-arrow key twice in steps 1 and 5 to highlight the entire number.

The macro is cumbersome to define, but it saves you time whenever you use it. Another advantage is that because the superscript/subscript text attributes are defined as a percentage of the current point size, the fractions will always be the correct size.

Joseph W. Duhamel
Floral Park, NY

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Ants in My Mac

Q. My Mac SE and I live in an ant-infested college dormitory. This is great for my friends, who can make comments about "bugs in my system," but I'm worried. Is there any way I can seal my beloved Mac and keep it from becoming an expensive ant condo? I already have a set of nylon covers, but I don’t think they're up to this job.

J. Wes Jarvis
Ashland, OR

Andy: Comment 1: Your pals are a hoot and a half. Comment 2: You may have the beginnings of a successful startup company sitting there on your desk. Wes. Having a computer serve as an ant farm sounds at least three times as cool as this "interactive multimedia" thing Apple's been trying to cram down our throats.

Now about your problem. I called a couple of exterminators, and the consensus is that there are only a few kinds of insects famous for wreaking havoc with electronics: cockroaches (wouldn't you know it), which nibble on the wiring's insulation; silverfish, which get zapped by the CRT yoke and cause short circuits; and fire ants, which tend to set up housekeeping in the Mac and leave eggs and other residue. So if you're in a really buggy environment, you may want to take some precautions.

After a lot of research (not to mention embarrassment) I've found the solution to your little problem. It's panty hose. No kidding. As Macintosh mosquito netting, it works like a charm. Go down to the drugstore; pick up a pair of black, queen-size, sheer-to-waist hose (you may want to shoplift them); and cut off a leg. After you've set up your Mac, stretch the foot over the top and pull the rest of the leg down to the bottom, as if you were preparing your SE to participate in a bank heist. Secure the open end of the leg to the underside of the Mac with duct tape, bunching it around the various cords leading into your Mac, and you've got one bug-proof SE.

One of the beauties of the panty-hose solution is that it keeps the bugs out without restricting air flow through the Mac's cooling slots. And there's a bonus feature — the sheer black hose over the screen totally eliminates glare! Unfortunately, your floppy drive will be completely inaccessible, and on Parent's Weekend, you may have to explain what you're doing with a one-legged pair of panty hose in your closet.

For you other Mac users, I hope you appreciate what we do here at Help Folder in order to get at the Truth for you. I have tested as many kinds of Macs as I could and have compiled the following compatibility data for the Hose treatment:

- One leg works with the Mac Plus, SE, Classic, Ile, Ile, Isi, and LC; most third-party hard drives; and Apple's 12-inch color and black-and-white monitors.
- One leg plus torso works with Apple's 13-inch color monitor and Portrait Display.
- Panty hose are incompatible with the Mac II, IIx, and Ifx.

Crippled HyperCard

Q. My new Mac came with a copy of HyperCard that appears to be partially disabled. For example, the paint, button, and field tools are nowhere to be found. Is my version drive must be formatted in the chosen orientation. So, if your hard drive's been flat under your Mac for the past three years and you impetuously decide you want to stand it up on its side, you'll have to reformat the drive in that position or risk experiencing a ton of read/write errors.

In fact, you should treat your new drive the way you would a new tropical fish: Spend some time allowing the newcomer to get used to its environment. A drive that's spent the past two weeks in hot, humid trucks won't react well to sudden immersion in an air-conditioned office. Before installing new equipment, let it stand in its new environment for a few hours.

Actually, though, there's such a concept as "upside down"; all the drive manufacturers I talked to stress that if the drive is to be mounted horizontally, the shiny platter enclosure should be on the top. As to preferred vertical orientation, well, a few people ventured the opinion that the top of the drive (the metal part) should be on the right.

By Bob LeVitus and Andy Ihnatko
HELP FOLDER

Claris is different from that sold by the one Claris sells. But its Home stack is locked at the second level (Typing). To access the higher user levels — Painting (level 3), Authoring (level 4), and Scripting (level 5) — here’s what to do:

1. Launch HyperCard, and go to the last card (Command-Home).
3. Type Set the User Level to 5; press Return.
4. Type Magic; then press Return.

Your copy should now have all five user levels available.

If you’re a real HyperCard fanatic, you might consider buying a copy from Claris. Although the application and Home stack are exactly the same, the Claris versions (the S49 upgrade kit and the S199 development kit) include comprehensive documentation, lots of additional stacks — including the excellent HyperCard Help and HyperTalk Reference stacks — and free (but not toll-free) technical support.

PageMaker 4.0 Unexpectedly Quits

Q. We’re having a mysterious problem with PageMaker 4.0 that no one, not even Aldus’ technical support, has been able to solve. When I use the Print command, the application “unexpectedly quits” (if in MultiFinder) or I get a system-error message (if in the Finder) and have to restart. This happens instantly — the Print dialog box doesn’t even start to show up. It also happens with both old and new PageMaker documents.

What makes it really puzzling is that we have another Mac in the office that is the same model, was bought the same day, and has the same software configurations on it, and we can print from PageMaker on this Mac without any problems.

I’ve reinstalled the System, the Finder, MultiFinder, the PageMaker application, and the printer driver. I’ve tried starting up with the System heap with HeapFixer. I’ve checked for viruses with SAM. The Aldus person talked me through my System Folder, but I have few INITs and no likely culprits. Help!

Kurt Bodden
Cambridge, MA

Bob: It sounds as though you’ve already done many of the right things, but there are still a couple more to try.

Had a similar problem with PageMaker several months ago. Every time I tried to use the spelling checker, it quit unexpectedly or crashed. Aldus tech support was stumped, and so was I. Reinstalling PageMaker didn’t help, nor did anything else we could think of. Finally, out of frustration, I decided to trash my PM4 Defaults file (in the System Folder) and let PageMaker automatically create a fresh one for me, which it did the next time it was launched. That was all it took. Try it — it may work for you too.

Another thing: You say you reinstalled the System, the Finder, and MultiFinder. But did you trash your old System, Finder, and MultiFinder before running the Installer? It’s always safest to do just that. The correct procedure for reinstalling your System software when you suspect it has become damaged or corrupted is as follows:

System 6 users: If you’ve installed any fonts or DAIs into your System file, delete fonts and DAIs from the System Folder on your hard disk. If you don’t delete these files before running the Installer, it may just update the System. Finder, MultiFinder, and printer-driver files instead of replacing them. If these files were corrupted before you ran the Installer, updating may not correct the problem but replacing will. Now run the Installer.

That’s all there is to it. You now have fresh System software on your hard disk. If that’s what your problem was, all should be right.

Editing Icons on Folders

Q. Is there a way to change system icons such as folder icons individually? For example, can my word-processing folder have one icon and my utilities folder a different one?

John Yoder
Alexandria, VA

Bob: You’re in luck, John. It’s not only doable but it’s actually easy if you’re using System 7, which lets you edit or colorize icons with nothing more complicated than a paint program. Here’s how:

1. Select an icon, and choose Get Info from the File menu (Command-I).
2. In the Get Info window, click on the icon once to select it, and copy it.
3. Open a new document in a paint program, and paste the icon into the document.
4. Modify the icon in any way you want, and then select it, and copy it.
5. Return to the icon’s Get...
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Digital sound processor with on-board compression
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**Product specifications and comparisons based on published company information as of July 10, 1991.

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POWER TOOLS
HELP FOLDER

Info window, and paste in the new icon. Presto — that file, folder, or disk now sports your redesigned icon (see Figure 1).

By the way, System 6 does not let you edit the icon of a single folder, no matter how proficient you are with ResEdit. You can use it to edit folder icons (they're stored in the Finder's ICN# resource), but the editing affects every single folder.

Fade to Black

Q. I'm using a Mac Plus and have recently been experiencing problems with the screen blanking out. Sometimes when I'm working in an application, the screen goes black or flickers between what should be there and a white screen. This occasionally occurs just after I've turned on the computer.

The only way to get the screen back to normal is to tip the side of the Mac (actually, any jolt that shakes the computer works). I know this is not the way to solve this problem and could cause more damage in the long run. Could you give me advice on what the problem might be and the best (and cheapest) way to have it fixed?

Greg Brunn

Treasure Island, CA

Bob: Well, Greg, there's bad news and there's bad news. The bad news is that whatever is making your Plus act up will require the intervention of an Apple repair technician. And the bad news is that it sounds like your power supply is about to breathe its last — my old Plus behaved a lot like that just before its power supply gave up the ghost.

If it's not the power supply, a connection — video or other — may have worked itself loose. In any event, you need to have your Mac examined by a qualified technician.

Andy: Ouch. Normally I'd chirp in here and say, "Technician, schmeckician! Fix it yourself!" But when you're talking about a Plus power supply, you're talking delicate, dicey surgery. A loose connection can easily be resoldered, but the fact that the juice pent up in the CRT is enough to kill you (and 11 of your closest friends) hours after the Mac has been unplugged is enough to make anyone twitch. As a Plus owner, you have to accept the fact that you may have to buy a new power supply at some point. But cheer up — at $300, it's still cheaper than buying a new Heli, or even a Classic, for that matter.

Voice Transcription on the Mac

Q. I'm looking for a voice system to transcribe technical information from a cassette tape to a printer via my Mac Plus. Is there such an animal?

F. Ambrosio Malagon

Oceanside, CA

Bob: After doing a bit of detective work, I discovered that Articulate Systems, which makes Voice Navigator II, is hard at work developing voice-transcription technology. However, it probably won't be available for at least a year and will almost certainly require a more powerful computer than your Mac Plus.

Andy: The general consensus in the proud community of Professional Computer-Science Geeks (of which I hope to be a member one day) is that we're about three years away from a real voice-input system with which you-doe-ent-hav-eh-too-tawk-strayn-jeh. Several companies have working prototypes, but we're still far from a reliable plug-and-play speech-recognition system.

And even when such a system reaches the market, it'll probably be designed for simple business words and would probably burst into flames if you gave it technical words such as pentadexxion, acetamin, triamino, or even polypeptide.
Ilisi versus MacPaint and Excel

Q. I recently purchased a Mac Ilisi running System 6.0.7, and I’m having problems with my software. First, MacPaint and some other graphics programs have a strange checkerboard pattern over the menu bar. Second, I can’t launch Microsoft Excel. It keeps telling me that the floating-point coprocessor is not installed, even though it works fine on an SE or a Classic, both of which also have no FPU math coprocessor. I have removed all my INITs and control panels, but still no go. What must I do?

Joe Ortega
Frankfurt, Germany

Andy: That checkerboard pattern usually means that you’re using a graphics program that was written sometime in 1958, well before the advent of color Macs. Because the color screen is “deeper” (has more bits of data per pixel) than the original noncolor Macintoshes, the program gets confused about where in memory the bit maps should go and you end up with that Warhol-like effect. The software will probably work just fine if you go to the Monitors control panel and set your screen to Black & White. New versions of MacPaint (released after 1986) should work fine in color mode.

There’s no quick fix for the Excel problem, unfortunately. It sounds as if you have a truly ancient copy that just ain’t on speaking terms with the Mac Ilisi.

I suggest that you upgrade your software. I’m sure you didn’t buy a shiny new Mac just so you could run software written for a machine with only half the Ilisi’s features!

Plus Versus Classic and SE

Q. I have a Macintosh Plus, and I used to wonder if I ought to spend the extra money to upgrade to an SE, because the SE has a faster SCSI bus and a 256K ROM chip, compared with the 128K of the Plus. I didn’t upgrade, because I never saw anything the SE could do or any software it could run that the Plus didn’t. But now that the Classic (with its 256K ROM) has arrived and the Plus and SE are now no longer available new, will all Mac software need at least 256K of ROM to work?

Also, does System 7 require 256K of ROM? Just what does that extra 128K of ROM do anyway? And finally, should I dump my Plus in favor of a Classic?

Joel Williamson
via CompuServe

Bob: Neither the Classic nor the SE is a whole lot more capable than your Plus, although both are fatter and all Classics and most SEs have 1.4-megabyte SuperDrives. System 7 runs on all Macs from the Mac Plus up, so you should be fine, as long as you have enough RAM and a hard drive (System 7 doesn’t require a 256K ROM, but it does require at least 2 megabytes of RAM and a hard drive).

Andy: We did a more intense breakdown of the struggle between the Plus and Classic in last April’s Help Folder (see “Plus Obsolete?”, page 250). I wouldn’t worry too much about Macintosh Plus incompatibilities. Problems occur not because there isn’t enough ROM but because the program you’re running is trying to use a feature the ROM does not support — Color QuickDraw, for example.

Although the Classic has four times the ROM capacity of the Plus, that extra space is almost completely filled up with code that lets the Classic work as a “diskless” AppleShare server. So again, don’t sweat it. Although I wouldn’t recommend buying a used Plus over a new Classic, I think that “upgrading” from a Plus to a Classic is rather pointless.

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<td>218</td>
<td>Zmac</td>
<td>218</td>
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</table>
### 1. Please indicate which of the following computers you currently use in your company or organization:

- [ ] Mac Plus
- [ ] IBM PC
- [ ] Mac SE
- [ ] Other

### 2. For how many microcomputers do you buy products?

- [ ] 1-4
- [ ] 5-49
- [ ] 50+

### 3. Your primary job function is:

- [ ] Administrative/General Management
- [ ] MIS/VE Communications Systems, Programming
- [ ] Engineering/R&D
- [ ] Financial/Accounting
- [ ] Marketing/Sales
- [ ] Computer Dealer/NAR

### 4. For which of the following products are you involved in selecting brands/models to be bought by your company or organization?

- [ ] SOFTWARE
  - [ ] Accounting
  - [ ] Spreadsheets
  - [ ] Project Managers
  - [ ] Word Processors
  - [ ] Database Managers
  - [ ] Graphics
  - [ ] CAD/CAM
  - [ ] Communications
  - [ ] Database Managers
  - [ ] Graphics
- [ ] HARDWARE
  - [ ] Mainframe
  - [ ] Mini
  - [ ] PCs
  - [ ] Printers/Plotters
  - [ ] Monitors
  - [ ] Disk/Tape Back-up
  - [ ] Add/In Boards
  - [ ] Communications

### 5. Are you involved in the purchasing of microcomputer equipment at your company?

- [ ] Yes
- [ ] No

### 6. If so, what function do you serve in the buying process?

- [ ] Evaluation/Specification
- [ ] Recommendation
- [ ] Buyer/Purchaser

### Please Print Clearly

| Name: ____________________________ |
| Phone: ____________________________ |
| Company: ____________________________ |
| Title: ____________________________ |
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100 SUPER PRODUCTS UNDER $250

Who says high tech has to be high-cost? The MacUser editors have once again compiled their A-list of 100 insanely great, useful, sometimes unusual, products that offer great value at an even better cost/performance ratio. Why pay more? MacUser is a buyer’s paradise!
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- Quantum Drives/Wren Drives

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<th>Capacity</th>
<th>Speed</th>
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<td>$1748</td>
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*Mean Time Between Failure is the average life expectancy of a drive. In case of a 200,000 MTBF, this means a potential of 24 years of 40 hour weeks, 52 weeks per year!*

- 600 MB Optical
- Read/write reliable storage
- 66ms Access Time
- Great for archiving, color scans etc.

Fujitsu 5.25" Drives

<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity</th>
<th>Speed</th>
<th>Price</th>
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<td>$2498</td>
</tr>
</tbody>
</table>

*Mean Time Between Failure is the average life expectancy of a drive. 24 hour factory replacement available for 5.25" drives for an additional fee.*

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- 44MB REMOVABLE
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Double or triple your speed with no down time. Now that's service you won't find anywhere else!

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$995
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Please call for prices.

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Mac IItf with 8 Mb RAM, RasterOps: 24-bit Video Card, Ikegami Trinitron 19" Color Monitor, RasterOps Video Accelerator with 4 Mb RAM, 660 Mb Internal Hard Drive, MacPro Plus Keyboard, MicroTec 60025 24-bit Color Scanner, QMS ColorScript 100 Thermal Color Printer with 5 Mb RAM

$21,049

Introducing 3 new performance enhancements for Macintosh.

RealTech IIci Cache Card
Full 64K of static RAM cache, and SANE control via the control panel.

$169

RealTech IIi Cache Card
Can be connected directly to the internal slot in the Mac IIci or to the RealTech II adapter, which has a math coprocessor socket, a cache card slot and a processor direct slot. 64K of static RAM and SANE control via the control panel.

$169

RealTech IIi Adapter
Has a math coprocessor socket, a cache card slot and a processor direct slot. Works with the RealTech II Cache Card while retaining the processor direct slot.

$59


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$5539 Mac IIfs B&W 21" Dual Page System, 5 Mb RAM, 105 Mb Quantum, MacPro Plus Keyboard

$5139 Mac IIfs 14" Trinitron System, 4 Mb RAM, 105 Mb Quantum, MacPro Plus Keyboard

FAX: 1-409-539-4141
Call: 1-409-760-2400

Several members of our management team (left to right): Barbara, Jim, Lev, Roi.

"WE'RE NOT HAPPY (unless you are!)
We want you to become a repeat customer. So we give you discount mail-order prices...superior service & selection...our unbeatable hassle-free warranty...toll-free tech support...and an unsurpassed return policy. What's more, we do it all with a smile...because that's what you deserve."

"...cache cards are simple, efficient, cost-effective enhancements for an already speedy Mac."
— MacUser, June 1991
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Ex 2400 w/5NP-5 & Fax ................. 235
LC w/5NP-5 & Fax ...................... 235
MacPort w/5NP-5 & Fax ................ 199

PERIPHERAL LAND
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Quick SCI .................................. 299

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Standard 12 x 12 ....................... 779
Standard 12 x 18 ....................... 1169
Standard 18 x 25 ....................... 3119
Standard 6 x 9 ........................... 549

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All of MicroNet's high-quality drives come with a one-year warranty; an optional second year is available. MicroNet drives have won awards for design and performance, and continue to lead the industry in its most competitive market. Both MacWorld and MacUser magazines have rated MicroNet as one of the best in mass storage devices. If a drive fails within 90 days, send it back. Within 48 hours of receiving your unit, we'll ship you a replacement drive overnight—at our expense. You may extend this replace-policy to a full year for the modest cost of $169.

MB MS Sec. Price
III-303 14.0 1.4 $1469
III-404 16.0 1.4 1589
III-644 11.9 1.4 2379
III-1000 15.0 1.4 2929
III-135Q 15.0 1.4 3519
III-644NP 11.9 3.0 2729
III-1000NP 15.0 2.5 3279
III-1350NP 15.0 3.2 3669

External
SBT1288NP 6.0 3.1 5769
SBT2022NP 7.5 2.6 6849
SBT6600NP 5.7 3.8 9679
SB606NP 7.0 3.6 4649
SB888NP 8.0 3.6 4879
SBT1288NP 6.0 4.1 6059
SBT2022NP 7.5 3.8 7499
SBT2600NP 5.7 4.4 10519

Other SCSI devices
MD5000DAT ............................ 2499
44Mb Removable .......................... 619
88Mb Removable .......................... 579
Rewritable Optical ....................... 2499

QUANTUM HARD DRIVES
Reliable drives backed by a two-year warranty.

MB Per MB Per
Internal Hard Drives
Q 105 .................................. 435
Q 170 .................................. 699
Q 210 .................................. 799
External Hard Drives
Q 105 .................................. 529
Q 170 .................................. 785
Q 210 .................................. 885

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We know networking...try us!
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64 K Cards (all machines) ............ 289
10T Hub .................................. 669

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Zoom 9600 V.32/V.42 bis .......... 449

Affordable options to enhance your system.

UNINTERRUPTIBLE POWER SUPPLIES
450 AT .................................. 309
Ap 360 SX ............................... 249
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MinuteMan 300 ......................... 429
MinuteMan 600 ......................... 695

ZOOM MODEMS
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Zoom 9600 V.32/V.42 bis .......... 449

EVErEX
$665
EMAC 150T Tape Back-up

KEYTRONICS
MacPro Plus Keyboard ............... 139

Thanks for your order! We appreciate your business!

$99

1-800-972-3018 Software & Hardware That Fits
610 South Frisco RD Box 3166 Conroe, TX 77301
Please circle 165 on reader service card.
Hard Drives and Storage

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
</tr>
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<tbody>
<tr>
<td>Quantum mechanisms, 2 year warranty, 52MB low profile</td>
<td>$279</td>
<td>$9</td>
</tr>
<tr>
<td>Quantum mechanisms, 2 year warranty, 105MB low profile</td>
<td>$419</td>
<td>$14</td>
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<tr>
<td>Quantum mechanisms, 2 year warranty, 170MB</td>
<td>$579</td>
<td>$22</td>
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<tr>
<td>Quantum mechanisms, 2 year warranty, 210MB</td>
<td>$799</td>
<td>$24</td>
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<tr>
<td>Quantum mechanisms, 2 year warranty, 300MB Seagate</td>
<td>$1399</td>
<td>$45</td>
</tr>
<tr>
<td>Quantum mechanisms, 2 year warranty, 300MB Wren Runner</td>
<td>$1630</td>
<td>$48</td>
</tr>
<tr>
<td>Quantum mechanisms, 2 year warranty, 600MB Seagate</td>
<td>$1899</td>
<td>$60</td>
</tr>
<tr>
<td>Quantum mechanisms, 2 year warranty, 600MB Wren Runner</td>
<td>$2199</td>
<td>$69</td>
</tr>
<tr>
<td>Quantum mechanisms, 2 year warranty, 1.2GB Seagate</td>
<td>$2695</td>
<td>$85</td>
</tr>
<tr>
<td>Quantum mechanisms, 2 year warranty, 1.2GB Seagate*</td>
<td>$2695</td>
<td>$85</td>
</tr>
<tr>
<td>Quantum mechanisms, 2 year warranty, 5.0GB*</td>
<td>$4499</td>
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*MagicDrive Extended Warranty available $75/year

Magic Removable Drives

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<tr>
<th>Model</th>
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<tbody>
<tr>
<td>Magic SyQuest 43R</td>
<td>$449</td>
<td>$14</td>
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<tr>
<td>Magic SyQuest 88R</td>
<td>$899</td>
<td>$27</td>
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<tr>
<td>SyQuest Cartridge</td>
<td>$677</td>
<td>$22</td>
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<tr>
<td>1 GB Tahiti Maxtor</td>
<td>$399</td>
<td>$120</td>
</tr>
<tr>
<td>400 MB Ricoh ISO</td>
<td>$2299</td>
<td>$78</td>
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<tr>
<td>600 MB Sony ISO</td>
<td>$3199</td>
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CD ROM Drives

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
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<tbody>
<tr>
<td>Magic CD ROM (Toshiba)</td>
<td>$629</td>
<td>$19</td>
</tr>
<tr>
<td>Many CD-ROM software titles available</td>
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MagicTape Backup

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
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<tbody>
<tr>
<td>MagicTape 150MB</td>
<td>$699</td>
<td>$21</td>
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<tr>
<td>MagicTape 525MB</td>
<td>$999</td>
<td>$30</td>
</tr>
<tr>
<td>MagicTape 1.3GB DAT</td>
<td>$1695</td>
<td>$51</td>
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<tr>
<td>MagicTape 2.6GB DAT</td>
<td>$1895</td>
<td>$57</td>
</tr>
<tr>
<td>MagicTape 2.4GB 8mm</td>
<td>$2895</td>
<td>$87</td>
</tr>
<tr>
<td>MagicTape 5.0GB 8mm</td>
<td>$4499</td>
<td>$135</td>
</tr>
<tr>
<td>MagicTape 6.0GB 8mm</td>
<td>$629</td>
<td>$21</td>
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<tr>
<td>MagicTape 8.0GB 8mm</td>
<td>$799</td>
<td>$24</td>
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<tr>
<td>MagicTape 10.0GB 8mm</td>
<td>$999</td>
<td>$30</td>
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<tr>
<td>MagicTape 12.0GB 8mm</td>
<td>$1299</td>
<td>$41</td>
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<tr>
<td>MagicTape 15.0GB 8mm</td>
<td>$1499</td>
<td>$47</td>
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<td>MagicTape 20.0GB 8mm</td>
<td>$1699</td>
<td>$53</td>
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<td>MagicTape 25.0GB 8mm</td>
<td>$1899</td>
<td>$59</td>
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<td>MagicTape 30.0GB 8mm</td>
<td>$2099</td>
<td>$65</td>
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<td>MagicTape 35.0GB 8mm</td>
<td>$2299</td>
<td>$71</td>
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<td>MagicTape 40.0GB 8mm</td>
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<td>MagicTape 45.0GB 8mm</td>
<td>$2699</td>
<td>$83</td>
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<tr>
<td>MagicTape 50.0GB 8mm</td>
<td>$2899</td>
<td>$89</td>
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<td>MagicTape 55.0GB 8mm</td>
<td>$3099</td>
<td>$95</td>
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<td>MagicTape 60.0GB 8mm</td>
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<td>MagicTape 65.0GB 8mm</td>
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<td>MagicTape 70.0GB 8mm</td>
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<td>MagicTape 75.0GB 8mm</td>
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<td>MagicTape 80.0GB 8mm</td>
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<td>MagicTape 85.0GB 8mm</td>
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<td>MagicTape 90.0GB 8mm</td>
<td>$4499</td>
<td>$137</td>
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<tr>
<td>MagicTape 95.0GB 8mm</td>
<td>$4699</td>
<td>$143</td>
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<tr>
<td>MagicTape 100.0GB 8mm</td>
<td>$4899</td>
<td>$149</td>
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MagicTape Accessory Kit

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
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<tbody>
<tr>
<td>MagicTape Accessory Kit</td>
<td>$99</td>
<td>$3</td>
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CD ROM Drives

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magic CD ROM (Toshiba)</td>
<td>$629</td>
<td>$19</td>
</tr>
<tr>
<td>Many CD-ROM software titles available</td>
<td></td>
<td></td>
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</tbody>
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Storage Options

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
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<tbody>
<tr>
<td>Bernoulli Removable 44</td>
<td>$969</td>
<td>$29</td>
</tr>
<tr>
<td>Pinnacle RFO130 Optical</td>
<td>$2629</td>
<td>$81</td>
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<tr>
<td>PLI Infinity Turbo 88</td>
<td>$1149</td>
<td>$41</td>
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<tr>
<td>Midcomet 88 Removable</td>
<td>$1099</td>
<td>$36</td>
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MagicDrive Accessories

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
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<tbody>
<tr>
<td>Double-Up compression</td>
<td>$175</td>
<td>$6</td>
</tr>
<tr>
<td>Magic SCSI II Accelerator</td>
<td>$899</td>
<td>$36</td>
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Affordable Macintosh System Sales and Leasing

Macintosh Classic System

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macintosh Classic</td>
<td>$1333</td>
<td>$40</td>
</tr>
<tr>
<td>4MB RAM, 40MB hard drive, keyboard, mouse</td>
<td>$1333</td>
<td>$40</td>
</tr>
<tr>
<td>With 100MB Hard Drive</td>
<td>$1333</td>
<td>$40</td>
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Macintosh LC System

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
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</thead>
<tbody>
<tr>
<td>Macintosh LC</td>
<td>$1333</td>
<td>$40</td>
</tr>
<tr>
<td>4MB RAM, 100MB hard drive, keyboard, 12&quot; RGB or 14&quot; 8-bit monitor</td>
<td>$1333</td>
<td>$40</td>
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</table>

Macintosh IIsi System

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macintosh IIsi</td>
<td>$1333</td>
<td>$40</td>
</tr>
<tr>
<td>8MB RAM, 100MB hard drive, extended keyboard, and 14&quot; color monitor</td>
<td>$1333</td>
<td>$40</td>
</tr>
<tr>
<td>With 17MB RAM</td>
<td>$1333</td>
<td>$40</td>
</tr>
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</table>

Macintosh Iici System

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macintosh Iici</td>
<td>$1333</td>
<td>$40</td>
</tr>
<tr>
<td>8MB RAM, 100MB hard drive, extended keyboard, mouse, microphone, System 7, and 14&quot; color monitor</td>
<td>$1333</td>
<td>$40</td>
</tr>
<tr>
<td>With 14&quot; 20-bit Trinitron</td>
<td>$1333</td>
<td>$40</td>
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Macintosh IIx System

<table>
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<th>Lease</th>
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<tbody>
<tr>
<td>Macintosh IIx</td>
<td>$1333</td>
<td>$40</td>
</tr>
<tr>
<td>8MB RAM, 200MB hard drive, extended keyboard, mouse, microphone, System 7, and 14&quot; color monitor</td>
<td>$1333</td>
<td>$40</td>
</tr>
<tr>
<td>With 24-bit 20&quot; Trinitron</td>
<td>$1333</td>
<td>$40</td>
</tr>
</tbody>
</table>

UK FAX 800-891-742 • Singapore 65-287-5181 • Canada 800-624-9307 • USA 1-800-622-3475

LEASING: Prices quoted reflect 48 month lease based on credit approval. Minimum $50 month lease. Terms available from 24 to 60 month periods.
MacProducts USA Carries Over 3,000 Products for your Macintosh
Affordable leasing available for the entire MacProducts USA inventory. Leasing prices are denoted in the grey shaded area.

### Magic Memory

<table>
<thead>
<tr>
<th>Type</th>
<th>Buy</th>
<th>Lease</th>
</tr>
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<tbody>
<tr>
<td>1MB SIMMs 70/80/120ns</td>
<td>$35</td>
<td>$1</td>
</tr>
<tr>
<td>4MB SIMMs</td>
<td>$179</td>
<td>$6</td>
</tr>
<tr>
<td>16MB SIMMs</td>
<td>$899</td>
<td>$27</td>
</tr>
<tr>
<td>Apple Video RAM Upgrade</td>
<td>$69</td>
<td>$2</td>
</tr>
<tr>
<td>Classic Upgrade 2MB</td>
<td>$59</td>
<td>$2</td>
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<tr>
<td>Classic Upgrade 4MB</td>
<td>$99</td>
<td>$2</td>
</tr>
<tr>
<td>GCC PLP I/IS 1MB</td>
<td>$69</td>
<td>$2</td>
</tr>
<tr>
<td>GCC BLP I/IS 2MB</td>
<td>$139</td>
<td>$5</td>
</tr>
<tr>
<td>HP 1/24MB</td>
<td>$999</td>
<td>$239</td>
</tr>
<tr>
<td>MAC LC 8-bit Video RAM</td>
<td>$79</td>
<td>$3</td>
</tr>
<tr>
<td>Portable RAM 1-8 MB</td>
<td>CALL</td>
<td>CALL</td>
</tr>
<tr>
<td>QMS 2/34MB</td>
<td>$199/$279/$339</td>
<td>$6</td>
</tr>
<tr>
<td>TI 1MB RAM Upgrade</td>
<td>$75</td>
<td>$3</td>
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### RailGun Accelerators

<table>
<thead>
<tr>
<th>Model</th>
<th>Buy</th>
<th>Lease</th>
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<tbody>
<tr>
<td>Magic RailGun 030</td>
<td>$175</td>
<td>$60</td>
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<tr>
<td>&quot;The computing power in a Plus!&quot;-MacUser</td>
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### Modems & Fax Modems

<table>
<thead>
<tr>
<th>Type</th>
<th>Buy</th>
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<tbody>
<tr>
<td>Abatron 24/96 FaxModem</td>
<td>$295</td>
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<td>DoveFax 24/96</td>
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<td>DoveFax 24/96 Plus</td>
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<td>Prometheus Ultima 96</td>
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<td>US Robotics Courier HST14.4</td>
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<td>Magic Modems &amp; FaxModems</td>
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<tr>
<td>Magic 2400/1200/300 band</td>
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<td>Magic 2400/9600 SendFax</td>
<td>$59</td>
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<tr>
<td>Magic 2400/9600 FaxModem</td>
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<td>$6</td>
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<tr>
<td>Magic V.32 &amp; V.42 Bis MNP-5 Modems</td>
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<tr>
<td>2400 V.42 bis MNP-5</td>
<td>$175</td>
<td>$5</td>
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<tr>
<td>9600 V.32/V.42 bis MNP-5</td>
<td>$175</td>
<td>$5</td>
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<tr>
<td>Transmit up to 38,4k baud</td>
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### Network & Connectivity

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<tr>
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<tbody>
<tr>
<td>Asante 10T Hub</td>
<td>$935</td>
<td>$28</td>
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<td>Daynalong P/E/SCI, SI, SE</td>
<td>$285</td>
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<td>Nuvotech Navolink I</td>
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<td>Shiva FastPath 4</td>
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<td>Sonic Ethernet TnT SEI/LI/CJ/BA</td>
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<td>Magic Networking Solutions</td>
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<tr>
<td>MagicNet (localtalk)</td>
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<td>Magic EtherNet</td>
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### Printers

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<tr>
<td>Apple StyleWriter</td>
<td>$469</td>
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<td>HP DeskWriter</td>
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<td>QMS PS 815</td>
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<td>HP LaserJet IIHP</td>
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<td>JetFill HP DeskWriter Refill</td>
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<td>NEC SilentWriter Model 90.5</td>
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<tr>
<td>SeikoSHA SP2000 Dot Matrix</td>
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### Scanners

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<tr>
<td>Caere Typisn Hand Scanner</td>
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<td>$108</td>
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<td>MicroFax 1580 SlideScan</td>
<td>$2150</td>
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<td>Microutk 6000ZS</td>
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### Software

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<td>Claris Resolve NEW!</td>
<td>$289</td>
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<td>FileMaker Pro</td>
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<td>Faxbase</td>
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<td>Groliter Online CD ROM</td>
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<td>Kid Pix</td>
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<td>Latiom</td>
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<tr>
<td>Microsoft Word</td>
<td>$271</td>
<td>$9</td>
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<td>MiniCAD +</td>
<td>$499</td>
<td>$15</td>
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<tr>
<td>Mode 32</td>
<td>$1053</td>
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<td>Norton Utilities</td>
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<td>PageMaker 4</td>
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<td>Photoshop 2.0</td>
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<td>Quark XPress</td>
<td>$489</td>
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<td>Radix Network Administrator</td>
<td>$433</td>
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<td>RoboSport</td>
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<td>Soft PCAT EGA Bundle</td>
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<td>StarVision 3DXR Rendarer</td>
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<td>Symantec Anti Virus 3</td>
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<td>Warner Beethoven CD ROM</td>
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### Video Solutions

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<tr>
<th>Type</th>
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<tbody>
<tr>
<td>GoldStar 1450+ 14&quot;RGB</td>
<td>$369</td>
<td>$12</td>
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<td>NEC MacSync 14&quot; RGB</td>
<td>$449</td>
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<td>Radius Direct Color 24 bd</td>
<td>$2359</td>
<td>$78</td>
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<td>RasterOps 24 StV</td>
<td>$1289</td>
<td>$39</td>
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<td>Seiko CM 1445 14&quot; RGB</td>
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<td>Magic Video Solutions</td>
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<tr>
<td>Magic 19&quot; B&amp;W card</td>
<td>$999</td>
<td>$30</td>
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<tr>
<td>Magic 19&quot; 24-bit color cl $1299</td>
<td>$45</td>
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<tr>
<td>Magic 13&quot; 8-bit color cl $1299</td>
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</tr>
<tr>
<td>Magic 19&quot; 8-bit color cl $1299</td>
<td>$45</td>
<td></td>
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</tbody>
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### To Order Call:

1-800-622-3475 or (512) 472-8881

Hours: M-F 8am-9pm Sat 10am-6pm

Cost Service: (512) 472-8881 ext 764

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Inst. Orders: Call or fax leasing. Yes flexible terms & quick approval make it easy to lease. Tax: Texas Residents only 8%

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**Terms:** Order must be prepaid in full or customers must have an approved credit card on file. Order must be placed within 30 days of delivery.

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**MacUser October 91**
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SIMM pack for Classic D Hub board $89
Board w/LM 49
LC FVAM 88
Board w/LS 129
SIMM pack for Classic hub board 16

"Be gentle drive from Hsi and Hc, install in Classic.

Logica's
Triple Crown for the IIsl.

Endorse your IIsl three ways. Use our 64K Cache card for 40% improved performance. The IIsl adaptor lets you use two expansion cards, as drawn above. The adaptor can be used with or without the 68852 math coprocessor (LCFPU), for faster math calculations. Buy them all or one at a time, as your needs grow.

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IIsl Shot Adaptor $59
IIsl FPU $75

SyQuest, Tape, DAT, Optical

45R SyQuest, one cart $475
45DR SyQuest, two carts $990
88R8 SyQuest, one cart 149
88DR Dual SyQuest, two carts 2249
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OptiDisk™ 1000 Tahiti Optical Drive 9800

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210 750
320 1250
425 1810
650 1490
1000 2350
1350 3190

External

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360
910
840
1340
1900
1740
2430
3290

*Log page internal drives that meet Classic, Hsi & LC power specs. All drives pictured are in premium enclosures.

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When it comes to performance, sound level, price and speed, our drives are your best all-around choice. In fact, Macworld rated our IIsl the fastest of all drives in its category. Our drives are also the quietest tested. Macworld also said Third Wave has "one of the best manuals" as well as "Third Wave has a solid track record." In the hard drive business, it's not just what you buy, but how you buy it from that makes the difference. So what are you waiting for?

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Teac CT660X (150mb) 24
SyQuest SQ400 (44mb) 70
SyQuest SQ800 (88mb) 149
4mm DAT Tape, 60 meter 19
Optical Cartridge (ISO) 512H/24 190
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245-245IC-324NE 60$590
9L-24L Systems Call
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Third Wave Computing

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(512) 832-8282 • FAX (512) 832-1533


Please circle 101 on reader service card.

**September '91 Macworld review**
### Mac CPUs

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mac Classic 2/40</td>
<td>1325.00</td>
</tr>
<tr>
<td>Mac Classic 3/40</td>
<td>1699.00</td>
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<td>Mac IIfi 3/40</td>
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<td>Mac IIfi 3/120</td>
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<td>Mac IIfi 3/5 RAM</td>
<td>3499.00</td>
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<td>Mac IIfi 5/120</td>
<td>3999.00</td>
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<tr>
<td>Mac IIfi 4/120</td>
<td>5599.00</td>
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Call for other configurations.

### HARDWARE

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<tr>
<th>Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>APSHD Engineering Tandem Disk Driver Kit</td>
<td>210.00</td>
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<tr>
<td>Datarray LC</td>
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<td>Datarray Mac</td>
<td>169.00</td>
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<td>Quadrakin</td>
<td>189.00</td>
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<td>CacheITOR</td>
<td>199.00</td>
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<tr>
<td>QuickSilver 2 W CPU</td>
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<td>FastMARC LC W CPU</td>
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<td>Articulate Systems VPS 10</td>
<td>559.00</td>
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<td>Bays Electronics</td>
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<tr>
<td>PS-470 SIMM ADAPTER</td>
<td>799.00</td>
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<td>Microlaser Memory Board</td>
<td>479.00</td>
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<td>CAERI</td>
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<tr>
<td>MAC-STACK 48MB REMOVABLE</td>
<td>1599.00</td>
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<td>MAC-STACK 8MB REMOVABLE</td>
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<tr>
<td>Daystar</td>
<td>150.00</td>
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<tr>
<td>Power Cache ICI</td>
<td>45.00</td>
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<tr>
<td>Accelerator (All Models)</td>
<td>CALL</td>
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<tr>
<td>DoVE</td>
<td>250.00</td>
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<td>DoVE XFX Desktop</td>
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<td>DoVE Pro Plus WY VOICEMAIL</td>
<td>300.00</td>
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<td>EMAC</td>
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<td>Generation Systems</td>
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<tr>
<td>External TV Box</td>
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<td>TV Out Doors</td>
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<td>Micronology 48MB TRANSFORMABLE</td>
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<td>MICROTO TRUELaser</td>
<td>£1799</td>
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*New high-performance PostScript printer with AppleTalk, serial RS-232 and Centronics parallel ports (auto switching), 35 resident TrueType fonts, and a RISC microprocessor for 6 page-per-minute performance.*

### SOFTWARE

<table>
<thead>
<tr>
<th>Description</th>
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<tbody>
<tr>
<td>ABACADATA</td>
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<td>ADOBE</td>
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<td>AJLIGATOR 30 W ATM</td>
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<td>ALCORUS 2.0</td>
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<td>DESIGNER</td>
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<td>FLATWORKS</td>
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<td>FLEXIPROFESSIONS</td>
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<td>GALLERY EFFECTS</td>
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<td>INCISION</td>
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<td>SAVVY/2 Supplied</td>
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<td>QUARK</td>
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<td>QUICKCUT</td>
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<tr>
<td>QUICKCASE 2</td>
<td>93.00</td>
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<tr>
<td>CALLED MAKER</td>
<td>55.00</td>
</tr>
</tbody>
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<table>
<thead>
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<th>Description</th>
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<td>MAINSTAY</td>
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<td>MACSCHEDULE</td>
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<td>MECC</td>
<td>38.00</td>
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<tr>
<td>THE OREGON TRAIL</td>
<td>28.00</td>
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<td>WORD MUNCHERS</td>
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<tr>
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<td>33.00</td>
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<td>FLIGHT SIMULATOR</td>
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<td>PARACOMP</td>
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<td>FILM MAKER</td>
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<tr>
<td>CADRF</td>
<td>99.00</td>
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<td>ULTRASCIPT MAC</td>
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<tr>
<td>GRAM SCHOOL</td>
<td>159.00</td>
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<tr>
<td>QUAIR                                                       WORDPERFECT MAC</td>
<td>299.00</td>
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<td>QUICKXSW</td>
<td>195.00</td>
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<tr>
<td>3D WORDPERFECT MAC</td>
<td>269.00</td>
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105 Mb, 12 ms, Slimline ................... $389 ......... $469
210 Mb, 12 ms.............................. $699 ......... $779
425 Mb, 12 ms............................. $1599 ......... $1679

Imprimis drives Index 5.25”
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Index extended keyboard

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<td>French, German, Swiss</td>
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Macintosh CPUs and Systems

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<td>Mac II FX</td>
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- 170 Megabytes 12ms $579.99
- 210 Megabytes 12ms $689.99
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- 210 Megabytes 12ms $799.99
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Software

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<td>Acius 4th Dimension</td>
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<td>Adobe Illustrator</td>
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<td>Adobe Photo Shop</td>
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<td>Claris FileMaker Pro</td>
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Monitors

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Video Cards

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Memory

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<td>Micron 8 bit SE/30 640x480</td>
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<td>8 bit II 640x480</td>
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<td>RasterOps 24si Color Board</td>
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<td>264STV</td>
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<td>364 Color Board</td>
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Scanners

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<td>Canon XAPSHOT 24 bit Bundle</td>
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<td>Microtek 600ZS Color</td>
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<td>600GS Gray Scale</td>
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<td>Slidemaker Slide Scanner</td>
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CD ROM

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<td>Zoom 24/96 Send/Receive Fax Modem</td>
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<td>Sony 1304 14&quot; Color</td>
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Accelerators

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<td>Modems</td>
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<td>Abaton 24/96 Send/Receive Fax Modem</td>
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 Practical Peripherals

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<tr>
<td>9600 Baud Modem with Software and Cable</td>
<td>$499.99</td>
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</table>

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<th>Drive Size (MB)</th>
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<th>EXTL</th>
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<tr>
<td>210</td>
<td>699</td>
<td>799</td>
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<thead>
<tr>
<th>Product</th>
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<td><strong>SyQuest</strong></td>
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<td><strong>WangDAT</strong></td>
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<td><strong>(Dub'l-Bus add $75 ea.)</strong></td>
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- One cartridge
- Add'l cartridge: $69-129
- One cassette & Retrospect
- Add'l cassette: $17-$24
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- **Disk for Disk Replacement Warranty**
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It was a bleak day outside Apple’s headquarters. Pickets were complaining about layoffs. Rumors were running rampant that the slowdown would ruin Apple and that it would be years before the company could make a comeback. It looked bad. Meanwhile, there was talk about Apple doing a deal with IBM. What did it all mean?

I had no choice but to visit my old friend Swami Sri Swish Nanda in his new meditation dome just outside of Pensacola, Florida. The Swami had long since moved from his old San Francisco tree house, and I hadn’t seen him for years. So I decided to take the MacUser Learjet to find the Swami and see if he could use his powers of virtual oneness to simulate the future.

At the airport, much to my amazement — although I shouldn’t have been surprised — was a limo with two of the Swami’s scantily clad veiled assistants waiting to escort me to his quarters. We rocketed out of the airport, and in minutes I entered an enormous dome, where I was put right into an elevator that took me down at least ten stories into the earth.

The doors opened to reveal the Swami in the middle of a luxuriant football-field-sized room replete with trees, a brook, deer, birds, a couch, and a large-screen projector TV. “Come on in, Dvorak. I’m tuning up the new projector crystal ball. If we wear these special cybergoggles — here, sit down and put them on — we can get some idea of what things will be like for Apple in 2009. That’s the year of the last meeting of Apple as an entity.”

He motioned me to the couch, and I donned the glasses. The Swami sat down next to me, and we both stared at the screen as it began to flicker. He poked me. “Oh, did I mention that Apple is a division of IBM in 2009?”

As I was about to express my shock, the screen and the glasses came to life and we were transported into the boardroom of IBM. I didn’t know the CEO, but he looked like Michael Milken. It was a bizarre scene. The room was coal-black marble. Everything was black except for a series of bright halogen spotlights overhead, beaming down on the room’s occupants and making them all look ominous. John Sculley was at one end of the table, strapped tight to a chair, with a gag in his mouth. Beside him stood two tall goons — guards. Next to him at the table was an aged Steve Jobs, who looked like he was 90 years old. Older than Sculley, for sure.

The CEO spoke. “Sculley, ol’ boy, you know the story. When we acquired IBM for our German brothers after the United Europe began to dominate world affairs, we expected the Apple division to be cooperative. It wasn’t my idea to incorporate your company. It was the idea of John Aker, along with his pal Ross Perot. Apparently it was part of a grand scheme to save Perot’s investment in that money-drain NeXT. Right, Steve?”

The old, saddled Jobs looked up nervously. He was real scared. “Right!” His eyes darted left and right. Then he hunched down in his chair, not wanting to look Sculley in the eyes. Sculley jerked about, trying to get free.

The CEO continued. “But that was before we knew that the United Europe would dominate. Its rules are what we play by. And it seems that Apple does not want to play by the rules. The plan is for you to be absorbed, eliminated! That’s why you are being paid so much. The idea was simple. You started talking with us in 1991. We did joint ventures in 1992. You sold us stock in 1993. You feigned another round of problems in 1994. We took you over in 1995.

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He motioned to one of the guards, who removed the gag from Sculley’s mouth. Sculley began to shout. “You creep! We had a deal. We had a deal!”

The CEO motioned to the other guard, who then slapped Sculley hard across the face. “Shaddup!”

Suddenly the screen went blank, and sparks flew from the cybergoggles. I threw mine off as a couple of large guys in turbans ran into the room and blasted the smoking goggles with CO2 from fire extinguishers.

The Swami was laughing. “I tell you, Dvorak, ever since I heard about the IBM-Apple talks, I’ve been trying to find out what exactly this ‘deal’ was that they made, and each time this type of thing happens. There is something weird about all this. I have only one clue. Look at this video still of the CEO. We did a computer analysis of what he might look like today — 18 years younger.”

He handed me a sealed envelope and told me not to look at it until I was flying home. Somewhere over Iowa, I tore open the envelope. It was a picture of Bill Gates!
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