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At last, Hewlett-Packard introduces a laser printer built specifically for the Mac from the ground up—the new LaserJet 4M. A laser printer for Mac users with everything you expect. And, more importantly, everything you need. From built-in PostScript Level 2 software from Adobe and 6 MB of memory, to standard LocalTalk and optional EtherTalk. Features which make certain this new generation in laser printing is ready-made just for you.

The finest print quality in its class.
In addition to complete Macintosh compatibility, the LaserJet 4M printer also delivers the finest print quality of any 600 dpi machine available—thanks to

© 1991 Hewlett-Packard Company  P12276 *Suggested US list price
HP's microfine toner, Resolution Enhancement technology, and an advanced engine expressly engineered for 600x600 dpi.

New generation features mean you will lose no time getting your work onto the page. A new RISC processor and 6 MB of standard memory accelerate formatting and I/O speeds, so complex PostScript language and graphics files are rendered faster and more clearly than ever before.

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Surprisingly affordable. Perhaps the most remarkable attribute of the new LaserJet 4M printer is the price—$2,999.* A breakthrough in its own right. So call 1-800-LASERJET (1-800-527-3753), Ext. 7135 to receive a print sample** and comparison disk to see the quality for yourself. Or visit your nearest authorized HP dealer and see the printer built to add some polish to your Apple.

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 DiskFit Direct™
 DiskFit Pro
To go forward, you must back up

Circle 26 on reader service card

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16 January 1993 MACWORLD
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• Reorder Startup files to work around conflicts due to loading order problems
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We could go on and on. After all, that's only two of the 43. But suffice it to say:

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Apple's Record-Breaking Earnings:
Apple Computer had its highest-ever revenues and net income for the fourth quarter and for the company's fiscal year 1992, which ended September 25. Revenue for the quarter was $1.768 billion, up 17 percent from the same quarter a year ago. Net income for the quarter was $97.6 million, up 20 percent. For fiscal 1992, net revenue rose to $7.087 billion, up 12 percent over the previous fiscal year.

And Mac Shipments Rose: Apple also reported that unit sales of Macs were up 35 percent for the fourth quarter versus the same quarter last year, and up 20 percent for the 1992 fiscal year. Apple now surpasses IBM as the leading vendor of personal computers, in units shipped. PowerBooks accounted for more than 400,000 units in their first year of existence.

Lotus Upgrades 1-2-3: Lotus 1-2-3 version 1.1 catches up to a few features in arch-rival Excel with drag-and-drop moving of cell ranges, automatic summing of rows and columns, and filling down or across (or, in 3-D sheets, back). Version 1.1 also has improvements in graphing, drawing, and presentation features. It lists for $495 from Lotus, 617/577-8500.

Symantec Upgrades SAM: Symantec (408/253-9600) is upgrading its anti-virus utility to version 3.5 in two flavors: a single-user version and a network version with a network installer. Both have a much-simplified interface; can be set to run virus scans at a certain time; and can scan files compressed with Stuffit and Compressor. The single-user version lists for $99; ten-packs for $759.

PhotoPro Speeds Photoshop: Raster-Ops (408/562-4200) has begun shipping PhotoPro, a RISC-based accelerator that helps a Mac II run Photoshop from four to ten times faster than a IIcx can, the company said. The $999 NuBus board accepts multiple PhotoPro piggyback accelerator boards that work in parallel to further increase performance. Those boards also list for $999 each.

PowerBook Printing: Palomar Software (619/721-7000) has developed On the Road, a $99 print-delay utility that allows PowerBook users to issue the print command in normal fashion when not connected to a printer; the utility automatically prints all documents when the network connection is reestablished. On the Road supports many printers and fax modems and works with LocalTalk, EtherTalk, and AppleTalk Remote Access.

RAM Prices Jump: In the wake of a U.S. Department of Commerce preliminary finding that several Korean RAM vendors have been selling their chips for less than they cost to produce, DRAM prices rose by about 50 percent, apparently in anticipation of possible tariffs.

More Mail Gateways: StarNine Technologies (510/649-4949) has announced Mail Link for cc:Mail/QM, an MHS-compatible link between QuickMail and cc:Mail that does not require a Novell system or other MHS (message handling service) host. StarNine is also shipping version 2.0 of its MHS gateways for QuickMail and Microsoft Mail, with improvements to file-enclosure support and address management. Pricing depends on number of users.
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The Changing Mac Landscape

BY ADRIAN MELLO

As the price war in personal computers continues raging, the Macintosh landscape is undergoing radical change, affecting which models will continue to be available and which users will be best served. Over the last two years Macintosh prices have fallen dramatically. A couple of examples illustrate just how aggressive with pricing Apple has become. Two years ago the Macintosh Classic was introduced at a suggested retail price of $1499 for a configuration with 2MB of RAM and a 40MB hard drive. Today you can buy the more powerful Classic II with an additional 2MB of RAM for $1079 (with street prices often under $1000). And Apple now offers the LC II for $1239, less than half the original $2499 list price of the LC.

What's causing the price avalanche? PC prices in the DOS and Windows market have fallen through the floor because of intense competition among clone vendors. To remain competitive, Mac prices have followed suit. It's now clear that Apple made the right decision two years ago when it boldly introduced three new low-cost models—the Classic, the LC, and the IIsi. These products reversed a long-standing trend of introducing continually-higher-performance models offered at premium prices (a good idea at first, but an increasingly dubious strategy as prices plummeted for DOS and Windows-based computers). Those plummeting prices forced Apple to bring out the low-cost Mac and change the fundamental nature of the company so that it could sell a high-volume product line at significantly lower profit margins. The company cut costs in a number of ways, including laying off workers, reorganizing manufacturing and distribution, and putting existing functions into fewer chips. Now, having surpassed IBM to become the single leading vendor of personal computers, Apple appears well prepared to meet the challenges of falling prices.

How Prices Change Products

But price wars mean more than just a pleasant surprise for buyers. Radically falling prices also set off a cascade of events that will permanently alter the Macintosh price/performance landscape. Here's how it looks to shape up.

First, price changes in one part of the range almost always affect prices elsewhere in the range. As midrange models drop in price, low-end models also drop. Last autumn Apple cut the IIsi from $2499 to $1729, which would have been only $30 more than the LC II. To prevent the less capable LC II's sales from drying out, Apple also reduced that machine from $1699 to $1239. For the time being, there is a $500 difference in list price between the two models.

And, as more features are squeezed into new models at the old prices, the old models are often squeezed out of existence. The introduction of progressively more nimble Macintoses led to the extinction of the Mac II, IIX, IIXc, and IIFx. And now that the LC II is gone, Apple is also reduced that machine from $1699 to $1239. For the time being, there is a $500 difference in list price between the two models.

Finally, as low-end machines become more powerful and midrange machines become less expensive, most buyers will choose systems between $1000 and $2000, because those systems offer enough performance at a good price. This means it's time to rethink the geography of Macintosh models. Instead of a clearly stratified low end and midrange, there is a high-volume market emerging that will constitute the bulk of computer sales. Call it the mainstream, if you like; it is likely to be in that price range between $1000 and $2000. The narrower price band is likely to eliminate important distinctions between the buying power of users. More people will have access to the Mac experience at a higher level of performance—running color QuickTime, for example.

New High-Volume Market

PERSONAL COMPUTERS IN general are already undergoing a market implosion. In 1991, most of the personal computer market growth was for systems priced from $1000 to $2000, according to International Data Corporation, a research concern owned by Macworld's parent company. This segment represented 39 percent of the growth and 43 percent of the revenues. Systems priced from $2000 to $3000 grew only 6 percent. Sales of systems under $1000 fell by at least 20 percent, and sales of systems $3000 to $7000 fell by a whopping 30 percent.

Although the Mac's superior hardware and software integration and refinement will still command a premium throughout the product range, the continuing question is how much of a premium are potential new users willing to pay. Prices of high-volume Mac models must remain in the ballpark to compete with Windows-based computers.

Mac prices are already very good. It's remarkable that you can get a complete Performa 600 system with a hard drive and color monitor for a street price of around $2400. The Performa 600 is a reasonably powerful midrange computer, capable of more than enough performance for most applications. Unlike the LC II, the Performa 600 is a suitable choice for most businesses. And don't be surprised if home and education users find it hard to resist the added performance of a Performa 600, especially one equipped with an internal CD-ROM drive.

However, although prices have improved, a $2400 system like the Performa 600 is still too pricey for many would-be computer buyers who have never used a Mac. At present it's easy to find a fully configured 80486 machine running the latest Windows for $1500 to $1700.

To gain market share in desktop personal computers, Apple must offer a full system similar in capability to the Performa 600 or Mac IIX for under $2000. Naturally, current Mac users are unlikely to convert to Windows.

Wish List for Low-Cost Macs

SO, IF FULLY CAPABLE MAC business systems become available for under $2000, what will be the consequences for low-cost Macs such as the Classic II and LC? At this point, both of these machines need to compete for new users with 286- and 386-class machines that now cost under $700.
STATE OF THE MAC

$1000. That price includes a complete system with a color monitor and hard drive. An LC II with a color monitor and keyboard currently sells for around $1700 or less—still quite a bit more than a supposedly comparable Windows machine. To win more new users, Apple should continue to cut prices and should boost the performance of the Classic and LC models or their eventual replacements.

Here are some suggested performance targets for entry-level Macs. Think of it as a wish list, not as a prediction. The next Classic design should provide at least as much performance as the now-discontinued SE/30. Many long-term fans of the traditional Mac design were disappointed with the Classic II's slow performance relative to the SE/30. And for interest's sake, it's also time to add something extra to the Classic design, such as an optional CD ROM drive, a color screen, or at the very least an expansion slot. Of course, all these features add cost to a machine that should be kept under $1000.

The next LC should offer performance comparable to the soon-to-be-defunct Mac IIsi. The LC will need a little more power to handle growing expectations of home use and light business use. It needs to be as fast as the IIsi or include more than one slot. Providing a CD ROM option similar to that of the Performa 600 and Mac IIsi would be great. To remain competitive, the more-powerful LC system with monitor and keyboard should sell for a street price under $1500.

Both the LC II and Classic II suffer from narrow data buses. In fact, the two machines share a similar board design. Although it's true that both use a 32-bit microprocessor, the LC II and Classic II can only transport data to and from the processor at 16 bits. (This is a little like having a coffee maker that produces 32 cups of coffee in a single brewing, but the pot can only hold 16 cups—you can still only make 16 cups at a time.) Apple could speed up both machines by upgrading the board design with a broader data bus.

For years everyone has anticipated the day when a computer would cost about the same as other electronic appliances such as video and stereo systems. Although we aren't there yet, Macs are quickly approaching this point. In the meantime, the Macintosh world has changed permanently. Within the coming year most midrange and low-end Mac sales will converge within a new high-volume market. High-volume Macintosh desktop models will probably be separated by a span of about $1000 to $1500. And they'll increasingly provide a higher-quality Mac experience to many who could not have afforded it before.
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<table>
<thead>
<tr>
<th>DAT Drive</th>
<th>Internal</th>
<th>External</th>
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<tbody>
<tr>
<td>1.3-2.0GB DAT Drive</td>
<td>$1249</td>
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<tr>
<td>4.8GB Compression DAT</td>
<td>$1549</td>
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Just As Soon As You Dig Through 300 Folders, Restart Ten Times, And Figure Out What Palatino Looks Like.

You know all those things you wish your Mac did? Let you get at files immediately, or load new extensions without making your system blow up. Well, it can. With Now Utilities 4.0, an updated version of the collection awarded best utility last year by MacWeek and MacUser. Its 7 components are designed, tested and guaranteed to work together, and it simplifies using your Mac in so many ways, it'd be impossible to mention them all in one ad. So here's the Reader's Digest Condensed version.

| NowSave | Automatically saves your work, and it can record every keystroke in a special back-up file, just as you typed it. So even if your system crashes, your work is saved. As is the hair you would have torn out.

| WYSIWYG Menus | Means what you see is what you get. Will it let you see fonts in their actual typefaces? Yes. Will it let you change the order, size and color of fonts in their menus? Absolutely.

| NowMenus | Creates sub-menus up to five levels deep for anything in your Apple menu. It lets you launch files and applications instantly. It lets you assign hot keys to menu items on the fly. It even lets you group applications, files and folders into worksets. Is there anything it doesn't let you do? Yes, but give us a break. The ad just started.

| Super BoomRanger | Saves you time and hassle by keeping track of your most frequently used files and folders. Then it presents them to you in the "open" and "save" dialog of every application. And it finds lost files with ease—even if they've been compressed.

| Startup Manager | Controls the loading of extensions and control panels. It helps prevent crashes. It disables extensions that do crash. It even links together extensions that require each other and keeps disagreeable extensions apart so they won't bloody each others' proverbial noses.

| Now Scrapbook | Organizes graphics, text, sounds and QuickTime movies and stores them in catalogs. It also shows you "thumbnail" views and lets you sort, zoom, scale, resize and crop images just like a real live art director, even if you don't have a ponytail.

| Now Profile | Isn't sexy. But it does provide a detailed analysis of your system and its configuration. So in case of trouble all the info's right there. Sexy, no. Smart, yes.

So there it is, Now Utilities 4.0. Or at least as much of it as we can fit in one ad. For the rest of the details, call 1-800-237-3611. Oh, and just in case you're still wondering, Palatino looks like this.

Mac LC, LC II, IIci, IIci, IIci, Box & Quadra.


Available in platinum for Mac IIci, IIci & Quadra.

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Circle 176 on reader service card
Digital Edition

DAMN GOOD EDITORIAL, THAT one you wrote about electronic magazines and books being convenient, yet at the expense of libraries and bookstores (Commentary, October 1992). Convenience, speed, efficiency: all the effects of electronic, that is, digital, media, would be great; but I’m kicked back in my armchair right now, Tolkien’s The Hobbit in hand, coffee at my side, and a Field & Stream at my feet, and I have to say that my self-imposed absence from my Macintosh is not only nostalgic but also downright relaxing.

Electronic media are a godsend for the workplace, and even in my own struggles with The Novel I feel dependent on electronic research. But it’s times like right now, work done and the toes pointing skyward, that I have to say plain old paper and ink does the trick.

Mark Siety
Jaua, South Dakota

BORRELL RAISED A FASCINATING issue of equity. He says that the same people who can’t watch cable will probably not be able to access electronic communications. The federal government must establish a policy of equal access to information, or the poor will not be able to afford electronic communications. Otherwise, the feds will simply encourage the existing class structure of educated elites and displaced industrial workers.

Kris Magnusson
Salt Lake City, Utah

Trust Ehman or Not?

AS OF RIGHT NOW, I AM OUT $500 plus a lot of time in tracking down a lost monitor, not to mention long-distance phone calls, photocopying, and fax expenses. You were much too kind to Michael Ehman in your article (Conspicuous Consumer, October 1992). As far as I am concerned, he is a con man of the worst sort, and it would appear that he conned you also regarding his concern for former Ehman Inc. customers.

Nevertheless, thank you for being a thorough watchdog in an industry whose high-speed products are often matched only by unscrupulous, fast-lane business practices. I wanted to add my voice to the five complaints against Ehman/Bridgette mentioned in your article.

Paul Cummings
San Jose, California

I FIND I CAN’T BE VERY GENEROUS when it comes to judging Mr. Ehman. Sure, I was told my Cutting Edge drive, still under warranty, was repaired; but unfortunately, when I tried to use it I found it had the same problem it had when I sent it to them.

Apparently, Ehman believes he’s sincere about taking care of customers’ complaints; but if he really is, he can prove it by satisfying the five—of which I’m one—continues

MACWORLD January 1993 39
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who wrote to Macworld with complaints about his company. He probably will make a comeback, one way or another. But will I ever be reimbursed the $375 I'm out because I've had to get my hard drive repaired locally?

Norma von Stieck
Lansing, Michigan

I THINK THE ARTICLE "HOW EHRMAN INC. UNRAVELED" WAS PATHETIC, USELESS, BORING, DULL, AND UNWANTED. IF YOU CAN FIND FIVE MAC USERS, EXCLUDING THE ONES WORKING AT MACWORLD, THAT ARE INTERESTED IN HOW EHRMAN INC. BECAME BRIDGEITTE, THEN I WILL IGNORE THE WASTED NATURAL RESOURCES USED TO PRINT THESE ARTICLES. I DON'T READ MACWORLD TO HEAR ABOUT THE COMPANIES THAT GO KERPLUNK, AND I DON'T THINK ANYONE ELSE DOES EITHER.

David Tannenbaum

Music from a Master

REGARDING THE MIRACLE PIANO TEACHING SYSTEM (REVIEWS, OCTOBER 1992), YOUR COMMENTS ON THE LACK OF DYNAMICS AND EXPRESSION WERE VERY GOOD. HOWEVER, ONE THING I HAVE FOUND IN 14 YEARS OF TEACHING IS THAT STUDENTS GENERALLY HAVE EXTREMELY POOR RHYTHMIC CONTROL, SO MAYBE IT IS NOT SO BAD THAT A METHOD AIMED AT BEGINNERS TRIES TO DEVELOP A GOOD SOLID RHYTHMIC BASE. MOST OF MY STUDENTS CAN READ-PITCHES, BUT RHYTHM IS A DIFFERENT MATTER. STUDENTS REALLY DON'T SEEM TO GRASP THE RELATIONSHIPS BETWEEN NOTE VALUES. OF COURSE, IF THEY NEVER GO BEYOND THE BASICS, THEY NEVER DEVELOP ANY REAL MUSICIANSHIP, EITHER. THE MIRACLE SYSTEM PROBABLY NEEDS A FOLLOW-UP COURSE.

Joel Bowman
Kalamazoo, Michigan

Parent Companion

KID PIX COMPANION DESERVES AT LEAST FOUR STARS INSTEAD OF THREE

First Ever MacAcademy Learning Extravaganza Huge Success - 12 Locations Announced For 1993!

Five day event devoted to learning the Macintosh Computer. Program includes over 144 workshops teaching the Mac and 20 popular Macintos programs.

Now, for the first time, you can master all of your Macintosh programs in as little as five days. In fact, you can learn all the techniques, features, and hundreds of tips and tricks in a matter of a few hours. If you don't believe it just ask the 550 people who attended the first-ever MacAcademy Learning Extravaganza in October, 1992 in Monterey, CA.

MacAcademy has been an innovator in Macintosh training since they first introduced their 2-Day Macintosh Speed Learning workshops back in 1987. Since then MacAcademy has pioneered a unique video training series and specialized workshops that are now being used by over 25,000 companies and over 125,000 individuals.

This year MacAcademy was awarded the MACWORLD Magazine World Class award for excellence in training. MacAcademy continues the tradition of innovation and quality by announcing 12 locations in 1993 for the all-new and popular Learning Extravaganza program. The Extravaganza features 20 MacAcademy instructors in one location for a full week. Over 144 workshops are taught covering nearly 30 different subjects, all for the low price of only $479.

550 people attended the all new MacAcademy Learning Extravaganza in October, 1992. After 5 days of attending workshops they gave the program a rating of 4.7 on a 1 to 5 scale! "It was fantastic." "The greatest most valuable training I've ever attended." "Great instruction!" "The instructors were all very knowledgeable and friendly. I would not hesitate to recommend it or come again!" "By far the best training environment I have ever attended." "I would recommend it to any Mac user." "What a week! Learned more than I ever imagined possible." "The PageMaker class was worth the whole registration fee. It will save me hours in computer time alone!" "The five days were outstanding! The Extravaganza is a tremendous value."

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I think the article "How Eieman Inc. Unraveled" was pathetic, useless, boring, dull, and unwanted. If you can find five Mac users, excluding the ones working at 
MacWorld, that are interested in how Eieman Inc. became Bridgette, then I will ignore the wasted natural resources used to print these articles. I don't read 
MacWorld to hear about the companies that go kerplunk, and I don't think anyone else does either.

David Tannenbaum
Great Neck Estates, New York

Ultima Pro and Con

I would like to point out a few things the reviewer missed in his review of Ultima Home Office (Reviews, October 1992). He mentioned that the sound quality in incoming and outgoing messages in the voice-mail system was poor. I noticed the same thing initially, but after reading a few pages in the manual, I discovered that the sound quality is adjustable. When I chose Better or Best in the dialog box, all messages took up a little more disk space but sounded fine.

He also said a bug occurred when he deleted message files, specifically that their names still appeared in the message queue. This is also adjustable, so you can save the message names as a record of calls if you wish. It takes about ten seconds to set it up in order to also delete the names.

Finally, the reviewer called Prometheus technical support "underwhelming." I have only called them twice, but both times they answered my questions in a timely and satisfactory manner.

Don Aldridge
Frankfurt, Michigan

REGARDING THE MIRACLE PIANO

Teaching System (Reviews, October 1992), your comments on the lack of dynamics and expression were very good. However, one thing I have found in 14 years of teaching is that students generally have extremely poor rhythm control, so maybe it is not so bad that a method aimed at beginners tries to develop a good solid rhythm base. Most of my students can sight-read pitches, but rhythm is a different matter. Students really don't seem to grasp the relationships between note values. Of course, if they never go beyond the basics, they never develop any real musicianship, either. The Miracle System probably needs a follow-up course.

Jay Rogers
Downey, California

Music from a Master

I was dismayed by reading Joe Mazzoni's recent article "Seeing Through Slide Scanners" (October 1992). All too often your articles are written from the point of view of tech heads, not people who are actually out here making a living doing professional work on the Mac. Your writers often miss the point of how useful or useless equipment and software can be, because the writers are not dealing with anything but lab tests and searching for "more elegant" approaches. The scanner article is a perfect example of this—it tells us how scanners work (who cares?); rates the products on a variety of technical issues, which are largely moot, because none of the scanners are good enough to use for prepress; and it fails to provide information on the many ways that slide scanners are extremely useful to design studios on an everyday basis.

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Just in case you were wondering, yes. This is a real printout.

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First Ever MacAcademy Learning Extravaganza Huge Success -
12 Locations Announced For 1993!

Five day event devoted to learning the Macintosh Computer. Program includes
over 144 workshops teaching the Mac and 20 popular Macintosh programs.

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1993
MacAcademy
Learning Extravaganza
Locations

- Dallas, TX
- Detroit, MI
- Las Vegas, NV
- Monterey, CA
- Boston, MA
- Chicago, IL
- Seattle, WA
- Los Angeles, CA
- Washington, DC
- Cincinnati, OH
- New York, NY
- Orlando, FL
The MacAcademy Learning Extravaganza teaches the basics, the advanced techniques, the short-cuts, PLUS hundreds of tips and time saving tricks for the Macintosh and all the programs.

Even Steve Wozniak, co-founder of Apple Computer signed up for the Learning Extravaganza. When asked for his opinion he said the extravaganza was “cool” and that he’d be back next year!

Workshops Available During the 1993 MacAcademy Learning Extravaganza

**Application Training Workshops**

- **Microsoft Excel** ................................... 6.0 Hours
- **Microsoft Word** ................................... 6.0 Hours
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- **QuarkXPress** ...................................... 6.0 Hours
- **FileMaker Pro** ..................................... 6.0 Hours
- **Microsoft Works** .................................... 6.0 Hours
- **ClarisWorks** ....................................... 6.0 Hours
- **Claris HyperCard** ................................... 4.5 Hours
- **WordPerfect** ....................................... 4.5 Hours
- **Claris MacWrite II** ................................. 3.0 Hours
- **Photoshop** ......................................... 6.0 Hours
- **4th Dimension** ...................................... 6.0 Hours
- **Canvas** ............................................... 3.0 Hours
- **MacProject Pro** .................................... 3.0 Hours
- **MacDraw Pro** ....................................... 3.0 Hours
- **PowerPoint** ......................................... 1.5 Hours
- **Adobe Illustrator** ................................. 4.5 Hours
- **Aldus FreeHand** .................................... 4.5 Hours
- **Persuasion** ......................................... 3.0 Hours
- **Quicken** ............................................. 3.0 Hours

**Macintosh Workshops**

- **Macintosh Operation** ............................... 4.5 Hours
- **Using System 7** ..................................... 1.5 Hours
- **Small Macintosh Networks** .......................... 1.5 Hours
- **Macintosh LANs** ................................... 1.5 Hours
- **Mac & DOS** ......................................... 1.5 Hours
- **Mac Trouble Shooting** .............................. 1.5 Hours
- **Mac Add-Ons** ....................................... 3.0 Hours
- **Using Macintosh Fonts** ............................. 1.5 Hours

**Additional Workshops**

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- **Mac Business Ideas** ................................. 3.0 Hours
- **Design & Layout Ideas** ............................ 1.5 Hours

Workshops are 90 minutes in length. The number of workshops for each program varies.

For Registration Information

Call 800-527-1914

MacAcademy Learning Extravaganza
477 S. Nova Rd. Ormond Beach, FL 32174

Circle 106 on reader service card
What's Wrong with This Figure?

In the article "What's Wrong with This Picture?" (Letters, October 1992) you admit to having made an error, explain its cause, and yet commit a similar error again. The real and perceived difference in the bags is not 4 to 1, but exactly 8 to 1—you are not depicting a two-dimensional object, but a three-dimensional one; therefore, doubling the size of each axis results in an eightfold increase in volume. The three-dimensional character is even enhanced by the shadows in the graphic. Thus, your graphic is about 41 percent off, nicer than a bar chart.

Robert Seiter
via CompuServe

The text and caption are talking about area—since the illustrated bag is 2-D—so the 4 to 1 ratio is correct. But although the image is 2-D, the bag is meant to represent a 3-D space, and the difference in volume would indeed be 8 to 1.—Ed.

Charles Seiter's article has taken almost all of its examples from the book The Visual Display of Quantitative Information, by Edward R. Tufte (Graphics Press, 13th printing, 1992, $40) without any credit or acknowledgment. The section talking about distortion from special effects is covered more thoroughly in chapter 2 of Tufte's book. The use of facial expressions is on page 142. The scattered scatterplots showing how two data sets can have the same statistics but show different interpolations when viewed on a scatterplot is on page 14. The caption for the graphical representation of Napoleon's march is the only place Tufte is mentioned.

Even though these examples are not Tufte's original work, but used as examples in his book, the use in Seiter's article is still improper without any reference to Tufte. While any of the examples can be excused as independent discovery, using the same arguments, using several of the same examples, and following the general outline of another person's work is plagiarism.

Michael Zelen
Sacramento, California

Thanks for the tip—MacIndex includes short abstracts of reviews and articles as well. Readers who did not see the October issue may also want to know that Macworld indexes (covering the previous year) ran in the January 1985, 1986, 1987, 1988, and 1990 issues, and in the February 1989 and 1992 issues. In 1991 the index did not run in the magazine, but an index covering 1990 is available: send a self-addressed, legal-size envelope with 75 cents postage to 1990 Index, Macworld, 501 Second St., San Francisco, CA 94107.—Ed.

An Index Is Found

Regarding the letter "Looking for an Index" (Letters, October 1992), I would like to mention MacIndex, formerly MacInfo, a Macintosh publication index, available by subscription. For $120 a year for a new subscription, you get a monthly index that includes all articles appearing in Macworld, MacUser, and MacWeek from February 1989 to the most recent month. The indexes are used with the software EndNote or EndNote Plus from Niles & Associates or can be exported to almost any database. You can combine the indexes as you get them, and search the index database by a variety of criteria or keywords. You can get MacIndex and EndNote by contacting Graphic Technology Research by phone at 616/473-5000 or by fax at 616/473-5002.

Michael Zelen
Sacramento, California

Reading your bleak assessment of the state of educational technology, and wanted to let you know there is one piece of good news. You state in Commentary that "The call for an Office of Educational Research and Improvement (OERI) within the Department of Education, for example, is tragically like the never-implemented National Institute of Instructional Technology (NIIT) proposed by Congress in 1979." Although your syntax leaves me uncertain, you apparently believe that OERI is a proposal that never got off the ground. Rest assured: there is an OERI. We are trying to assert leadership in educational technology. It is not easy. But we do exist.

Diane Ravitch
Assistant Secretary and Counselor to the Secretary
Office of the Assistant Secretary for Educational Research and Improvement
Department of Education
Washington, District of Columbia

Letters should be sent to Letters, Macworld, 501 Second St., San Francisco, CA 94107, or electronically to CompuServe (70370,7021), MCI Mail (294-8807), America Online (Macworld), or AppleLink (Macworld1). Include return address and daytime phone number. Due to the high volume of mail received, we can't respond personally to each letter. We reserve the right to edit all letters. All published letters become the property of Macworld.
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John Fleishman  
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The SuperSource for Video

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Art Beat

BY CATHY ABES

Behind Macworld's Graphics

BY CATHY ABES

Artist: Erik Adigard, with his partner, Patricia McShane, co-owns M.A.D., a graphics-and-design studio in San Francisco. This past July, some of M.A.D.'s work was featured at the Add Noise computer graphics show organized by Canon and Adobe in San Francisco.

Hardware: Mac IIfx with 32MB of RAM and a 425MB internal hard drive; Microtek MSP 300 ZS scanner; SyQuest 45MB removable-cartridge hard drive.

Software: Adobe Photoshop 2.01; Adobe Illustrator 3.2.

How It Was Done:
To illustrate our comparative review of 2-D CAD packages this month, Adigard began by scanning his hand holding an architectural drawing, at 150-dots-per-inch resolution. Because he found it so difficult to precisely position his hand on the scanner and to hold it completely still during the scanning process, he had to rescan about ten times before he was finally able to get an image that looked exactly the way he wanted it.

After opening the image in Adobe Photoshop 2.01, Adigard cropped the scan and touched it up, using the rubber-stamp tool to clone the architectural drawing so that he could extend it to the top-right edge of the image. In order to intensify the contrast, he increased the color saturation of the scanned image by 50 percent.

Next he used the Inverse command (from the Select menu) to invert the colors and create a ghostlike effect—changing the hand to blue, the background to white, and the drawing to yellow. Using Adjust Hue/Saturation (under the Image menu), he changed the colors again—making the hand orange (so it would become a light tan when pasted), and the background and the drawing blue.

To create a mirror image of the original scan, Adigard copied the image, flipped it horizontally using Photoshop's Flip command (under the Image menu), and pasted the copy directly on top of the original at 50 percent opacity to allow the double image of the hands to show through.

To darken the triangular area above the hands where the architectural drawing and the background overlap, he selected the area and used Adjust Color Balance (Image menu) to add more blue and red. To create a more textured effect, Adigard used the Noise filter on the triangular area, then copied the triangle with a 50-pixel feather, applied the Mosaic filter, and feathered the selection with the lasso at a 50-pixel radius. Finally, he pasted the copy on top of the original using the Lighten Only option (within the Paste Controls dialog box) to preserve the white lines in the drawing that would otherwise have been obliterated by the Mosaic filter.

After he'd finished the time-consuming operations—inverting and colorizing the images—Adigard resampled the illustration at a higher resolution (177 dpi), then did the flipping and retouching. The higher resolution was needed to give a

The illustration that opens our feature on 2-D CAD on page 171.

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The scanned image of Erik Adigard’s hand holding an architectural drawing.

The same image after it had been inverted to create a ghostly, negative effect.

After the image was copied, flipped, and pasted over the original to create a mirror image.

Adigard used the Noise and Mosaic filters and the feather to add special effects to a copy of the overlapping triangular area, which he then pasted over the original.

The image after the engraving and the architectural symbols were added but before the hands were pasted to create a positive effect.

The yellow architectural symbols and the registration symbol were also created in Illustrator and then imported into Photoshop. First, he placed them in the illustration at 20 percent opacity. Then, using the lasso tool with a feather edge of 20 pixels to deselect various areas of the symbols, he pasted them at 70 percent opacity. The object at the top of the drawing is an architectural symbol from Adobe’s Dingbat font that Adigard distorted using the Stretch command (from the Effects submenu under the Image menu).

To make the hands positive (rather than negative) he selected the hand scan (after clipping out the architectural drawing), recolored the scan, and touched it up. After selecting the background using the magic wand with a 15-pixel feather, Adigard then deleted the background, which created a glowing effect around the hands.

After selecting the original scanned hand again, Adigard pasted it behind the graphic symbols at 40 percent opacity, then flipped it and pasted it again over the other hand. Then he deselected the top of each hand using the lasso with a 40-pixel feather to fade the selection and integrate it into the rest of the illustration.

Apart from the preliminary work involved, Adigard spent about 12 hours completing the final illustration. The final file size was 8.25MB.
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THE WAR ON SOFTWARE PIRACY began in 1975, when members of the Homebrew Computer Club (a hobbyist organization whose membership included the founders of Apple Computer) began trafficking in unauthorized paper-tape copies of a not-yet-released program called Altair BASIC. The 19-year-old recent Harvard dropout who wrote the program penned an indignant letter to the hobbyists, calling them thieves. The hobbyists howled with outrage, claiming that their efforts were justified because (1) the program hadn't shipped when promised, (2) it would cost too much when it shipped, and (3) it was something they needed right away. They would later insist that, far from hurting Altair BASIC, their liberal copying helped make it an industry standard, thus sending the steamed epistolier on the road to moguldom. His name was Bill Gates.

That was almost 20 years ago, and now it has come to this: as seen on a video distributed by the Software Publishers Association (SPA), the industry's trade group and lobbying arm, two high-school students are about to copy a game onto a floppy disk when out from the screen pops a generic, if somewhat sanitized, rap singer who hip-hops a tune called "Don't Copy That Floppy," loaded with scratchy couplets informing the students that by their actions, they might put a program on the breadline.

"That's right, rap music. "Yo! You can shoot a cop, but don't cop that floppy! Chicka-chicka, scratch! Chicka-chicka, scratch! (OK, maybe I altered the lyrics just a little.)"

As the video shows, piracy is still a hot issue. But I believe that the ground has significantly shifted in this skirmish. Still, to grasp the full impact of the piracy issue requires reading the exposition of a wise, lucid singer who hip-hops a tune called "Don't Copy That Floppy," loaded with scratchy couplets informing the students that by their actions, they might put a program on the breadline.

The very proliferation of computers in corporations works in favor of the antipiracy forces. More and more, the management of computers in large and medium-size companies is entrusted to information professionals. These people know the rules—it's part of their job to get users to work with only legal copies of software. And it's their head that gets chopped if the company gets caught.

And that's the biggest development—people are getting caught. In an effort led by large companies like Lotus and Microsoft, and a concurrent initiative spearheaded by the SPA, investigators are actively seeking out companies that routinely use illegal copies of software in the course of doing business. A big source of tips on violators is the toll-free big-brother line run by the SPA. Nothing subtle about it—the SPA urges guilt-ridden employees (or disgruntled former employees) of companies using illegal software to turn in their bosses. Once hard evidence is obtained, the SPA or the company whose software is being pirated can either pursue the violator in civil court or enlist the government's aid and actually conduct a military-style raid on the company. "We know you're in there! Come out with your hands up and your spreadsheets open!" The penalties, almost always limited to fines and monetary judgments to date, far exceed what it would have cost to buy the software.

As a result, according to Microsoft corporate attorney Kevin Harrang, "a lot of our [antipiracy] efforts are going toward the big corporate user." Embarrassing raids, along with hefty fines, are getting across the message that it's up to the boss to make sure that any software in the building is paid for. While it still may be acceptable for suits to swipe paper clips, only malcontents and pariahs swap pirated software inside big companies anymore. To quote the title of an instructional video (this one without the rapper) distributed by the SPA, "It's just not worth the risk."

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<td>$1349</td>
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<td>516 MB HitchHiker Portable HD (40 MB)</td>
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<td>1090 DiamondDrive 1000</td>
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<td><strong>MDS Drives ... 30 day MBG</strong></td>
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<td>American Power</td>
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<td>StyleWriter Ink Cartridge</td>
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<td>LaserWriter II Toner Cartridge</td>
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<td>Avery ... 60 day MBG</td>
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<td>Avery 5190 (3&quot; Disc Label/Laser)</td>
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<td>Curtis Manufacturing ... 30 day MBG</td>
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Circle 182 on reader service card
in the corporate world, "I think we're doing all right," says Susan Wood, Claris's channel manager for corporate and educational sales. To hear someone who works for a software company actually sounding half-sanguine on the matter is an abrupt shift from the usual moaning and groaning. The tide has turned.

Poetic License
SECURE IN THEIR ULTIMATE VICTORY, the publishers are now offering concessions. There has been a lot of controversy over the license agreement, that dense shrink-wrapped gibberish that explains that you don't really own the software you just paid $695 for, and, by the way, the company doesn't promise that it will work at all. "It's not clear whether or not the shrink-wrap agreement is an enforceable contract," explains Jack Russo, a specialist in computer law, who notes that software licenses have never been definitively tested in court. But as far as restrictions on illegal copying go, the law itself is as tough as anything in a license agreement. To be specific, according to the Copyright Act—Section 117 of Title 17 of U.S. Code—legal purchasers of software are allowed to make only a single copy, and that for "archival" purposes only. This is an onerous restriction. It means that if you own a desktop machine and a laptop, and want to use your word processor on both, legally you must buy two copies.

But even the software developers realize that this goes too far. Corporate information professionals have already been successful in forcing the software industry to remove copy protection from its business products, and the next step is a revision of the software license—in the user's favor. "We now give you grants you don't have under copyright law," says Microsoft's Kevin Harrang. Chief among them is the right for one owner to use an application on two different computers. For instance, you can now have a copy of Word on both your office computer and your home machine, or your laptop.

The idea is to bring the license agreement more in line with common sense—if you don't force reasonable people into being criminals, then they will be less likely to commit the more serious violation of copying software for their colleagues. Now that Microsoft and Claris are including such provisions in their licenses, other companies have to follow suit. And why not? It's not like people have to buy separate music tapes to play on their home sound system and Walkman player.

Software developers are also showing flexibility on licensing multiple copies of software for network use. In addition, almost any developer will grant deep discounts for those seeking site licenses. There's a general recognition that the law is too restrictive, and that it's in everyone's interest to make fair deals. The ability to copy software is now accurately viewed by developers as a feature, not an inherent flaw, and software developers are becoming smart enough to see that they can get a competitive edge by granting users the ability to make legal copies.

Kid Stuff
THE LAST BATTLE IS FOR THE HEARTS and minds of the youth of America. The one area where the piracy wars still rage is entertainment software. The SPA graciously admits that "we can't go into people's homes," so the threat of getting caught is remote. Kids copy like crazy.

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Also available at your favorite retailer.
some pirates (those with a bit of initiative will reproduce the decoding materials), it also makes every legal copy of the software less valuable—those who actually pay for the game have to go through a tedious process every time they play. “It’s not a happy answer,” admits Broderbund spokesperson Jessica Switzer.

Some game publishers use no protection. “I don’t believe in making my customers pay because other people are thieves,” says Darryl Peck of Inline Design. “We’re getting killed [by pirates], but I don’t think we’re getting killed more than anyone else.”

But the SPA is pinning its hopes on education. It offers its now-notorious rap video free to schools, along with lesson plans for teachers and little buttons that say “Don’t Copy That Floppy.” The idea is to get young minds to view software companies as warm and fuzzy enterprises whose very existence is threatened when you make an extra copy of Might and Magic for a friend.

It is true that propaganda can be powerful. But I have spoken to enough 14-year-olds on the matter to understand that this is a case where the combination of self-interest and the lack of retribution overwhelms any budding sense of ethics. It is going to take more than the squeaky-clean rapper of the “Don’t Copy” video to stop kids from software piracy—more like the equivalent of Ice-T with a shotgun.

Might Makes Right

The results from the war on piracy so far indicate that, like all wars, the winner is the one who best applies force. In the corporate market, the legal and political muscle of the SPA and its members has made a difference. As a result, the industry has been able to force the government to devote valuable law-enforcement efforts to the protection of the bottom line of those who sell software. On the other side, the focused power of corporate buyers has forced the software companies to remove copy protection and offer some slack on the license agreements. None of these factors apply in the entertainment market, so things are still in a mess. But that, too, is only temporary, because eventually, new technology will reduce the problem.

“In the long term, we’re looking at technology, and hardware-based solutions,” says Kirk Loevner, vice president of Apple’s developer group. You’ll see more software delivered on uncopyable CD ROMs, or even, as Loevner envisions, hardware keys inside computers that allow only legally purchased copies of software to be run.

Even these new technologies are not going to be enough to solve the problem. If whizbang antipiracy schemes reduce the usefulness of the software itself (as copy protection does), buyers will not accept them.

The free-flowing nature of software itself dictates that any resolution of the software piracy problem is destined to be a compromise between freedom and enforcement. Amazingly, almost everyone involved—with the possible exception of 14-year-olds—seems to realize this. And once those little code-snatchers grow up and get lawyers, they’ll realize it, too.

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A Roll Call of Saints and Sinners

BY DEBORAH BRANSCUM

HERE DID THE YEAR go? Once again, it's time to review the Macintosh scene and take a look at industry saints and sinners as 1992 slouches toward its end. Despite a bad economy, Apple's fortunes were up this year; IBM's were down; and consumers everywhere faced mixed blessings in the areas of quality, service, and support. Listings are in alphabetical order; the halo icons indicate companies with angelic behavior, while the horns indicate a devilish bent.

Like most of us, Apple is both a saint and a sinner. On the saintly side, in 1992 Apple decided to include a year of toll-free tech support for those who buy or upgrade to System 7.1, as well as for Performa buyers. Performa buyers also get one year of in-house service. If the company can't solve the problem over the phone lines within 24 hours, it sends someone out to your home to deal with it. The company's PowerBook repair program has an excellent track record, and Apple acted promptly to inform users of potential problems with exposed PowerBook batteries and with a small number of PowerBook 100s. The environment got a boost when earlier this year Apple completely eliminated the use of chlorofluorocarbons in all of its manufacturing operations, and established a laser-cartridge recycling program. Perhaps most important to Macintosh users, the company continued to cut prices and introduce exciting new models.

Apple's decision not to warn users before purchase about the occurrence of broken pixels in PowerBook 170 displays was stupid. But the true sin was refusing to let users return the computers—except under narrow circumstances—if they found the flaws unacceptable. Another sin: Apple changed its policy so that user groups and online services may no longer distribute system software free of charge or for a nominal fee. It may be a sound financial decision for Apple, but it costs consumers more and robs some user groups of the modest income that helps them stay afloat. It's not a mortal sin, per-

haps, but selling Performa computers without system software disks is a silly idea. If anything goes wrong, there are no disks to fall back on—and things do go wrong. More irritating was Apple's release of AppleShare 3, which was incompatible with CE Software's QuickMail. That meant the ubiquitous networking system for the Macintosh could not peacefully coexist on the same server with the most popular Macintosh electronic-mail system, causing problems for users of both. (Fortunately, AppleShare 3.1 solved that problem.) Security is a much more serious issue: on a server, AppleShare no longer requires a password before someone can access sensitive files via a network server. (It was a necessary trade-off so network servers could manage other functions as well, according to AppleShare engineer- managing. Chris Zuleeg. He points out that the password requirement of earlier versions of AppleShare could be avoided by starting the network server from a floppy disk. His advice: if you're really concerned about security, lock up the server.) Another Apple transgression this year was releasing System 7 Tune-Up Version 1.1, a crash-mister the company quickly recalled and replaced with 1.1.1.

Still, that was a passing problem. Those who travel to Japan and hope to use their PowerBooks and Apple fax modems while in the country may be in for a more lasting disappointment. Despite Apple dealers' advice to the contrary, the PowerBook fax modems are not designed for international use. One Apple customer, who travels to Japan frequently, simply could not get his fax modem to function. Apple's workaround is a visit to your dealer before and after each visit for a switch adjustment.

Baseline Publishing, Peachpit Press, and T/Maker Company are all saints for their money-back guarantees. Customers dissatisfied with their purchases have 30 days to return software and books from Baseline and Peachpit, respectively. T/Maker doubles that period by giving WriteNow upgrade owners a 60-day money-back guarantee.

The very first users of BeagleWorks 1.0 found themselves bedeviled by bugs. But Beagle Bros did the right thing by suspending sales, then shipping free upgrades to its customers. (The program was recently sold to WordPerfect, which will market it under another name.)

Bridgeit Inc. and Michael Ehman have sinned by refusing to honor Ehman Inc. product warranties. According to reports from two readers, Bridgeit has reneged on its promises to take care of their warranty repairs.

Envisio sinned this year by not recalling early, defective models of its Notebook Display Adapter. Macworld's reviewer was greeted by smoke from his PowerBook keyboard after the tiny Envisio circuit board was installed—unfortunately, he wasn't alone. Envisio re-paired any damaged PowerBooks for their owners at no cost, and the defect was eliminated in later models. But a problem of this magnitude called for a swift, public recall of the defective product. (Last fall the company discontinued the product, which had received less-than-glowing reviews.)

Grolier Electronic Publishing, WordPerfect, and other companies that offer toll-free technical support are surely Saints (hope- fully not tettered saints, as the costs of support go up).

Mail-order company MacSource appears to be a serious sinner. At press time, MacSource's main line is busy round the clock and the tech-support line goes unanswered. Several readers have called in concern because of overdue product orders. MacSource officials were unavailable for comment. If it turns out that the company is in trouble, customers who paid by money order or check stand to lose big time. Please remember—always use a credit card when buying by mail.

MACWORLD January 1993 75
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5182 KidDesk ...........$28.

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Just point and click to fax. If you can print a Mac document, then you can fax with COMstation Five. Plus you can keep working in any application while you send and receive faxes. And if you receive a crucial document by fax that needs editing, you don't have to re-key it. That's because optical character recognition (OCR) is a built-in feature.

PSI Integration
5340 COMstation Five ....$448.

SuperPaint 3.0
It combines painting, drawing, and image enhancement in one powerful, easy-to-use graphics program. With 24-bit color, textures, gradients, and full color TIFF and EPS graphics support, SuperPaint is ideal for anything from the simplest business illustrations to sophisticated full-color art. A six time winner of Macworld's "Readers Choice Award!"

Aldus
3545 SuperPaint 3.0..................$98.

The Norton Utilities & GreatWorks
With the Norton Utilities and GreatWorks, you can handle just about anything. It's the first such package with the advanced disk repair, data recovery, automatic backup, and other features of the utilities, and the word processing, database, spreadsheet, charting, outlining, painting, and drawing modules of GreatWorks – all rolled into one.

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5375 Norton Utilities & GreatWorks..........................$99.
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  DeltaGraph Professional brings you 40 different chart types, with 80 subtypes, and full slide show capabilities in a comprehensive yet easy-to-use program. It handles standard pie, bar, and line charts, and ternary, spider, and bubble charts. It also features preformatted chart and clip art libraries, and extensive data importing capabilities.
  
  Free TI-68 Calculator with purchase.
  
  *Limited time offer.

- **Bernoulli MacTransportable 90 PRO**
  Get all the storage reliability you'd expect from Bernoulli for 40 percent less! The new MacTransportable doesn't require an interface kit. Everything you need right to get up and running is in the box including a 90MB cartridge.

- **VideoFusion**
  Now the same special effects you've seen in television and film presentations can be created on your Macintosh. VideoFusion lets you add magic to your QuickTime movies, video productions, and presentations. Using standard Mac terminology like "cut," "copy," and "paste," you can apply the latest special effects from VideoFusion's library or create your own.

- **TimesTwo**
  TimesTwo actually makes your hard disk bigger rather than making your files smaller! A one-time installation converts your hard disk to twice its original size in minutes, leaving your data unchanged. It's completely compatible with all Mac software and works with all SCSI and erasable optical disks.

- **DesignCAD 2D/3D**
  Create stunning 2D and 3D designs in a fraction of the time of other programs. In just a few hours you can easily create full-color, gray scale, or black-and-white designs. Use your designs for engineering, animation, desktop publishing, multimedia, and more. If you can conceive of an idea, DesignCAD gives you the power to create it.

- **Sketcher**
  Create realistic natural-media effects on your Mac with Sketcher, the affordable yet revolutionary program for creating grayscale graphics and retouching images. Sketcher duplicates the effects of traditional tools and textures. Use dozens of brushes, pens, chalks, and even paper grains and image processing tools to apply your artist's touch to the desktop.

- **Painter 1.2/ArtZ bundle**
  Simulate the tools and textures of natural media with Painter, the remarkable 24-bit color paint program. Create original art or apply natural media effects to other artwork, including scanned images. Used with the ArtZ 6" x 8" tablet, the effects are astonishing. The latest from the premiere tablet maker, ArtZ's stylus is cordless, batteryless, and detects 120 levels of pressure.
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After Hours
5002 TouchBASE/DateBook bundle ...............$98.

Stuffit SpaceSaver/Stuffit Deluxe 3.0
Stuffit SpaceSaver provides complete on-the-fly compression. Increases disk space (with lightning speed) without effort on your part. Stuffit Deluxe, the most efficient compression product available, solves all your compression needs, from archiving to transparent compression, and includes Stuffit SpaceSaver.

4971 Stuffit Deluxe ............................................$68.
4969 Stuffit SpaceSaver ......................................$38.

Disk Cafe
If you use drives from different manufacturers, you need to format them all with the same utility. Disk Cafe is a complete storage formatting utility that works with nearly every drive available. So it can prevent compatibility problems including data loss. And its advanced diagnostic tools detect and repair disk defects.

Bering
5121 Disk Cafe ..................................................$45.

DiskFit Direct
DiskFit Direct is a fast, easy, and affordable backup for your Macintosh. Launch it, click “BackUp,” and insert disks. DiskFit Direct creates an exact copy of your hard disk in Finder format on any removable disk, including floppy and SyQuests.

Dantz
5491 DiskFit Direct .............................................$32.

HayesConnect/SmartCom II
HayesConnect network serial device sharing software allows any serial device to be shared over a network from a server. SmartCom II Communications program features error-free transfers via Hayes Verification, XMODEM, MacTerminal XMODEM, VT 100/102, VT52, & TTY emulation. Plus many other features!

Hayes
4314 HayesConnect .............................................$74.
1628 SmartCom II 3.3 ...........................................$83.

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Maxa

- 5349 Snooper w/ Norton Bundle...........$118.
- 5350 SnooperKit w/ Norton Bundle........$148.

**Daymaker**
New version! Daymaker 2.0 is faster and filled with new features. A Recurring Events function schedules upcoming events with more flexibility. The “To Do” view organizes “to do” items. Reports can be previewed before printing and will be sharper with integrated DYNoPAGE.

- 5261 Daymaker 2.0 ......................$82.

**Lemmings**
Lemmings for the Mac has arrived! Now Mac owners can demonstrate their game playing smarts and test their sanity, saving mobs of imperiled green-haired rodents from certain doom. Lemmings for the Mac brings you 120 levels of original and intellectually challenging gameplay.

- 5459 Lemmings ..........................$35.

**Falcon MC**
Now you can experience the colorful, high-flying thrill of an F-16 fighter. More than 12 missions put you into instant action. Engage in a dogfight with a MiG 29, while dodging anti-aircraft missiles. Then knock out enemy resources – factories, power plants, tanks, truck convoys. In full color.

- 5382 Falcon MC ..........................$45.

**The Miracle**
This is the first keyboard that teaches you how to play it! It makes learning even the basics a pleasure. Includes a professional keyboard with 49 standard-sized velocity-sensitive keys, 128 digitized instruments and sounds, full MIDI compatibility, hundreds of songs and lessons, and full orchestral accompaniment.

**Spaceship Warlock/Creepy Castle**
Spaceship Warlock is 125 megabytes of graphics, animation, and original music. In a science fiction “interactive movie” adventure game, 1991 Game Hall of Fame “Best CD-ROM” award from Macworld. Creepy Castle is an arcade style action/adventure game featuring animated monsters, dual voice digitized sound effects, four challenging scenarios, and four levels of difficulty.

**Algebra I**
“The best algebra tutorial program I have seen.” (Macworld, 4-91) This program can generate problems or take problems from a student’s own text book. Students are checked on every step toward the solution and can request a series of increasingly more specific hints when they have trouble.

**Get hooked on Diamonds.**
“The most addictive game since Crystal Quest.” (Bob Levitus, MacLetter) Diamonds 2.0 is a challenging and entertaining game for all ages. Try to work your way through 30 levels of intense challenge and excitement. There’s even a built-in editor so you can create your own fun levels.

- 5162 Diamonds 2.0 (pictured) .................$26.
- 5461 Jewelbox .....................................$26.
Capitalist Pig

This thought-provoking business simulation lets you start and run a business in the privacy and safety of your own computer. Choose your company name, stock logo, product, and source of capital. Then set your business, financial, and marketing plans - the clock starts ticking and you're in business!

Pluma
4640 Capitalist Pig ..................$34.

PAX IMPERIA

Experience a universe of adventure and conquest. Rule an expanding empire while pursuing diplomatic relations with other emperors in neighboring star systems. Race for technological advancement and planetary discovery. Go where no Mac has gone before!

Changeling Software
4992 Pax Imperia ..................$34.

Aesopolis

Bring Aesop's fables to life with multimedia. This enchanting CD-ROM features a stunning virtual museum with thousands of splendid color canvases and high fidelity sounds. Double-clicking on one of the artworks reveals both screen-written and spoken versions of the fables.

Quantum Leap
4870 Aesopolis ..........................$49.

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Warlords is a fight to the finish where only one of eight empires will prevail! Starting from your home castle you ruthlessly expand your territory and eliminate all other players. Train sixteen different army types ranging from conventional infantry to dragons. Use your wits to out-think and out-fight cruel and wily opponents.

"Best Wargame of the Year" - Computer Gaming World Magazine.
Strategic Studies Group
3933 Warlords ..........................$38.

Strategic Conquest and Spaceward Ho!

Spaceward Ho! 2.0 challenges you to colonize the galaxy against up to 20 computer players or human opponents on a network. Build fleets, research technologies, and conquer new worlds. Strategic Conquest 3.0 is the latest version of the classic game of military strategy. Maneuver armies, planes, and boats to conquer every island and continent against the computer or a friend.

Delta Tao
4057 Spaceward Ho! ..................$37.
2891 Strategic Conquest .........$37.

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Hellcats is the most realistic flight simulator ever! In Missions At Leyte Gulf, you load your Hellcat with torpedoes, rockets, or bombs. Support a ground assault and neutralize enemy tanks and ground vehicles, or protect your fleet positions against sub attacks.

Graphic Simulations
4070 Hellcats Over the Pacific ...........$39.
4998 Missions at Leyte Gulf .......$22.

Alphabet Blocks

Now any child who can use a mouse can learn to read with Alphabet Blocks. In this fun introduction to alphabet sounds and names, two computer friends - a chimp and a jack-in-the-box - gently coach your child through the basic rules of reading. Kids have a great time with these infinitely patient tutors!

Sierra On-Line
5533 Alphabet Blocks ...........$31.

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New! This adventure on CD-ROM integrates spectacular live action, sound, and music! Your mission is to retrieve Dracula's coffin while fending off evil beings. Truly interact with the play environment and use your creativity, skill, and intelligence to overcome obstacles.

Sanctuary Woods
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The longer you own your Mac, the more your'll find yourself wanting more hard drive space. Our DataPlace Hard Drives, bundled with four free utilities, offer an elegant and reliable solution. These are the most reliable drives around, preformatted using the latest technology in formatting software. And they're fast too. The two removable drives feature mechanisms from SyQuest, and they come with one free SyQuest cartridge. All DP+ drives feature a sturdy case, two metal-clad SCSI connectors, an external fuse, and an easily accessible SCSI ID switch.

Each comes with manuals, cables, a two to five-year warranty, * and instant technical support from Mac's Place. And if your drive should need warranty repair, Mac's Place will give you a free loaner. All drives come with MacTools 2.0, DP Formatter Plus, StuffIt SpaceSaver, and Kaboom! SE.

Drives are pre-formatted with DP Formatter Plus so they're ready to use right out of the box.

MacTools 2.0 is all the utility you'll ever need. It performs scheduled backups and disk analysis, speeds data access by defragmenting files, detects and cleans known Mac viruses, and much more. SpaceSaver compresses your files and folders so you have double the disk space! It compresses files an average of 50% and some graphics files as much as 98%. SpaceSaver automatically decompresses files when you open them and compresses them again when you're done.

You'll find a myriad of sounds to make your Mac fun with Kaboom! SE. Each sound can be played when you start up your computer, insert disks, empty the trash, and more! Get great drives with great utilities and all the support you need from Mac's Place.

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Sierra On-Line 4737  ...$40.

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150 wild and wacky sounds.
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ChipSoft 5480  $49.

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With 365 hilarious cartoons.
Amazinc 5338  ...$49.

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Ergonomically designed.
MicroSpeed 5013  ...$47.

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Games, puzzles, and holiday cheer!
Nordic Software 4301  ...$31.

Flight Simulator 4.0
Test your skills on a fleet of aircraft at 125 airports.
Microsoft 3532  ...$42.

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Great stocking stuffer. Great value!
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Logicode
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**Service Hero**

Phil Block of North Hollywood, California, nominates Raquel Romano from Nisus Software for sainthood. Seems she was fast and friendly in responding to Block's technical questions. What a concept!

Microsoft, like Apple, is a company people love to hate. But the monolithic enterprise has several things going for it, apart from good products. One saintly move was to deviate from its standard, expensive policy and allow Word 5.0 users to upgrade to 5.1 for a mere $14.95 plus shipping. Technical support is getting saintlier these days too, according to a user-group source. He claims Microsoft's support has measurably improved over the year.

Those good deeds haven't eradicated the devilish streak at Microsoft, however. The Windows version of Word, for example, leapfrogged over the Mac version several upgrades ago. Macintosh users are still missing several features that Windows users enjoy, including revision tracking, macros, and document comparison.

Now Software trespassed against its users by releasing Now Utilities 4.0 before its time. Earlier versions won kudos; 4.0 was too buggy to bear.

MacBottom hard drive owners have surely been sinned against by PCPC, Personal Computer Peripheral Corporation. Reader Sandy Lavin wins the worst-luck award. She sent in her drive for a warranty repair in November 1991. Nearly one year later, Lavin says she hasn't received her drive back, nor has she ever heard anything from the company, despite phone calls and letters. Only a few readers have written this year about customer mis understandings or concerns.

Pinnacle's sin is the figures it uses in the advertising for its PMO-650 rewritable optical drive. According to the ad copy, the PMO-650 is "five times faster than Sony's SMO-E501 optical drive." Not so fast—Macworld tests showed Pinnacle's drive was the fastest. But it was only 27 percent faster than most of its competitors. A healthy margin, but not quite five times faster.

Owners of Sigma Design's Doubleup compression board were left in the lurch this year when Salient Software and Stak Technology, maker of the chip used by Sigma, were unable to negotiate a licensing agreement. Stak had previously shared its decompression algorithm with Salient Software, which added that code to DiskDoubler. The upshot was that users of both Doubleup and DiskDoubler could share compressed files with other DiskDoubler owners. But then Stak was awarded a patent on its code and wanted royalties from Salient, which found the demands excessive. Because the companies couldn't come to an agreement, DiskDoubler no longer works with the Doubleup board, and Doubleup board users can only share compressed files with other Doubleup board users.

Software Ventures bundled MicroPhone II 4.0 with an application to help users navigate ComputerServe and other online systems. Only problem is, the application doesn't work yet. MicroPhone Pro users are similarly tormented.

TigerSoftware made itself less than saintly by including capsule reviews at the beginning of the product advertisements in its catalog. It's a great sales tool, but inexperienced customers may not realize that the "Reviewer's Notebook" section is part of the advertisement, not an objective overview.

Visionary Software's saintly act is to print product manuals on recycled paper and create each program so that demo versions can be easily distributed to friends.

**A Blanket Thank-You**

MY APOLOGIES TO THOSE WHOSE GOOD POLICIES OR ACTIONS I'VE OVERLOOKED. AND A WARNING TO COMPANIES WHOSE DARK DEEDS HAVE GONE UNPUBLICIZED—I MAY CATCH UP WITH YOU NEXT YEAR!

In the meantime, I'd like to take this opportunity to award halos to all the mail-order companies, hardware vendors, and software publishers who have responded promptly to issues raised by our readers this year. Some companies ignore the complaints Macworld forwards to them, but many genuinely care about their customers and move swiftly to address customer misunderstandings or concerns. Please accept my blanket thank-you. And readers, send your nominations for both saints and sinners for next year.

**Research assistance by CAROLYN BICKFORD.**

Send nominees for sainthood to Service Heroes, Macworld, 501 Second St., San Francisco, CA 94107, or via AppleLink (Macworld1) or America Online (Branscum). Conversely, drop Conspicuous Consumer a line if a company is ignoring you.
TypeReader isn't just an extraordinary OCR product. It's an extraordinary OCR tool that helps managers, owners and professionals get their work done faster. With better results than they ever thought possible. These OCR users and many others became believers when presented with the opportunity to compare leading OCR software (including OmniPage Professional) to TypeReader software from ExperVision. Their words speak for themselves, so we won't burden you with a lot of sales hype. We'll simply tell you that by acting now, you'll pay only $149 for TypeReader with proof of ownership of another OCR software product. If you're not a current OCR software user, you'll get a $100 rebate when you purchase TypeReader.

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Envelopes, file folders, floppy disks, video cassettes, art boards, tape cassettes, luggage tags, bar codes, notebooks, name tags - these are just a few of the thousands of uses people have found for the LabelWriter® II label printers.

These tiny marvels connect to your Macintosh® with ease and use thermal printing technology to produce laser sharp labels in just 3.5 seconds.

There are two LabelWriter II models. The standard LabelWriter II prints on white, yellow or clear 1½" x 3½" labels. The LabelWriter II Plus also handles 2½" x 4", 3.5" disk, and video cassette labels.

Both come with a Desk Accessory that lets you create, format and print a label at any time, without interrupting your main programs. You can combine text with clip art and graphics. Or manage mailing lists, print postal bar codes, barcode 39, and serialized labels. There's even a chooser driver so you can print directly from your favorite programs.

The LabelWriter II printers are compatible with System 7, ATM® and TrueType®. An AppleTalk® interface is also available.

For more information please call 1-800-4-COSTAR, ext. 184. Outside the U.S. call 203-661-9700. Or fax 203-661-1540.

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Circle 196 on reader service card
### Updates

**JANUARY 1993**

**THIS SECTION LISTS THE LATEST VERSIONS OF SELECTED MAC APPLICATIONS THAT WERE SHIPPING BY THE TIME WE WENT TO PRESS.**

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**V.** = version #. **REO.** = min. RAM and system software required. **= last time (in the past year) this or an earlier version was reviewed. **S** = cost of update to registered owners. **NA** = first version, not applicable. **Blue** = new version. **Yellow** = reviewed product.

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<td>1.5MB/7.0</td>
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</tr>
</tbody>
</table>
| PANDORA | 2.0 | 1MB/8.0/0.7 | |}

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Circle 199 on reader service card

MACWORLD January 1993 93
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You can buy these three BEST SELLERS separately for $152.00 or you can get them all together in the Best Seller Bundle for just $99! Here's what you get: TouchBASE lets you store information about personal and business contacts, alternative phone numbers, plus customize the fields. Quickens enables you to revolutionize the way you balance your checkbook and plan your finances. It even prints checks and pays bills electronically. After Dark will guarantee you won't need to worry about screen burn-in again! And, for relaxation you'll receive a FREE copy of Tesserae—mind-calling, addictive logic game to remove stressful tiles from the board.

Publisher: After Hours Software

NEW! $99

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Connect any one of 10 Macs to a PC via modem or AppleTalk network to control virtually any DOS program. Run programs at full speed, access Windows graphics, extended and virtual memory, and PC peripherals. Copy and paste text or graphics between programs, print DOS files on your Mac printer. Transfer files, translate documents in either direction and mount DOS disks using included software. BridgeMac. Publisher: Argosy Software, Inc.

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RunPC/Network: COM0098

$279

PowerMerge

File synchronization for the Mac. If you use more than one Mac, PowerMerge gives you a simple and automatic way to keep track of the latest version of your files. PowerMerge will synchronize files between a PowerBook and a desktop Mac, two desktop Macs, a Mac and a non-Apple computer, or any two Macs via network or removable media. An unlimited number of files, folders, and disks can be selected and automatically maintained. Advanced features include: Conflict Notification if files have changed on both Macs since updating, a History Log that reviews which files were updated, and include/exclude so the user can control the process.

Publisher: Leader Technologies

$85

UserLand Frontier

With UserLand Frontier, you don't have to choose between proxy fonts and the power to customize and customize your Macintosh. For the first time, you can use power and ease-of-use. Frontier features development tools you need to get your scripts running quickly, including a full script debugger and structured variable tables so you can work with us while your scripts are running. When you're done, you can link scripts into Frontier's database, or save them to the Finder's database.

Publisher: UserLand

$189

ScanMaker II and ScanMaker II XE*

The new ScanMaker II is great for scanning color or black-and-white images up to 240 dpi and scans color photographs or artwork in full 24-bit color or 256 shades of gray. The ScanMaker II is bundled with Adobe Photoshop LE. The ScanMaker II XE is great for scanning color or black-and-white images and is bundled with a full version of Adobe's Photoshop, the premier image processing software for the Macintosh.

Manufacturer: Microtek

$1239*

Stuffit Deluxe 3.0 or Stuffit SpaceSaver

*.Stuffit Deluxe 3.0 is the complete compression solution. Only Stuffit Deluxe 3.0 can offer all these capabilities from anywhere in your file system. Create transparent compressed archives that can be accessed in any program and can be edited, opened, and searched. Stuffit SpaceSaver is the latest most efficient compression product available. Our new 4th March intelligently offers the optimum file size that not only makes this the fastest you specify. ETU302 $69

*.SpaceSaver is unlike other compression programs. It increases disk space in two levels. Stuffit SpaceSaver has a very fast and efficient compression and decompression program. The result is a highly compressed file that can be decompressed in any program. SpaceSaver provides complete functionality such as file compression and uncompression, making it the perfect tool for any application. SpaceSaver is also one of the few programs that are easy to use and are free.
The Power User's Tool Kit 12.0 is packed with productivity enhancers and tools to customize your system to work the way you want. Compiled exclusively for MacWAREHOUSE customers by Steven Bobker, this valuable collection of twelve programs and fonts includes three programs especially designed for System 7 users.

Here's what awaits you—Type it4Me will expand them into a phrase or paragraph you've designated. Install Drag'in and you'll be able to see the contents of windows when you drag them, instead of just an outline. Use LineUp to make your open folder windows display in a hierarchical stack. Sharyk is a modern display type font, reminiscent of art deco stylings. With SpeedyFinder? and Finder Date Hack, System 7 users can customize their systems with more speed and display/command options galore. Even PowerBook users will find tools on The Power User's Tool Kit 12.0, including PB Sleeper, which makes the PowerBook play a sound when it "goes to sleep" or "wakes up."

The Power User's Tool Kit 12.0 is *FREE* when you order from MacWAREHOUSE. You pay only $1.50 for shipping and handling. If you would like the disk, please ask for Item #AAA0030.

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**Power User's Tool Kit 12.0**

- **CPU Connectix PowerBook Utilities**
  - NEW!
  - Put more power into your PowerBook!
  - Get even more from your PowerBook with Connectix PowerBook Utilities (CPU), the first software utility created exclusively for your PowerBook. CPU extends your battery life. That keeps your PowerBook up and working longer. CPU protects your sensitive data: whether your PowerBook is running, shut down or asleep. Custom menu bar displays show accurate battery level, remaining battery life, date and time. CPU gives you much more: instant sleep and wake, LCD screen saver, keyboard shortcuts, cursor finder, mouseless menu control and over a dozen other enhancements that make your PowerBook more effective. Get the power of CPU and put more power into your PowerBook today. Publisher: Connectix UT10297

- **WindowWatch**
  - Track the hours you spend on a project with WindowWatch. It's a must for professionals who bill their services by the hour (or minute). WindowWatch runs in the background, automatically generating a timesheet as you work. Use WindowWatch to collect and merge timesheets from team members over the network or export timesheet information to a spreadsheet. Don't miss any opportunities to accurately bill your clients. After all, time is money.
  - Publisher: ASD Software UT10264

- **Virex 4.0**
  - VirEx is the ultimate solution to Macintosh computer viruses. VirEx application detects and repairs files infected by all known Macintosh viruses. VirEx INT continuously monitors the computer to prevent infection and performs repairs instantly. VirEx 4.0 provides comprehensive network features. An administrator can request a network-wide virus scan and schedule periodic scans to ensure that the network remains virus free. The administrator can also outline VirEx versions and automatically update them. VirEx is updated frequently and all registered users receive one free update.
  - Publisher: Microcom Inc.
  - Available in 10 Pack UT10150 $499, Single UT10093

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**DiskFit Pro**

Get Finder-readable backup to floppy, cartridge or other hard drives, get DiskFit Pro. DiskFit Pro copies files from your hard disk and creates a "Smartclk". With each subsequent backup, the "Smartclk" is updated and obsolete files are replaced, so backups are fast and backup sets stay compact. Files are stored in Finder format so a click and drag is all it take to restore data. A backup reminder helps to form the habit and a calendar allows the scheduling of automatic, unattended backups to a hard drive or a folder on the server. System 6 compatible. System 7 ready.

Publisher: Deltapoint Development

**FileGuard**

"It's about as much software-based security as you can get in one package." - Macuser, March 1992

Protect your hard drive from unauthorized access (including security bypass with a system dumper), copying and creation, applications and process (including System folders) from unauthorized access, deletion, unauthorized copying. Protect your desktop from unauthorized access. Deep in the System folder is FileGuard's User Log which continuously tracks user/group activity. System 7.6 Compatible.

Publisher: ASD Software

**InTouch 2.0**

InTouch 1.1 was rated "the best name and address file for the Mac" in MacUser Magazine, 9/1 (85 user rating). New InTouch 2.0 is even better Version 2.0 is an integrated reminder program, setting alert, phone books, fax cover sheets and much more. InTouch stores unlimited names, addresses, phone numbers and notes. Easy reminder program will notify you about that important meeting or phone call later. You can even add the contact's phone number and call it automatically. Set e-mail reminders that your contact can receive at home. The reminder program also includes a calendar, appointment reminder, and event scheduler.

Publisher: Advanced Software

Also available: Docunet3 for DTYP061 $99 and InTouch 2.0 Network Pack (UT0607 $139).

**PowerPoint 3.0**

PowerPoint 3.0 is a powerful, user-friendly presentation program that can be used by anyone from the office to home. It allows you to create professional-looking presentations with ease. It includes a wide range of features, such as automatic formatting, easy-to-use toolbar, and templates for creating presentations. It also includes a built-in database and graph, which can be used to create professional-looking presentations. It is compatible with System 7.5 and later versions.

Publisher: Microsoft

**Fractal Design Painter®**, **Fractal Design Sketcher**

Fractal Design Painter® is a powerful paint program that allows you to create realistic paintings. It includes a wide range of features, such as realistic brushes, customizable palettes, and a powerful color management system. It also includes a wide range of tools, such as layers, channels, and masks, which allow you to create complex paintings. It is compatible with System 7.5 and later versions.

Publisher: Fractal Design Corp.

**Super 7 Utilities**

Super 7 Utilities includes 7 powerful utilities that help you to get more out of your Macintosh. They include a disk backup utility, a disk utility, a file management utility, a system utility, a network utility, a security utility, and a backup utility. They are all designed to work together to help you manage your Macintosh.

Publisher: Aztec

**Virtus WalkThrough 1.11**

The latest version of this award winning 3-D drawing program provides everything you need to quickly capture and explore your ideas in 3-D. Virtus Walkthrough includes multiple windows and extensive drawing tools to provide an interactive environment for editing and viewing your ideas. Interactive 3-D presentations, QuickTime® and PICT animated movies and perspective pictures make your audience's. Enhanced printing of 3-D Dots, PICT/Care/ACID and MacDraw, and export of VORTEX, 3-D MAX, QuickDraw, MacDraw, PIC and EPS formats. Winner of MacUser Breakthrough Product of the Year Award 1990.

Publisher: Virtus Corporation
ACCUZIP 6.0

ACCUZIP 6.0 reduces your mailing costs in every possible way. It corrects, parses, and standardizes every address in your database. Then, it adds Carrier Route Zip+4 and a Postnet Barcode. It uses the database on the included CD-ROM to check addresses for accuracy, so mail intended for NJ won't end up in NY. ACCUZIP also performs presents for First, Second, and Third Class Mail, produces all the applicable postal forms, and even prints each label.

Publisher: Software Publishers

$639

MacPrint 1.3

MacPrint 1.3 is a MacIntosh application which includes artificial intelligence to check your邮政 program for problems. With MacPrint 1.3 you can clean up your configuration and improve your MacIntosh efficiency. MacPrint 1.3 is a MacIntosh application which includes artificial intelligence to check your邮政 program for problems. With MacPrint 1.3 you can clean up your configuration and improve your MacIntosh efficiency. MacPrint 1.3 is a MacIntosh application which includes artificial intelligence to check your邮政 program for problems. With MacPrint 1.3 you can clean up your configuration and improve your MacIntosh efficiency.

Publisher: Insight Development

$95

Help! 1.03

Help! 1.03 is the only MacIntosh application which includes artificial intelligence to check your DCC program for problems. Help! 1.03 will clean up your configuration and improve your MacIntosh efficiency. Help! 1.03 analyzes your MacIntosh and creates an easily understood report that describes all problems and tells exactly how to solve them. Help! 1.03 detects conflicts, incompatibilities, improperly installed files, environmental problems, damaged files, and duplicate files. Includes a simulation feature which allows you to check in advance for problems.

Publisher: Teknosys

$89

PacerTerm

PacerTerm was designed with the user in mind. It has multiple TTY/VT100 or VT220 emulation modes, connecting uses your choice of serial links, transmits data to and from any number of applications, including EFT, and TCP/IP. Once connected, PacerTerm lets you type data as fast as your modem will handle, friendly from your host to your data applications. Apple talk is "Macintosh networking at its best!" PacerTerm is a powerful HyperTalk script with a full function script editor, plus programmable buttons, lets you build a database, friendly from your host to your data applications. Apple talk is "Macintosh networking at its best!"

Publisher: Pacer Software

$159

COPYright

COPYright is a transparent utility that completely replaces the Finder's copy function, enabling users to copy files and folders into any application. COPYright also performs all Finder functions (launch applications, delete files, etc.). It also means copy protection of a different kind by keeping a log of all copies and from a Macintosh and is the first file copying utility that helps you track all copying traffic.

Publisher: GS Technologies

$35

DayStar Universal PowerCache

DayStar Universal PowerCache is work up to three times faster with the best combination of blazing speed and low cost. Its universal P3 design supports 14 ideas and leaves native slot empty. It's guaranteed 100% compatible running at full speed and doesn't require additional memory. Rated as the best accelerator by leading industry editors, the PowerCache is always upgradeable to any future DayStar products. Choose the board you need to get the speed you want.

Manufacturer: DayStar Digital

$939

TouchBASE/DateBook Bundle with Redux FREE!

TouchBASE is a schedule organizer and comes with the TouchBASE/DateBook Bundle. TouchBASE lets you store information about personal and business contacts, alternate phone numbers, and customize the fields. Also allows you to print envelopes and mailing labels, including postal barcodes, and fax sheets covers. Datebook is the ultimate personal time manager for MacIntosh. Instant access and advanced scheduling keeps you on top of important dates and things to do. TouchBASE comes in multiple formats including text, chart, and time-based schedule views. Easy to use and easy to learn schedule quickly. TouchBASE/DateBook bundle comes with free Redux, quick and easy backup utility.

Publisher: After Hours Software

$99
Due to federal tariffs imposed on SIMMs, prices may vary significantly. Please call for the latest prices and availability.

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

MORE BRAIN POWER FOR YOUR MAC

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 a letter open while you refer to last month’s sales figures.

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Adding memory doesn’t require technicians in lab coats. You’ll find installation at home easy when you follow our FREE step-by-step installation video instructions. Just open your Mac, slide out the main circuit board and plug in your SIMMs.

WHAT DO I NEED?

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 @ $49 ea.)

The chart explains exactly what you need to achieve the desired level of performance.

To open your Mac Plus, SE, and Classic you’ll need a specially designed tool — it’s available from us as part of a handy tool kit for just $9.

WHAT YOU NEED TO KNOW

Memory chips come factory-installed on plug-in cards, called SIMMs (Single Inline Memory Modules). Each one megabyte SIMMs card holds eight top-quality, 4-M chip.

SPEED

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

OVERNIGHT DELIVERY

Install a MacWarehouse Expansion Kit and working with your Mac will never be the same! Call us now. We’ll help you select just the right Memory Upgrade, and we’ll ship it overnight for just $3.

CHP 0012 120ns SIMMs $49

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MACWAREHOUSE 30-DAY MONEY BACK GUARANTEE

If, for any reason, you are dissatisfied with your Power User Memory Kit, you may return it to us 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 original condition, with the original packaging and documentation. TWO YEAR WARRANTY.

MacWarehouse also guarantees its Memory Kits against manufacturer defects for two years from the date of purchase. We will repair the item or replace it at our discretion.
Beam aboard the U.S.S. Enterprise™ with Captain Kirk, Mr. Spock and all your favorite Star Trek characters on a mission to prevent screen damaging phosphor burn-in. You'll encounter troublesome Tribbles, visit Dr. McCoy's sickbay, and battle a Romulan bird of prey in this incredible new screen saver inspired by the original Star Trek TV series. And, it runs all your favorite After Dark displays.

Now your monitor will "Live Long and Prosper™" with Star Trek: The Screen Saver.

Stand Alone Product.
After Dark software not required.

- Prevents phosphor burn-in
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- SystemIQ™ activity monitor
- Runs on color and B/W monitors

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How Butterflies Transform

An ordinary caterpillar is miraculously changed into a vibrantly colored, graceful butterfly. It's one of nature's most awe-inspiring events.

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The Tinies have decided to take a trip to Earth. Unless you stop them, they will turn our planet upside down.

You have been chosen by the King of Tinies to find these boisterous critters, and put them back in their color-coded sleepers. The little beasts will heelee you every step of the way. By the time you realize that you are descending into madness, it may be... too late...

To have your product considered for this section, send a press release to Updates, Macworld, 501 Second St., San Francisco, CA 94107, or send a fax to 415/442-0766.
MicroNet's Rewritable Optical Systems Offer More Speed, Size, and Performance Options For Removable Data Storage.

Today's complex projects require forward-thinking storage solutions. That's why MicroNet has added a new 3.5" rewritable optical system to our Macintosh, PC, and workstation product lines. It's fast, reliable, and cost-effective. Store 128 MB on a shirt-pocket-size disk at a lower media cost than any other system. Access data in just 38 ms. And secure valuable files now, and far into the future with optical cartridges impervious to contamination and head crashes.

MicroNet also offers 5.25" optical storage options. Our 586 MB system is perfect for transporting or archiving large CAD, pre-press, or graphic files from work site to work site. And like our 3.5" system, it's ISO compatible, so media can be recognized in any ISO standard drive.

MicroNet's rewritable optical systems for the PC operating under NetWare, ship with our specialized driver for optimum performance. And systems on a PC network, when combined with Cheyenne's ARCserve or ARCserve/Solo, make archiving and retrieving Macintosh, OS/2, and DOS files fast and easy.

MicroNet's 3.5" and 5.25" drives are available in internal and external configurations for most computer systems. They ship ready to install with software, connectors, cables, and brackets as needed.

Find out why MicroNet's systems are the preferred choice in rewritable optical storage. Call the MicroNet Sales Department today for the name of a Reseller near you. 1-714-837-6033.

Quality You Can Count On.
The abacus first appeared around 500 or 600 B.C. Some say it was invented by the Egyptians. Others think it was the ancient Chinese. But whoever it was, they had the right idea: create a simple, easy-to-use device for working with numbers, and people will be a lot more productive.

Introducing 1-2-3 for Macintosh Release 1.1: the easiest-to-use Mac® spreadsheet.

Like the abacus, 1-2-3 for Macintosh was inspired by simplicity, and Release 1.1 is even simpler to use. Now you can drag-and-drop data between worksheets. And with new SmartSum, you can simultaneously sum multiple ranges. Plus, Copy Down, Copy Right and Copy Back enable you to copy labels or formulas across columns, rows or 3D worksheets.

Of course, 1-2-3 is still the only spreadsheet that gives you In-Cell™ editing, so you can enter a formula directly into a cell for faster, easier editing.

The easiest graphing of any Mac spreadsheet

1-2-3's remarkable graphing and charting capabilities make it the best Macintosh spreadsheet for presenting data. Because unlike Microsoft Excel, 1-2-3 lets you store your graphs and charts in the same file as your worksheets. So you can manipulate data, text and graphics all in the same file with one set of menus and only one set of tools. And you can make one-click graph type changes, pull objects across window boundaries to the
True 3D makes organizing and analyzing data fast and easy.

Only with the true 3D capabilities of 1-2-3 can you easily consolidate multiple spreadsheets into one file without having to link the files. 3D allows all spreadsheet functions to be performed through multiple worksheets just as they are performed down rows and across columns.

The easiest transition from DOS to Mac.

For DOS spreadsheet users moving to Macintosh, 1-2-3 is the only way to go. 1-2-3's traditional Classic Menu makes it easier for you to access familiar 1-2-3 commands and to run macros already written for 1-2-3. And only 1-2-3 offers cross-platform capabilities, so you can work more efficiently and productively with the 18 million other 1-2-3 users across all major platforms.

1-2-3 for Macintosh. All in all, it's the easiest way to work with numbers to come along in centuries. To find out for yourself, buy a copy from your Lotus Authorized Reseller, and try it for 60 days with a full money-back guarantee direct from Lotus. Or call 1-800-TRADEUP, ext. 7244 for a free working model. (Excel users be sure to ask about our special upgrade price.)

Lotus 1-2-3 for Macintosh
LAUNCH A MAC ATTACK!

One click—that’s it. Whether you’re a novice or a power user, OnCue II gives you more control over your desktop. Directly find, retrieve (up to the last 100 files used), move, copy, delete, and rename files or folders—without using the Finder. Quickly locate a file by name, format, creator, date created or modified, and file size. Instantly launch any file, application, or groups of files with one click. Launch any file from the keyboard. Even launch files that have missing applications by assigning another application of your choice. Launch your Mac Attack with On Cue II by calling ICOM Simulations, Inc. at 1-800-877-4266.

OnCue II

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AND DANCE WITH THE PIGS

Or swim with the fish, shoot some fireworks, even set up your own ant farm. With 55 amazing dazzle-my-eyes screen savers—including three playable game screens. Intermission does double duty by preventing monitor burn-in and providing enhanced system security and advanced password protection. You even have the option of importing modules from other screen savers or creating your own. And now, Intermission comes with incredible tickle-my-ears sound! Available for both Macintosh or Windows. Start dancing with the pigs now!

Call ICOM Simulations, Inc. at 1-800-877-4266.

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CRT displays—those heavy, eye-fatiguing monitors that have been an integral part of every desktop computer system—may soon give way to a new breed: the LCD (liquid crystal display) panel. Panels have a lot going for them—they're visually pleasing, consume a fraction of the power a monitor requires, and occupy much less physical space. Light and reliable, they're perfect for the next wave of computers, miniaturized to sit on our laps and in our hands.

That's the good news. Now for the bad. The passive matrix technology used in the lower-cost PowerBooks (the 100, 140, 145, and 160) provides poor screen performance, while the active matrix displays found in the 170 and 180 offer much sharper visuals but carry a correspondingly steeper price tag. As a result, users have been forced to choose between low price and high performance. But during Macworld Lab's testing of LCD panels for "Crystal-Clear Presentations," we discovered that a newly developed technology called active addressing is combining the best of both methods to achieve the performance of active matrix at a fraction of its cost.

Contrasting Performance
LCD panels display information by combining polarizing filters with liquid crystal subjected to an electric field. Each pixel on the display is formed by a cell of liquid crystal material (in color displays, each pixel is composed of three sub-pixels—one each for red, green, and blue).

The degree of contrast—the range of grays between black and white—determines the sharpness of text and graphics on the screen. In other words, the greater the difference between the blackest black and the whitest white a screen can display, the more clearly we see detail. Greater contrast for graphics means levels of gray are more easily distinguished. Higher contrast for text means greater legibility, perceived as better focus; while low contrast means washed-out, and often blurry, text.

LCDs achieve high contrast by raising the average voltage passing through a pixel. When enough voltage is applied to the liquid crystal material, the pixel becomes black (opaque). Panels have a background voltage at which pixels are white (transparent). The response time—the time it takes for liquid crystal material to change color—determines the speed at which pixels disappear or appear when information on the screen is changed and also determines each pixel's contrast ratio. The higher the contrast ratio, the more legible the display. A contrast ratio that's acceptable to the human eye ranges from 6:1 to 8:1. On an LCD panel, a more typical ratio is 10:1, and very good LCD displays have ratios as high as 25:1 or above.

The Pitfalls of Passive Matrix
A PASSIVE MATRIX LCD USES A MATRIX of electrodes (flat wires) to send a 20V pulse through each row of pixels on the screen every 1/60 second (or 16.7 milliseconds), which means the LCD's frame rate—how often it refreshes the screen—is 1/60 second. A column driver applies a second, lower voltage to each column to turn the pixels on and off. The combination of row and column voltages determines whether a pixel is black or white or some shade in between. (For more details on this process, see the diagram "How Color LCDs Work," on page 159.)
Because voltage levels taper off between pulses, and the liquid crystal material's response time is considerably slower than the LCD's frame rate, the electrodes may need to send that 20V pulse through the rows of pixels as many as 15 times before the liquid crystal can reach the average voltage needed for high contrast. If an image or element moves on the screen—for instance, if you move the cursor—the liquid crystal cannot respond quickly enough to keep up with the changing screen. The result? Blurry, washed-out images—the moving cursor may blur, leave a trail, or even disappear. Only pixels that change infrequently—giving the controller enough time to sufficiently boost the liquid crystal's voltage—ever reach the full contrast ratio the LCD panel can attain.

Maintaining an LCD panel's high contrast ratio can be compared to sustaining a high water level in a leaky bucket. As a steady stream of water continuously leaks out of the bucket, the water level drops. But suppose you pour a cup of water into the bucket at frequent, regular intervals—at a rate faster than the rate of leakage. Each time you add a cup, the water level rises a bit higher until eventually it reaches the top of the bucket.

**Faster Response Times**

**ACTIVE MATRIX DISPLAYS IMPROVE response time by using transistors to focus voltage on individual pixels.** Every pixel on the screen has its own transistor; a 640-by-480-pixel monochrome screen has slightly more than 300,000 transistors. Each one maintains and rapidly changes, the voltage within the liquid crystal cell of a particular pixel. With the electric field concentrated on them, the liquid crystals that form a pixel respond much more quickly—in 30ms to 50ms—than the crystals in existing passive matrix displays.

**Difficulties inherent in the manufacture of active matrix displays—which involves meticulously laying down thin films of transistors in a complicated patchwork—make for a high rejection rate of panels.** An acceptable screen must have fewer than 10 faulty transistors out of 300,000. This makes the yield of good screens low (by some estimates as low as 10 to 15 percent) and the price very high.

**Active Addressing: The Best of Both**

**THAT MAY CHANGE SOON. IN FOCUS OF Tualatin, Oregon, is developing active addressing, a new approach to activating a pixel that uses special processing chips called application-specific integrated circuits (ASICs).** Active addressing, using liquid crystal materials that have a shorter response time, can achieve screen performance as good or better than current active matrix technologies. Motif—a new company jointly owned by In Focus and Motorola—plans to use passive matrix's economical manufacturing techniques to produce active-addressed LCD displays.

Active addressing uses passive matrix technology but achieves screen performance comparable to that of active matrix. Like passive matrix, active addressing requires two electrodes: one for each row, and one for each column. The row and column electrodes supply voltages to the pixel formed at their intersection and activate that pixel by raising the average voltage to the point where the liquid crystal turns black. However, unlike currently available active matrix panels, active-addressed panels do not produce a huge voltage pulse on the rows. Instead, circuitry much like the column drivers on current passive matrix panels is used on the row electrodes to activate the pixels in a constant mathematical pattern, and a special, multilevel driver (controller) is used to send small pulses in complicated patterns to the whole column. The timing of the pulses keeps the average voltages in each pixel high, and raises them both wherever and whenever needed to the 3V needed to turn a pixel black.

The liquid crystal material used by active-addressing passive matrix panels also has a fast (50ms) response time, comparable to that of an active matrix panel. This in combination with a high average voltage enables these panels to display full-motion video with the same quality as that produced by an active matrix panel.

Since the row and column patterns used by active addressing are based on mathematical formulas, applying the technology to ever-larger displays will be possible as soon as the appropriate panels and column drivers are available. So far, In Focus has developed active addressing only for 640-by-480-pixel screens.

Although LCD panels equipped with active addressing will initially cost an estimated 25 percent more than regular passive matrix panels, active-addressed panels will still be priced far below currently available active matrix panels. LCD panels with active addressing will not be available for about a year because the ASICs are still in development.

With its ability to provide high-quality screen performance at a reasonable price, active-addressing technology promises to make LCD panels more popular. Perhaps the best news of all is that active addressing may eventually lower prices of the most expensive LCDs of all—color LCDs. In fact, within the foreseeable future, those clunky old CRT monitors just might disappear altogether.
Don't say we didn't warn you. Because the PLI MiniArray runs a little faster than you're used to. But we figure you could get used to it.

You see, the PLI MiniArray uses striping, which places alternate bits of data on its two (or four) separate drives, effectively splitting data throughput, seek and access chassis*, although your computer will think of the MiniArray as just one large, fast drive.

Which is how it should be.

Another benefit of the MiniArray, besides tremendous speed, is tremendous capacity (up to 4.2GB). So your multi-media presentations will look like movies, not slide shows. And just think how important that kind of capacity is for networking and desktop publishing.

A typical fast drive will transfer data at 1.5MB per second. The MiniArray 040 transfers up to 8.4MB per second. That's more than six times faster. So you may find yourself being very cost-effective all of a sudden.

Let's face it: Haven't you gone long enough without one?

*external drives

---

WARNING Very Fast

**MiniArray**

At a transfer rate of up to 10MB per second, you can run QuickTime movies that look like movies—not slide shows.

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Why do I need a fax modem? That's exactly what I thought. As a graphic designer at Supra, my job is to design great-looking stuff, not to use our products. So I was skeptical — and downright reluctant — when my boss told me to start using a SupraFAXModem.

But I tried it. And I love it! Here's why...

**SAVES TIME.** Now I have extra time because I don't wait in line at the fax machine anymore — in fact, I don't even leave my desk! I simply use the Chooser to select the modem (instead of a printer), “print” an open file, and tell the modem where to send it. It only takes a minute!

**SAVES MONEY.** Besides the money we save because I'm designing instead of “chasing paper,” I save a lot by using the SupraFAXModem's data capabilities. It's usually less expensive to transfer a file using my modem than to use an overnight delivery service. And because SupraFAXModems feature V.42bis data compression, my files transfer up to 4 times faster — which means lower long-distance charges! It has also saved me when I've forgotten important files at work, because I can easily call our network and retrieve them using AppleTalk Remote Access.

**EASY TO USE.** Not being particularly technical, I was a little intimidated when my boss dropped the modem on my desk and said “Go for it.” But getting started was easy. The SupraFAXModem for Macs has everything I need in the box — FAXst™ and MicroPhone™ 1.6 software, cables, and manuals — so I dove in. A great little 16-page manual walked me through installing the modem (which went really fast), sending and receiving my first faxes, and transferring data files. The software was easy to use, worked great with my Mac, and did everything I wanted it to. Before I knew it, I was using a fax modem!

**GREAT FAX QUALITY.** As a graphic designer, I care about how things look. That's why I was thrilled when I saw how clear the faxes I send look when they reach the fax machine on the other end! It doesn't matter whether I'm sending a quick memo, or a proof page, the SupraFAX-Modem faxes a near-laser quality, perfect page.

**GOOD FOR THE PLANET.** And to top it all off, my SupraFAXModem Modern lets me avoid extra printouts and non-recyclable fax paper!

I strongly recommend that all Macintosh owners consider the benefits of using a SupraFAXModem.

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THE WRITEMOVE II WEIGHS 2½ POUNDS AND RUNS FROM BATTERIES OR AN AC ADAPTER.

GCC's Portable Printer for PowerBooks
Designed to complement the style and portability of PowerBooks, the WriteMove II from GCC Technologies is a portable thermal-fusion printer that offers 360-dpi resolution and weighs only 2½ pounds. The WriteMove II can operate from internal batteries or from a supplied AC adapter. The printer produces a page of text in about two minutes, according to the company.

The QuickDraw-based printer comes equipped with 21 fonts and includes Adobe Type Manager and TrueType support. Available now, the WriteMove II printer costs $599 when purchased direct from GCC. The company said it predicts a street price of about $499. GCC, 617/890-0880. — T.M.

PowerPoint Returns
FOR FOUR YEARS Aldus Persuasion had no serious competition in the Mac presentation-software market. Now serious competition has arrived: Microsoft PowerPoint 3.0.

Each of PowerPoint 3.0's four views—outline, slide, notes, and slide sorter—has a master page for placing standard elements. The outline has a lot of features, and its tools are available to format text anywhere—even inside objects drawn on slides with the new drawing tools.

Version 3.0's on-screen presentation capabilities are impressive, including many types of transitions and the ability to convert a bullet-point slide into a self-building series. The new version can time a user advancing through slides while rehearsing a presentation, then use that timing automatically during a live presentation.

Version 3.0 can walk non-designers through selecting a color scheme. It comes with 40 templates (each in several common formats, such as slides and overheads), and applying a new template doesn't wipe out any changes made to existing slides that deviate from the previously applied template.

PowerPoint 3.0 has a list price of $495 and includes the same add-on modules that are supplied with Word 5.1 for editing equations and graphing. It requires System 7. Microsoft, 206/882-8080. — D.L.

Tax Season Approaches
Good news for Macintosh-using taxpayers. Last year ChipSoft's MacInTax was the only tax software for the Mac, but this year, ChipSoft has a competitor: TaxCut, from Managing Your Money publisher MECA Software.

TaxCut's Interview feature walks you through your taxes with a series of questions. The program can audit your return for mistakes and inconsistencies and can trace a line item back through all the forms and worksheets that generated it.

MacInTax has a new EasyStep feature that is similar to the Interview feature in TaxCut. ChipSoft is also publishing a new program called Personal Tax Planner ($49.95).

Both companies ship early-bird versions, followed by free upgrades after the IRS finalizes tax forms. Both products list for $79.95. MacInTax offers forms for 15 states at $49.95 each; TaxCut has California and New York forms at $49.95 each. ChipSoft, 619/453-4446; MECA, 203/256-5000. — D.L.

High-Resolution Network Printer
Designed to support up to 20 users in complex networked environments, the QMS 1725 laser printer produces 17 ppm at 600 dpi by 600 dpi and can accept data from its multiple ports simultaneously. For faster output the printer can also operate at 300 dpi. The 1725 is the latest in the QMS printer line to use the company's Crown print architecture, which is designed for controlling spooling, emulations, font management, and other functions.

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- TurboPS/440 B* 400 dpi +IET
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- TurboPS/1212 B 1200 dpi +IET

For more information about the B Series, or for the dealer nearest you, call us today at:

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8MB of RAM expandable to 32MB, a serial port, a parallel port, and a LocalTalk connector. Users can add an optional Ethernet or token ring interface. The 1725 emulates PostScript Level 1 and Level 2 and PCL 4. As files are downloaded the 1725 senses their format and switches to the correct page-description language, according to QMS. Other printer emulations are also available. The QMS 1725 printer lists for $5995. The company said it has scheduled its first shipments for November. QMS, 205/633-4300.—T.M.

Organizing Your Life

Nolo Press, publisher of books and software aimed at demystifying the law, has revised Personal RecordKeeper (formerly For the Record) to version 3.0. Personal RecordKeeper is a place to organize and record all your important personal information, with forms for inventoring your possessions, recording financial information, listing where you store spare house keys, and so on.

The wide-ranging documentation includes information on how to store paper files safely; how to buy appropriate software aimed at demystifying the law; and how to prepare for your own death. Personal RecordKeeper lists for $59.95. Nolo Press is at 510/549-1976.—D.L.

New Inspiration

INSPIRATION SOFTWARE (formerly Ceres Software) is upgrading its brainstorming, flow-charting, and outlining tool Inspiration to version 4.0.

The new version's flow-charting and diagramming view has drawing tools (drawings are hidden when you switch to outline view), 63 predefined common node symbols, and room for 100 user-drawn symbols. It also provides headers and footers. Outline view adds support for splitting a topic or selecting and dragging multiple topics, including discontinuous ones; and has improved word processing and printing features.

Inspiration Software says version 4.0, which lists for $249, is also much faster and can import files from Symantec's More 4.08/245-2202.—T.M.

Logica 50MHz 68030 Accelerators

LOGICA RESEARCH has entered the accelerator race by announcing the Logicache 50MHz '030 accelerator board, which comes in versions for the Mac IIfi and Mac Iici. The board boosts performance of those systems by 200 percent to 350 percent depending on the application, according to Logica.

True to its name, the accelerator includes a 50MHz 68030 microprocessor, plus a 64K cache. The IIfi product comes with a two-slot adapter board so that installing the Logicache accelerator does not prevent further expansion of the system. The accelerator fills one slot on the adapter, leaving the other slot available for a second board. The Logicache 50MHz '030 also has a socket for an optional $200 math coprocessor chip for speeding up intensive math operations. Without the math coprocessor the IIfi version lists for $1299 and the Iici version lists for $1399. Both products are shipping now. Logica, 512/836-2168.—T.M.

SuperMac 17-Inch Monitor

THE SUPERMATCH 17 T MONITOR HAS MULTIPLE RESOLUTIONS AND LISTS FOR $1229.

The SuperMatch 17 T from SuperMac Technology is a 17-inch, small-footprint monitor that's available in multiple resolution modes. The color monitor lists for $1229, which at press time, the company said was the lowest price going for a monitor of its size. When purchasing the monitor, the user has a choice of models with 1024 by 768 pixels (to squeeze the largest images onto the screen), 832 by 624 pixels (WYSIWYG mode), or 640 by 480 pixels (which magnifies what would be displayed on a 13-inch monitor).

The SuperMatch 17 T meets the Swedish MPR II guidelines for magnetic-field emissions, according to SuperMac. The monitor began shipping in October. SuperMac, 408/245-2202.—T.M.
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NewGen's
High-Speed, Hi-Res Printers

THE TURBOP5/440ND and the TurboPS/440ND from NewGen Systems Corporation are 400-by-400-dpi laser printers that produce 17 ppm and can attach to a variety of networks. Both have a Weitek RISC processor for faster printing and include serial; parallel; LocalTalk; and thick, thin, and twisted-pair Ethernet connectors. The TurboPS/440ND has the added feature of being capable of printing on both sides of a sheet of paper.

The laser printers both contain emulations of Adobe's PostScript, Hewlett-Packard's PCL (for the LaserJet Series II), and the HPGL plotter language. They can sense the type of file that's being sent for printing and switch to the proper emulation, according to NewGen.

The TurboPS/440ND has a suggested list price of $5795, and the TurboPS/440ND has a suggested list price of $6495. Both of the printers began shipping in October. NewGen, 714/641-8600. -T.M.

Minotaur, Anyone?

If you're looking to test your gaming skills against one of those nefarious humanoid types, then Minotaur, the Labyrinths of Crete, might be the arena for you. Minotaur is an interactive network adventure game, and it's probably the first commercial computer game that requires you to play against someone else. You're an adventurer in a complex and magical maze, trying to overcome monsters, avoid traps, throw spells, solve problems, and generally grab any valuables that aren't actively hostile. You know, the American view of life...Anyway, at the same time, you have to look out for the other human player or players, who can help you or hinder you, but you can guess mostly which. And those human types tend to have these cunningly clever minds.

Minotaur offers nice 8-bit color graphics. It requires a Mac Plus, System 6.0.5, and 1MB of RAM (2MB for color). The program lists for $89.95, and that includes two copies of the software. You enter the Labyrinth via modem, direct-connect cable, or AppleTalk. Perhaps if you take along a very long cable you'll find your way back. Bungie Software, 312/492-2849. -T.M.

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Circle 99 on reader service card
Three-Dimensional Drawing

ADOBE ILLUSTRATOR is a 2-D illustration package, and Ray Dream Designer is a 3-D modeling and rendering package. Now Adobe and Ray Dream are taking a half-step into each other’s territory with products that straddle the line between 2-D and 3-D.

Adobe’s $199 Dimensions can import PostScript text and drawings from Adobe Illustrator, Aldus FreeHand, or other 2-D draw packages; extrude or lathe them into three dimensions; and rotate them (Dimensions also has some 3-D primitives for creating basic shapes). In Dimensions you can map graphics onto 3-D objects—for example, wrap a label around a bottle—set up surfaces, and add lights. Dimensions images can be returned to a 2-D program and edited as Bézier curves. Dimensions images can also be used as a 2-D environment and a 2-D tool, and any surface in a drawing can be used as a drawing plane. AddDepth also has much of Ray Dream’s rendering technology. Ray Dream, 415/961-7240.

Apple Aims to (SNM)Please

Apple has announced three new software products for large-scale networking. AppleTalk Connection for Macintosh integrates Simple Network Management Protocol into AppleTalk, opening up Mac networks to Unix- or Mac-based SNMP consoles and software. (Under SNMP, each network device actively provides the management console with information about how it is supposed to operate.)

TCP/IP Connection for Macintosh supports connecting Macs to TCP/IP networks, the networking protocol standard in the Unix world.

MacX-400 SD (Single Domain) turns a Mac into an X-400 server (X-400 is a standard for connecting disparate E-mail systems) that connects to a single message-transfer agent so that the server provides X-400 services over AppleTalk networks or other networks. This software also includes administrator’s tools to monitor X-400 traffic. For prices call Apple Programmer’s and Developer’s Association at 408/562-3910.—MATTHEW CLARK

News

Trend

Faster Optical Drive

Alphatronix has brought out the Inspire II series of high-capacity magnetooptical drives, for which the company claims an effective access time of 14 ms. This is considerably faster than most erasable optical drives on the market, although Pinnacle Micro has also begun shipping the PM0-650.

The four-port version will list for $1999 and the eight-port model will list for $2999. Both prices include Shiva’s Net Manager software. The LanRover/E also comes in a version for Novell NetWare. All models were scheduled to ship in November. Shiva, 617/252-6300.—T.M.
HP wins first-place awards for Mac-compatible products.
HP gives $100 or $50 rebates on award-winning ScanJets and DeskWriters.

HP's Mac-compatible scanners and printers seem to run forever. But our rebate program won't.

Now through January 31, 1993, you can enjoy the famous performance of HP's products for the Macintosh. And save a modest fortune in the bargain.

We're giving $50 rebates on the enormously popular HP DeskWriter printer, providing laser-quality output at a dot-matrix price. $50 on the HP DeskWriter C, so you can add a splash of color. And $50 off the already low price of the HP ScanJet IIp grayscale scanner.

We're also offering a $100 rebate on the HP ScanJet IIc color scanner. With its superior scanning capabilities, it meets all your imaging and text needs.

HP DeskWriters and ScanJets won landslide victories in Macworld magazine's World-Class Awards.* Voted on by Macintosh enthusiasts who subscribe to Macworld.

So call 1-800-35HPMAC, Ext. 7037 for more details and the name of your local authorized HP dealer.

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The Mitsubishi Diamond Pro® 17 is the ideal Macintosh® monitor for desktop publishing, graphic design, multimedia or image processing. It offers a large display with the most compact enclosure of any 17" flat-square or Trinitron monitor.

The high-resolution Diamond Pro 17 has a fine pitch (0.25 mm), vertically flat, square-cornered Trinitron CRT and features Mitsubishi's DigiCon™ digital convergence control and the Diamond Match Color Calibration System for color-critical applications. It's compatible with Macintosh graphics standards at 640 x 480, Quadra® 832 x 624 and Apple® standard 72 DPI. And with its MPU-based, auto-scanning capability, the Diamond Pro 17 enables you to upgrade your system for use with third party color boards offered by companies such as RasterOps®, Radius™, SuperMac™ and E-Machines™.

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Circle 165 on reader service card
Mitsubishi Electronics America, Inc., Information Systems Division, 5665 Plaza Drive, Cypress, CA 90630. Mitsubishi Electric Sales Canada, Inc., 4299 14th Avenue, Markham, Ontario L3R 0J2.

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*Mac LC, Mac II or Quadra cable adapters available at no charge from your dealer.
**Hi-Res Xante Printer**

The Accel-a-Writer 8100 from Xante Corporation is a 600-dpi printer that prints on paper as large as 11 inches by 17 inches. The 8-ppm printer incorporates an AMD 29000 RISC processor to speed imaging, 12MB of RAM expandable to 64MB, a True Type font scaler, and emulations of PostScript Level 2 and PCL 4.

Like a growing number of networked laser printers, the 8100 can accept data simultaneously from its serial port, parallel port, and LocalTalk connector. The printer also features emulation sensing, which means it switches to PostScript or PCL after detecting the format of an incoming file.

The Accel-a-Writer 8100 carries a list price of $3995. Xante plans to begin shipping it in November. The company will also offer upgrades that will boost the printer's resolution to 800 dpi or 960 dpi. Xante, 205/476-8189.—T.M.

---

**Microsoft Upgrades Word**

Word version 5.1 has a substantial collection of new features. The command ribbon has been replaced with a user-editable tool bar. A new command automates bulleting paragraphs. Text can be annotated with Post-it-like notes. Rows and columns in tables can be dragged and dropped into a new location. Version 5.1 also has a drop-cap feature and an automatic envelope-creation feature, and comes with a graphic add-on (the same graphics module used by PowerPoint 3.0). Gone missing is the scripting language originally promised for an interim release. Word remains $495; the upgrade from 5.0 is $14.95. Microsoft is at 206/882-8080.—D.L.

**Intergraph Revises MicroStation**

Intergraph has revised the Mac version of its high-end CAD package MicroStation to version 4.2, leaving other platforms temporarily behind at 4.1. Its new features fall in several categories.

To its drawing tools version 4.2 adds Non-Uniform Rational B-Splines, or NURBS (the kind of infinitely malleable three-dimensional curves popularized for Macintosh users in Alias Sketch), as well as a multiline drawing tool.

In the presentation area, MicroStation 4.2 supports fly-throughs and can position the camera to look in any direction from anywhere in space. It also adds multiple light sources, Phong and Gouraud shading, and can drop in a bit-mapped image behind a model.

The new version of MicroStation supports a wide range of industry standards for dimensioning, naming layers, and importing and exporting files. MicroStation lists for $3450. MDL, a C-like language for programming MicroStation add-ons, is available for the first time on the Mac at $1500. Intergraph, 205/730-2000.—D.L.
It's a fact. Now you can get faster PostScript® printing at a new lower price.

According to benchmark performance tests, the TI microLaser™ Turbo printer is faster than the Hewlett-Packard LaserJet® III, NEC 95 and Apple® NTR when it comes to charts, illustrations and desktop publishing. That's because it sports two processors — standard and RISC — for turbo-charged speed.

But when it comes to high performance, consider what else the Turbo has to offer:

Your choice of PC or Macintosh® configuration. HP LaserJet II emulation and Adobe® PostScript Level 2 software with 35 of the most popular outline fonts to dress up your documents. Automatic switching between HP and PostScript modes so you can print and go — no setup, no problem. And the ability to connect simultaneously to more than one computer, Windows™-based or Mac, and print with ease.

Best of all, with its new lower price of $1,749** for the PC model and only $50 more for PC and Mac compatibility, the microLaser Turbo is selling fast, too. Call right now for more information on the Turbo or other microLaser printer models. 1-800-527-3500.
Where Next, Columbus?

ON DECEMBER 6, the Smithsonian's National Air and Space Museum will open its new gallery, "Where Next, Columbus?" which presents the prospects for space exploration during the next 500 years. It features several Mac-based exhibits, with touch-screens and full-motion video, produced by Jack Sculley's San Francisco-based Context Productions. One exhibit raises questions about positive and negative motivations for exploring the unknown. Another invites you to work with an engineer, to design a robot that will journey to Mars and to learn the trade-offs between robotic and human exploration. In a third you act as a crew member on the bridge of a spacecraft, responding to emergencies such as solar flares and dealing with necessities such as recycling air and water. The National Air and Space Museum is at 202/357-1300.

—ANN GARRISON

QMS Color Printers

Add EfiColor

QMS has unveiled the ColorScript 210 and 230, RISC-based color printers that use thermal-transfer technology and include Efi's EfiColor Color Rendering Dictionary for improved rendering of photographic images. The ColorScript 210 produces letter- or legal-size output, while the ColorScript 230 prints on paper as large as 11 inches by 17 inches.

Both printers can simultaneously accept data from their serial port, parallel port, and LocalTalk connector and can sense whether to print a file using one of the included PostScript Level 1, PostScript Level 2, or HPGL emulations.

The ColorScript 210 lists for $4995 and the 230 lists for $7995. Both are shipping. QMS, 205/633-4300.—T.M.

BUG REPORT

Microsoft Excel 4.0 If cells are left blank or contain nonnumeric data or formulas, cross-tabulation may return incorrect answers without warning the user.

• Squares created with Excel's drawing tools are slightly elongated when printed on PostScript printers; curiously, a square pasted from Excel into Microsoft Word prints as a square.

• Elongated squares (see above) also affect graph axes, distorting scatterplots and other graphs that depend on relationships between points. Microsoft says it has no immediate plans to release a bug fix for Excel.

StatView 4.0 May crash after printing documents containing TrueType fonts. Abacus Concepts says a bug fix will be available free on request "before StatView 4.1 ships."

MacTools Deluxe 2.0 Unable to optimize floppy disks. Central Point Software says it is working on a bug fix.

Outbound Notebook Computers Transferring files over AppleTalk can be excruciatingly slow. Outbound Systems says version 1.3 of the Outbound software fixes this bug and is available free to Outbound owners.

MACWORLD WILL SEND YOU A BUG REPORT T-SHIRT IF YOU ARE THE FIRST PERSON TO INFORM US OF A SERIOUS, REPRODUCIBLE BUG THAT WE REPORT IN THIS COLUMN. SEE HOW TO CONTACT MACWORLD.

TREND

Envisio Color Flat-Panel Display

Envisio has come out with ColorFrame, which the company says is the first external flat-panel color display for the Mac. ColorFrame shows up to 4096 colors when working with a 16-bit or 24-bit adapter. The active matrix LCD device is 9 inches by 12 inches by 1/3 inches, small enough to fit in a briefcase. The display area measures 10 1/2 inches diagonally.

The ColorFrame will work with any color-capa-
No ‘uh-oh’

Fast, affordable fax/modems without the ‘uh-oh’ factor.

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- **Lifetime Warranty**
- **Upgradability** add voice messaging later; even increase speed when new standards are set.
- **Low Price**—advanced low-component-count engineering and high-productivity U.S. manufacturing make our value unbeatable.
- **Complete** including cables and award-winning STF® fax software and data communications software.

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<table>
<thead>
<tr>
<th>Modem Type</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>9696 9600 S&amp;R fax/9600 modem</td>
<td>$299</td>
</tr>
<tr>
<td>9624 9600 S&amp;R fax/V.42 bis modem w/ MNP-5</td>
<td>$139</td>
</tr>
<tr>
<td>9624 9600 S&amp;R fax/ modem</td>
<td>$109</td>
</tr>
</tbody>
</table>

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Circle 93 on reader service card
Survey: What Mac Do You Use?

Which Macs do you use at work, home, or elsewhere?

<table>
<thead>
<tr>
<th>Mac Model</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>All Quadras</td>
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<tr>
<td>Quadra 700</td>
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<tr>
<td>Quadra 900</td>
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<tr>
<td>All Mac II's</td>
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<tr>
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<td>15.9%</td>
</tr>
<tr>
<td>All PowerBooks</td>
<td>15.9%</td>
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<tr>
<td>Mac Portables</td>
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<tr>
<td>All Mac Stc</td>
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<tr>
<td>SE</td>
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<tr>
<td>Classic II Plus</td>
<td>24.4%</td>
</tr>
<tr>
<td>Other</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

Based on 579 respondents to a 1992 Macworld reader survey who use Macs. Multiple responses were allowed.

DoWhatDo

DURING THE 1970S, Gordon Pask developed DoWhatDo, an information theory describing how people make conversation and how computers can emulate the process. It became a hot topic at MIT, where video artist Joel Slaton was teaching in the Visible Language Workshop, a precursor to the Media Lab. Now at San Jose State University, Slaton has applied Pask's theory in an October performance titled DoWhatDo. Eleven groups representing Silicon Valley subcultures—from the Indian performers Abahinaya Dance Company and several glittering low-riders to step dancers at an African American fraternity—performed beneath a sculpture containing three Mac screens with nine video channels. Using video discs full of video clips, animation, and graphics related to the performer's art, special software made the videodiscs "converse" about the performers. Slaton's show was sponsored by the San Jose Institute of Contemporary Art, 408/998-4310.

—ANN GARRISON

Portable Drives from Liberty

Liberty Systems has introduced the 20 Series portable external hard drive for PowerBooks, available in 80MB or 120MB versions. The drives have 17ms average access times, according to the company; measure 3 inches by 1/4 inches by 5/8 inches; and include an internal power supply so there's no need to carry around an additional power brick. The company offers an optional $199 internal battery pack and recharger set.

The 80MB version of the drive lists for $799 and the 120MB version lists for $999. Both are shipping now. Liberty, 408/983-1127.——T.M.

Dayna's
NetScope Tracks

Network Traffic

Dayna Communications' latest prescription for network headaches is its NetScope Console software and NetScope Probe hardware, designed to ease AppleTalk network management. The portable NetScope Probe hardware attaches to any LocalTalk or Ethernet part of a network that's connected to a router. Once attached, NetScope collects data on transmission errors and traffic.

The NetScope Console software gathers data from one or more NetScopes Probes over the network. The Macintosh that runs the software can be anywhere on the net, so the network manager can gather data from the far side of routers. Together the products provide information on broadcasts per second and the use of network resources.

Now shipping, the two products list for $899 together and are also available separately. They also work with Dayna's Network Vital Signs, a fault-monitoring system. All three products bundled list for $1199 under the name Dayna Network Management System. Dayna, 801/531-0600.——T.M.
Monitor Special
Sampo 20" Color..............$1498
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- Includes interface cards

Trinitron 19" Color ........$1998

Full Page Display ............$398

14" Sampo Color..............$398
- Plug compatible with the IIsi, CI.
  and the LC

14" SONY Trinitron............$698
- SONY 1330 for the Mac LC, SI, CI and
  Quadra

16" SONY Trinitron............$1098
- Plug compatible with the Quadra
- Plug compatible with the CI, SI and LC
  at 640x480

19" Sigma Trinitron System
• With 8 Bit interface ..........$1998
• With 24 Bit interface ..........$2598

NuDesign Full Page Display
• Grey Scale for CI, SI, Quadra ...
  $398
• 8, 14, FX, SE30, 1Bt ...
  $488

20" Sampo Color System
- With 8 Bit interface ..........$1998
- With 24 Bit interface ..........$2598

600 & 1200 DPI Color Scanners

Umax UC-630 With PhotoShop..............$1148.00
Transparency/Slide Scanner Option ..............$798.00
Automatic Document Feeder .....................$498.00
- Rated four mice by MacUser (Dec '91)
- Rated fastest by MacUser (Dec '91)
- "Boasts the highest vertical resolution..." Tamarack and Umax
  produced the best images..." MacUser
- "Tamarack and Umax excel in speed and color accuracy" MacUser

Umax UC-1200S With PhotoShop ..............$3498.00
Transparency/Slide Scanner Option ..............$898.00
- Incredible 1200 dpi scanning res. recognizes 1 billion colors internally
- Single-pass design increases scanning speed
- Includes Adobe Photoshop

Sharp JX-320 With PhotoShop ..............$1598.00
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- MULTIVARIATE: discriminant analysis, principal components, canonical correlations.

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Circle 29 on reader service card
The Compaq Pagemarq 20 and Apple LaserWriter IIg topped our picks for office printers. The Pagemarq offers high resolution at high speed, while the LaserWriter IIg offers enhanced gray-scale output.
Printer speed and output quality continue to improve as prices fall. So what’s new? That happens every year. True, but this year there are some significant improvements, not just the usual enhancements, thanks to three companies that are setting new trends and pushing new limits: Apple, with its PhotoGrade gray-scale enhancement technology; Hewlett-Packard, with its enhanced 600-dots-per-inch output at affordable prices; and believe it or not, Compaq Computer, with its super-fast, high-quality, affordable debut printers. Just three years ago, a high-end printer that produced 400-dpi output and printed 10 pages per minute cost more than $10,000. Today, a 600-dpi printer that produces 17 ppm costs less than $7000. And 600-dpi, 8-ppm printers start at less than $3000.

The printers reviewed here vary in capabilities, but they share a common ground: the workplace. What is the job description for an office printer? To start with, it has to know how to network. All the printers reviewed here provide LocalTalk network ports that let an office full of Macs share the printer. Many printers include or accept optional high-speed Ethernet ports, which can slice printing times for large documents, especially ones with scanned images.

The next requirement is PostScript, the page-description language of publishing. PostScript printers can handle the most graphically complex documents and contain built-in network software. You don’t have to equip your network with the print-server software or printer-sharing boxes that are common in the DOS PC and mainframe worlds—simply add network cables and connectors. DOS PCs with LocalTalk expansion boards and software such as Farallon’s Computing PhoneNet Talk can join the party, too.

To keep up with the hard-copy demands of an office or workgroup, an office printer should have a print mechanism—an engine—that can print at least 8 ppm. A large or prolific office should consider a 10- or 17-ppm workhorse, or even a Clydesdale like the QMS-PS 3200, which prints 32 ppm (and retails for $19,995).

Some office printers aren’t just workhorses; they’re also show horses. Some printers use resolution-enhancement techniques that finely control the laser in a 300-dpi engine to simulate higher resolutions. Other printers use true 400- or 600-dpi engines. Still others combine both techniques to simulate resolutions of up to 1200 dpi.

Some of these ultra-sharp printers are billed as plain-paper imagesetters: lower-cost, chemical-free alternatives to photographic imagesetters. We looked at four of them: LaserMaster’s $6995 Unity 1000 and $9995 Unity 1200XL (which can produce 11-by-17-inch output) and Printware’s $7990 Pro-II and $15,990 Pro-III (also for 11-by-17-inch printing). Although their output quality is excellent, it isn’t significantly better than that of a Hewlett-Packard LaserJet 4M or any Canon BX-based 600-dpi printer, like QMS’s 860 Print System. Put another way, it isn’t thousands of dollars better.

Macworld Lab tests 24 office laser printers, including 2 new trendsetters
In the Controller's Seat

A POSTSCRIPT LASER PRINTER IS HALF electronics and half mechanics, and the past year has brought advancements in both areas. PostScript controllers—the logic boards that sit within printers and interpret PostScript commands from the Mac—are becoming faster and more sophisticated. Most PostScript controllers are now built around high-speed RISC (reduced instruction set computer) processors instead of general-purpose 68000-family chips.

RISC-based printers can better handle the calculations required to print documents containing large varieties of fonts and sizes as well as illustrations from programs such as Adobe Illustrator. If your office prints typographically simple documents—manuscripts, legal contracts, memos, correspondence—a RISC-based printer's extra punch may go unused. For these needs, concentrate more on engine speed than controller performance.

More printers are also using PostScript Level 2, an enhanced version of Adobe's PostScript that, in theory, allows faster printing and better support of unique engine features such as multiple paper trays. In practice, the current Apple PostScript printer driver (the LaserWriter file) doesn't take advantage of Level 2's improvements. Apple and Adobe have been collaborating on a Level 2 driver for well over a year, and its scheduled release is uncertain but expected by early 1993. Adobe says that besides allowing access to unique engine features, Level 2 will provide faster performance (even for Level 1 printers) and will bring an end to laser-prep wars—the driver conflict that occurs when a printer is shared among Macs running different system versions.

Until the new driver becomes available and proves itself compatible with existing applications (Adobe says its next driver release will be), there's no compelling reason to seek out a Level 2 printer over a Level 1 machine. Instead, look at overall capabilities and performance.

Gray-Scale Output
Resolution greatly affects how well shades of gray are printed. However, Apple's PhotoGrade lets the 300-dpi LaserWriter II and IIg printers produce gray-scale output that matches or even beats that of higher-dpi printers. While the Hewlett-Packard LaserJet 4M has resolution enhancement, that enhancement is designed for type, not gray-scale images, so its output matches that of other 600-dpi printers.

Typographic Output
The Palatino typeface's curves and straight lines accentuate differences caused by a printer's resolution. (The output here is enlarged to 300 percent.) The resolution enhancement in both the LaserJet 4M and LaserWriter IIg make a big difference in the quality of typographic output compared against printers with the same dpi.
And what of PostScript clones—printers with controllers that understand PostScript, but use interpreters created by firms other than Adobe Systems? Among the 300-dpi printers, some of the top performers were clones (see “Rating Printer Performance”). Unlike the batch we tested for September’s “Good Buys in Low-Cost Personal Printers,” only one clone—Xante’s Accel-a-Writer 8000—had problems printing Adobe’s Multiple Master fonts. PostScript clone vendors such as NewGen Systems, LaserMaster, and Xante have established good track records for releasing updates to fix compatibility problems. Of course, you can avoid the problems to begin with by seeking out a true Adobe interpreter.

Controller Conveniences

SOME CONTROLLER TRENDS ARE LESS

dramatic than the move to RISC chips and PostScript Level 2, but are welcome nonetheless. For example, more printers are offering *emulation-sensing* and *all-ports-active* features that simplify life if you have both Macs and DOS PCs. Emulation sensing lets a printer automatically switch between its native PostScript language and a foreign tongue, such as the Printer Control Language (PCL) used by HP LaserJets and many DOS applications. (In a mixed-platform environment, you appreciate having one printer that speaks both languages.) An all-ports-active feature eliminates having to flick switches to choose which of the printer’s ports you want to use. You can, for example, connect your Mac to the printer’s LocalTalk port and your DOS PC to its Centronics parallel port. When a print job arrives at one port, the printer temporarily disables the others.

Compaq’s new Pagemarq series, as well as QMS’s PS 1700 and 860 Print System, take the all-ports-active concept to its limits. These printers can accept multiple print jobs at different ports simultaneously—instead of putting one port on hold while another receives a job, all ports can receive jobs at the same time. The printers keep the jobs separate, storing them in memory or in built-in hard drives (available as options for some) until the job that arrived first is printed.

Speaking of hard drives, support for built-in or optional SCSI drives is also becoming more common. Most of the printers profiled in “Surveying Office Printers” include or accept a SCSI drive. A drive can improve performance with typographically complex documents by storing fonts that would otherwise be downloaded from the Mac. Doing away with downloading also reduces a network’s traffic, improving performance.

**Inside the Engine**

LIKE CONTROLLERS, PRINTER ENGINES

are getting faster: 9, 10, and 17 ppm are becoming common, even among inexpensive (less than $3000) printers such as Texas Instruments’ microLaser Plus PS35 and microLaser Turbo and Dataproducts’ LZR 960 and LZR 965 (the LZR-960 is also sold under different names by Hardware That Fits, Mirror Technologies, and Generation Systems). Remember that you’ll see this maximum speed only when printing simple documents or multiple copies of the same document. PostScript controllers are faster than ever, but they still can’t keep up with the printer’s engines on complex jobs.

Paper-handling capabilities are improving, too. Of the printers profiled here, many include or accept a second paper tray, so you can mix and match letterhead and second sheets or envelopes. (Several printers also accept envelope feeders.) Printers from QMS, Hewlett-Packard, and Toshiba include or accept *duplexers* for printing on both sides of a sheet of paper—saving trees while cutting down on paper costs and document-storage requirements.

Printers with extra paper-shuffling skills offer front-panel switches for choosing trays or duplexing options. But who wants to walk across the room to adjust print settings? For tray-selection options to appear in the Print dialog box, printer firms must provide customized versions of the LaserWriter driver or extensions that modify the existing driver during start-up. The extensions that accompany QMS, Compaq, and Dataproducts printers provide the best support for unique engine features (see “Chasing Paper”). One problem, though: If you have two vendors’ extensions installed—perhaps your large network contains both QMS and Dataproducts printers—neither extension works.

The forthcoming Apple/Adobe PostScript Level 2 driver will eliminate this problem and allow direct access to unique engine features by supporting PostScript Printer Description (PPD) files, which describe a printer’s unique capabilities. Some programs (Aldus PageMaker and FreeHand, for example) have supported PPD files for years, but Apple’s printer driver never has. Most current printers include PPD files, so, like the rest of us, they’re ready for the new driver.

**Laser Wars**

THE REAL NEWS IS THE CONTINUING

move toward higher resolutions and better output quality (see “Output Quality Up Close”). In previous years, printer vendors played tricks with their engines’ lasers to provide higher resolutions. HP’s Resolution Enhancement Technology (RET) was first. Apple fired back last year with its FinePrint and PhotoGrade technologies, which improve the appearance of character edges and halftone images, respectively. (HP’s RET doesn’t improve halftones.) QMS responded with its MR series printers, whose controllers coerce 600-dpi output from 300-dpi engines.
Other companies have developed their own technologies, all of which force an engine to apply smaller dots than it was designed to apply. While such tricks provide resolution that's better than the original, they do not produce the same sharp quality as does an engine designed to produce true 600-dpi output.

HP and QMS have fired the latest salvos in the resolution-enhancement battle, and their weapon is a Canon. Canon—which manufactures print engines for HP, QMS, Apple, and many others—has introduced two new engines that are designed to produce true 600 dpi. The new LaserJet 4M uses the Canon P-270 engine, whose maximum page size is 8 1/2 by 14 inches. The QMS 860 Print System uses the larger LBP-BX engine, which supports 11-by-17-inch paper. Both can print eight letter-size pages per minute (the LBP-BX prints four 11-by-17-inch pages per minute). Both engines are also available in 400-dpi versions.

NewGen Systems has also announced two printers that use the LBP-BX engine: the 600-dpi TurboPS/660B and the 400-dpi TurboPS/440B, which can be upgraded to 800 dpi.

The output from the new Canon engines is not only sharper, it's also cleaner. One classic problem with laser output is that character edges are often slightly fuzzy, surrounded by a haze of stray toner particles. This toner scatter occurs because of stray electrical charges generated by a relatively imprecise corona wire, the component that attracts toner from the photoconductive drum to the paper. Toner scatter causes type to appear heavier and overexposed, with hollow portions of characters such as b partially filled in.

In the new engines, Canon has replaced the corona wire with a roller that makes physical contact with the drum, eliminating stray charges and toner scatter. Canon says the new design also reduces the engines' ozone emissions.

Only one printer that uses the new engine design was available for testing—a prerelease model of HP's LaserJet 4M, which uses the smaller P-270 engine. The LaserJet 4M is the heir to the LaserJet throne, and it deserves the crown. Its 600-dpi engine and HP's RET combine to create the best output I've seen from a laser printer. Thanks to a RISC processor and built-in PostScript interpreter, performance is also much improved over the now-discontinued LaserJet III, which used a slow, plug-in PostScript cartridge. The 4M also sports an extremely legible status display, big front-panel switches (not those small, hard-to-press membrane switches many printers use), and paper-handling options galore. It's a terrific printer—with a great print engine that you will undoubtedly see in future printers from other firms.

**Rating Printer Performance**

<table>
<thead>
<tr>
<th>Multiple Fonts</th>
<th>Courier</th>
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<th>FreeHand 3.1</th>
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<tr>
<td>This test highlights typical print speeds in a typical multiple-font document. To test, we used a 7-page Microsoft Word 5.0 document containing a variety of fonts, sizes, and styles.</td>
<td>This test highlights printer throughput. To test, we used a 20-page Microsoft Word 5.0 document containing double-spaced 12-point Courier text in plain, bold, and italic styles.</td>
<td>This test highlights the speed of printing complicated drawings that don't use many special effects. To test, we used a newspaper graphic containing more than 2000 simple objects and several lines of Helvetica text.</td>
<td>This test highlights the printing speed of a typical high-end desktop publishing job. To test, we used a 4-page newsletter using several fonts, a MacPaint image, and three gray-scale TIFF images.</td>
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<th>300-dpi Printers</th>
<th>400-dpi and Greater Printers</th>
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<td>Compag PageMarq 20 (800 x 400 dpi)</td>
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<td>Texas Instruments MicroLaser TL Turbo</td>
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<td>Hewlett-Packard LaserJet III</td>
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<td>Apple LaserWriter IIg</td>
<td>NewGen TurboFS Pro 500 (600 x 300 dpi)</td>
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<tr>
<td>Texas Instruments MicroLaser Turbo</td>
<td>NewGen TurboFS/840e (800 X 400 dpi)</td>
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<td>Mirror Image 309</td>
<td>OMS-PS 815</td>
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<td>Dataproducts LZR 960</td>
<td>GCC Technologies BLP R5</td>
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<td>Hardware That Fits RealTech Laser</td>
<td>Texas Instruments MicroLaser XL PS5</td>
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<th>400-dpi and Greater Printers</th>
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<td>Compag PageMarq 20 (800 x 400 dpi)</td>
<td>Compag PageMarq 20 (800 x 400 dpi)</td>
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<td>OMS-PS 815 (600 dpi)</td>
<td>Xante Accele-Writer II (600 dpi)**</td>
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<td>Xante Accele-Writer II (600 dpi)**</td>
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<td>175</td>
<td>475</td>
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*Because this 800-by-400-dpi printer can also be set to 300 dpi, we tested it at both resolutions. **Upgrade board, tested in an Apple LaserWriter III.
Compaq Makes Its Marq

Canon Isn't the Only Engine Manufacturer Doing Exciting New Things. Fuji and Xerox's joint Japanese subsidiary, Fuji Xerox, has developed an engine design that's used in several of the printers reviewed here, including the Dataprod ucts LZR 1560 (and the versions of it sold by Hardware That Fits, Mirror Technologies, and Generation Systems) as well as Compaq's new Pagemarq 15 and Pagemarq 20. The Pagemarqs mark the venerable DOS PC vendor's entrance into the printer business, for both DOS and Mac users.

The Fuji Xerox engine produces 300-dpi or 400-dpi output at a maximum speed of 15 ppm. (The Compaq Pagemarq 20 uses a 20-ppm version.) Output quality is excellent, although not as sharp or clean as the LaserJet 4M's. You can select the desired resolution from the Print dialog box or by using front-panel switches. As with all printers with switchable resolutions, performance is better in 300-dpi mode, since the controller has fewer dots to generate. The engine can print pages as large as 11 by 17 inches—impressive for a package that's smaller than an HP LaserJet III Si, which is limited to legal-size paper.

The initial models of the Dataproducts LZR 1560 (and the versions of it sold by Hardware That Fits) have a problem with ragged-looking type in their 300-dpi modes. A Dataproducts representative said the problem is caused by noise in the hardware that fits (at least by Adobe) as a standard for emulation switching.

The Pagemarq 15 includes two paper trays, and the Pagemarq 20 includes three. The Fuji Xerox engine's standard paper trays hold just 250 sheets. That's on the skinny side for a fast engine—the deep trays that accompany QMS's PS 1700 and HP's LaserJet III Si hold 500 sheets. To improve paper capacity without using deeper trays (which would have required a redesigned engine), Compaq developed a unique tray design called the TwinTray, in which two 250-sheet stacks of paper sit alongside each other. When one stack is spent, a motorized mechanism inside the tray slides the second stack into position. It works, but changing stacks takes several seconds. And like Mom used to say at Christmas, it's just something else to break. (Indeed, one TwinTray arrived at Macworld broken.) A TwinTray also costs $20 more than a standard 250-sheet tray. The Pagemarq 20 includes three TwinTrays, while the Pagemarq 15 includes one TwinTray and one 250-sheet tray. A second TwinTray is optional.

What may be most impressive about the Pagemarq series is the array of options: a 60MB internal hard drive; 1MB or 2MB font modules that, like a hard drive, can hold downloadable fonts; and best of all, a fax-modem board that turns the printer into a plain-paper fax that can receive faxes even as it handles incoming print jobs. Software is included that lets you send faxes from a DOS PC or Macintosh. Although built-in faxing is not unique to the Pagemarq, its fax-modem board is the first to use Adobe's PostScript fax technology—if you send a document from another PostScript fax, it prints at maximum resolution using the Pagemarq's resident fonts. (Think of it as remote printing by phone.) You can expect other vendors to follow suit.

What to Buy, What to Avoid

The HP LaserJet 4M and Compaq Pagemarq series set new standards in their classes. They're the top picks in terms of quality and speed, respectively, and both companies offer good pricing. Still, other printers are worth considering.
If you want top halftone quality from gray-scale scanned images, look at Apple's LaserWriter IIg, which finished fourth in overall performance. Its 8-ppm Canon SX engine is yesterday's news, but its PhotoGrade-enhanced gray-scale output remains hard to beat. Text quality is excellent, too, and the printer includes Ethernet and SCSI connectors. The less-expensive LaserWriter III is slower and lacks Ethernet, but it also provides FinePrint and, if you upgrade its memory to 5MB, PhotoGrade.

For heavy-duty office use, HP's $6995 LaserJet IIIIS still shines, as does Dataproducts' $3395 LZR 1560 (and the version sold by Hardware That Fits). QMS's 600-dpi PS 1700 provides good performance, optional duplex printing, and simultaneously active interfaces. The $6995 PS 1700 contains the QMS Crown printer operating system, which gives you more control over printer memory and other internal settings than other PostScript printers.

With its unenhanced 300-dpi output, Texas Instruments' microLaser series is showing its age, but remains noteworthy for its upgradability. You can start out with the 6-ppm $2399 microLaser XL,
and upgrade to the 9-ppm microLaser XL Turbo, which finished close behind the Compaq Pagemarq 20 (when set at 300 dpi) in most tests and beat it in one.

If you want to give new life to an old Canon CX- or SX-based LaserWriter or LaserJet, investigate Xante's Accel-a-Writer series of RISC-based controller upgrade boards, which also boost resolution to 600 dpi. But Xante's first complete printer, the 600-dpi Xante Accel-a-Writer 8000, finished last or close to last in our tests.

One printer to avoid is Toshiba's PageLaser 6X400 model. Besides having a confusing configuration of paper-handling options (some of which we never did get to work, preventing complete testing), this printer has the most difficult front-panel menu system I've seen. Look instead to HP or QMS for a 17-ppm duplex printer. Likewise, the 600-dpi IBM 4029A from Lexmark International (which took over IBM's printer business) produces sharp output, but it's slow.

Eastman Kodak's EktaPlus 7016 PS is an odd bird. Its controller is a tortoise, but thanks to a 16-ppm engine, the printer finished fifth in the Courier test. The EktaPlus 7016 PS is also a 6-ppm photocopier. If you print simple documents, it could be a versatile alternative.

In the end, the big newsmakers this time around are the new Canon engines, HP's latest LaserJet, and Compaq's new contenders. Beyond that, RISC chips and resolutions are on the rise as prices fall. Between these welcome trends and the newest entries to the market, there hasn't been a better time to get down to the business of printing.

See Where to Buy for contact information.

Contributing editor and Getting Started columnist JIM HEID has worked with nearly 100 laser printers since Hewlett-Packard's LaserJet was introduced in 1984. His latest book, coauthored with Peter Norton, is a second edition of *Inside the Apple Macintosh* (Brady, 1992).

Macworld Lab testing supervised by DANNY LEE.
PICKING THE BEST VIDEO-CAPTURE BOARDS FOR MAKING QUICKTIME MOVIES

The Full-Motion

If you're ready to try your hand at making QuickTime movies or other video presentations, the first step is to get full-motion video—the kind we watch on television—into the Macintosh.

Fortunately, the process is pretty easy. With a full-motion video-capture board installed in the Mac, simply plug in the video source—video camera, VCR, laser-disc player, or TV tuner. The board converts the analog video—in sequence—into digital information the computer can understand, then stores the data on the Mac's hard drive. All you have to do is edit the material into a presentation or movie—but that's another story (see "QuickTime—Your First Time," Macworld, October 1992, to find out how to make a Mac movie).

Unfortunately, accommodating the demands that full-motion video makes on your computer isn't so simple. Besides the video-capture board, you may need to buy a speedier Mac and add a larger, faster hard drive. And after that, you'll probably want to upgrade or replace your video-capture board—it's a new technology that's changing constantly.

To help you become a Mac movie mogul, I evaluated 10 full-motion NuBus video-capture boards—SuperMac Technology's VideoSpigot NuBus, Workstation Technologies' WTI-Moonraker, Radius's VideoVision, and
Macintosh
RasterOps’ MediaTime and its variations. There are other video-capture boards on the market, but I focused on these because they are able to continually store a stream of moving images to a hard drive, up to the capacity of that drive—some products store directly to RAM, which is just too limiting. In addition, I weeded out products that couldn’t capture more than 5 frames per second (more on frame rates later). Both capabilities are vital to anyone making QuickTime movies or other video presentations.

While all of the boards evaluated in this article support single-frame capture, I looked at their full-motion capture capabilities only. And keeping in mind that many potential QuickTime moviemakers aren’t full-time video professionals with lots of money to spend on equipment, I concentrated on video-capture boards that cost $3500 or less.

What’s the Difference?
IT’S IMPORTANT TO NOTE THAT NOT ALL PRODUCTS COMMONLY REFERRED TO AS VIDEO-CAPTURE BOARDS OR VIDEO DIGITIZERS ARE CAPABLE OF CAPTURING FULL-MOTION, REAL-TIME VIDEO. THE SIMPLEST (AND LEAST EXPENSIVE) VIDEO DIGITIZERS—SUCH AS KOALA ACQUISITIONS’ MACVISON (WHICH LISTS FOR $499 FOR GRAYSCALE AND $799 FOR COLOR, BUT IS USUALLY DISCOUNTED HEAVILY)—TAKE SEVERAL SECONDS TO DIGITIZE AN IMAGE. AS A RESULT, THEY’RE ONLY ABLE TO DIGITIZE statically images FROM VIDEO (A FREEZE FRAME FROM A PAUSED VIDEOTAPE, FOR EXAMPLE).

VIDEO FRAME GRABBERS, SUCH AS DIGITAL VISION’S COMPUTER EYES PRO ($399.95) AND COMPUTER EYES RT ($599.95), ARE FAST ENOUGH TO CAPTURE A STILL IMAGE FROM A MOTION SEQUENCE; YOU DON’T HAVE TO HIT THE PAUSE BUTTON ON A VCR OR LASER DISC. ALTHOUGH THEY GRAB QUICKLY, THEY TAKE A SECOND OR MORE TO WRITE THE FRAME TO DISK, SO THEY CAN’T COPE WITH A FULL-MOTION SEQUENCE.

Then there are the true video-capture boards that digitize continuous, full-motion image sequences; these boards are essential for anyone planning to make a QuickTime movie or any type of multimedia presentation that incorporates live-action video.

Do You Need One?
JUST BECAUSE YOU’RE PLANNING A VIDEO EXTRAVAGANZA ON YOUR MAC DOESN’T NECESSARILY MEAN YOU’RE A CANDIDATE FOR A VIDEO-CAPTURE BOARD.

Keep in mind that full-motion video movies on a Mac are usually viewed within a small QuickTime window (160 by 120 pixels, or 320 by 240 pixels with QuickTime 1.5), due to the enormous demands a full-screen, full-motion video makes on your Mac. In addition, the motion of a QuickTime movie typically isn’t smooth, and on anything less than a Mac IIx or Quadra, it is downright jerky.

Even if you’re planning to create professional video productions for broadcast or distribution on videocassette, you can still benefit from QuickTime and a video-capture board. You can capture the video sequences and then storyboard and edit to your heart’s content in a QuickTime-editing program (such as Adobe Premiere) without worrying about the costly charges of a professional editing suite. When you’re done, you can take an edit-decision list to a production house and have a finished tape assembled that meets broadcast standards.

But if you can’t live with a small movie window, or if you don’t have the money or resources to have a production house finish the job, you’re better off bypassing the Mac in favor of conventional video editing—two or three editing VCRs and an editing controller. For casual video editing, a camcorder, and a consumer VCR with flying erase heads may be all the hardware you need to make an effective tape.
**Frame Rates**

**THE MOST IMPORTANT CRITERION FOR EVALUATING a video-capture board is its frame rate (frames per second, or fps), which measures how quickly (or slowly) the board digitizes full-motion video.**

The fundamental problem desktop video must cope with is the huge flood of data generated by video movies. A single 640-by-480-pixel color image equals about 1MB of data. At the standard North American television video rate of 30 fps, a video movie generates 30MB each second. That’s 10 to 40 times the data-transfer rate current desktop Macs can write continuously to a hard drive. Recording sound adds another 25K to 180K to each frame, depending on compression and whether the sound is mono or stereo (see “Compression and Quality”).

To stem this data tide into a manageable stream, there are three simple strategies:

1. **First, reduce the frame rate.** While 30 fps is standard for North American television, a much lower frame rate—about 12 fps—is common for QuickTime movies. Most Mac models simply can’t pull data out of the hard drive any faster. Here the tiny QuickTime movie window helps; a 12-fps movie that would look jerky blown up to the full size of the screen looks more acceptable in a tiny window.

2. **Second, digitize fewer pixels for your video movie,** which generates a smaller or coarser picture; fewer pixels means less data each second and fewer demands on your computer. The standard small QuickTime movie window, for example, is about one-sixteenth the area of a standard 640-by-480-pixel screen.

3. **Third, minimize the number of colors captured.** The capture boards can produce 16-bit color (thousands of colors) faster than 24-bit color (millions of colors), and the result looks almost as good. The speed penalty for 24-bit color can be as high as 25

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**Compression and Quality**

Full-motion, full-screen, full-color video (at right) needs 30MB of storage space per second of video to run on a Mac—far more data than a Mac can manage without assistance. There are two ways to help the Mac process this data flood: QuickTime compression (below, left) and JPEG (Joint Photographic Experts Group) compression (below, right). Both methods create some compromises in image quality.

### QuickTime Compression

If you don’t have access to a JPEG hardware compression board, you can squeeze video into the Mac by taking the following steps in software:

1. **Reduce the frame rate.** Eliminating every other frame reduces a video of 30 frames per second (fps) to a more manageable 15 fps. For a small QuickTime window, 12 to 15 fps is the standard frame rate.

2. **Drop pixels.** The standard Mac display screen contains 640 by 480 pixels; a QuickTime 1.0 window is 160 by 120 pixels. Digitizing fewer pixels creates a smaller, coarser QuickTime image, but the video file is one-sixteenth the size of the original file.

3. **Drop colors.** Capturing video in 24-bit color and then converting it to 16-bit makes for a smaller image file. The resulting 16-bit images look almost as good as they do in 24-bit color.

After video capture, you can further reduce the file size using QuickTime compression. The result: a video file that would have been 30MB per second is squeezed into as little as 80KB per second. When comparing the enlarged image detail here with the detail of the original image (at top, far right), you can see the loss of resolution that has occurred. For a small QuickTime window, though, the quality is acceptable.

### JPEG Compression

Hardware compression boards are the only way to capture full-motion, full-screen video on a Mac. These boards use JPEG compression, which compresses and decompresses video frames in real time by taking the following steps:

1. **Separate the image.** JPEG separates an image’s RGB information into three components: luminance, or light intensity (front); and two chrominance components (back), shown combined, which contain the color data.

2. **Discard and compress.** For compression purposes, JPEG divides an image into 8-by-8-pixel blocks. The JPEG algorithm looks at color values in each block; discards some color data, then averages the remaining color information to decrease the file’s size.

3. **Decompress and play back.** To cut the space required to store this video, the file size was compressed using a 36:1 ratio. The file is decompressed to its original size for playback.

Compared with the QuickTime image enlargement at far left, the JPEG-compressed image quality has a finer resolution, but still doesn’t offer the same resolution quality as the original image (detail at top, far right).
You’re better off capturing video.

While Macintosh—especially the Quadra—has the data-transfer rates and storage resources to capture 30 fps of video without compression hardware, if you view a 30-fps video on an IIfx or Quadra, you see fairly accurate real-time motion. If you have a fast Mac, consider recording your video movie at the standard QuickTime rate of 12 to 15 fps, particularly if it’s intended for viewing on anything less than a Mac IIfx. On a slower Mac, setting 12 fps for capture can produce smoother results than setting 30 fps, if the system isn’t capable of capturing that fast. Pushed to the max, the I/O becomes the limiting factor.

Display Adapters

Another consideration when choosing between capture boards is the ability—or lack thereof—to display the video.

The lowest-price full-motion video-capture boards such as the SuperMac VideoSpigot ($449) only capture video; to display the images, they rely on a separate video-display adapter or a Mac’s built-in video circuit. Other boards (SuperMac’s VideoSharp, Pro and Radius’s VideoVision, for example) include a video-display adapter for several sizes of Mac screens or for one particular size display (see “Video-Capture Board Details”).

Video-display adapters that include hardware pan and zoom can magnify small QuickTime windows. Pan and zoom magnifies any portion of the screen by “enlarging” the pixels (each QuickTime pixel becomes a 4-pixel “dot” in the enlarged window). While it doesn’t provide any more visual data, pan and zoom makes the QuickTime window four times as large, which is often easier to watch.

Video Output

Most video-capture boards can’t send a video signal to a VCR or television monitor. In some cases, the board can export monochrome video through an optional cable assembly that replaces the usual video cable between the video-display adapter and the monitor. For color, you need to add a Mac RGB video-to-NTSC (or PAL or SECAM) converter, which costs $350 to $600 and is available from the capture-board vendors or from third parties. (PAL is the broadcast TV standard for most of western Europe and SECAM is the broadcast TV standard for France.)

Getting Control Image-adjustment capabilities vary between video-capture board software programs. SuperMac’s ScreenPlay capture utility (at right) offers only minimal control. MovieRecorder (at left), which the VideoVision and WTI-Moonraker boards use for capture, gives you much more flexibility. RasterOps’ MediaGrabber program offers, in two windows (shown at bottom of facing page), comprehensive color (at right) and video (at left) controls.
Europe; SECAM is the broadcast standard in France and eastern Europe; NTSC is the TV standard for North America, Japan, and Taiwan. All the boards here support NTSC and PAL; only the RasterOps boards support SECAM, however.

The video output consists of the entire Mac screen, complete with title bar and windows; a typical QuickTime movie will be only a fraction of that image.

Radius's Video Vision comes with color video output built-in. For computer-generated images, including the Mac desktop, the VideoVision produces exceptionally stable NTSC and PAL video output. This is quite an accomplishment; a computer image typically flickers severely when translated to video. That's because a television signal is *interlaced*, meaning a frame is split into two fields—one containing all the even-numbered lines, another with all the odd-numbered lines. The two fields are transmitted alternately and your eye sees the images as interlaced together on the TV screen. A 1-pixel-high horizontal line (such as the top of a window border in an application file) appears only in every other field, causing that line to flicker noticeably.

Radius gets around this problem through convolution, an Apple-developed technique to suppress flickering. Convolution does blur the image slightly, however, and it isn't usually necessary or helpful for live-action images; but you can turn it off.

The Right Connections

MOST OF THE VIDEO-CAPTURE BOARDS ACCEPT A composite video input through an RCA phono plug (composite video is a standard video signal that synchronizes the red, green, and blue components; composite video jacks are used in most home video equipment). In addition, some boards (such as Radius's VideoVision) have two or three input jacks that can be switched via software—a convenience if you're using multiple video sources.

Many capture boards also accept video input through RGB or Y/C (also called S-VHS) connectors. These connectors can sometimes provide a slightly better image—for example, S-VHS (which stands for Super-VHS) has more lines of horizontal resolution than the VHS videotape format. But QuickTime window sizes are so small, you won't be able to tell the difference in quality.

Sound Advice

THE VIDEOVISION, MEDIA TIME, AND SPIGOT & SOUND boards include the ability to record sound with your movies; the Moonraker accepts an accessory piggyback board for sound input. All three can record stereo sound—the MediaTime and Moonraker feature 16-bit sampling, while the VideoVision is limited to 8-bit.

For boards without sound input, you can get 8-bit mono sound either through a Mac's built-in microphone or—with poorer quality—through an external accessory such as Macromedia's MacRecorder Sound System Pro. A disadvantage with the MacRecorder, aside from having to buy one ($349), is that it draws a considerable amount of processing time from the CPU because the Mac manages the MacRecorder as an input/output device through the printer or modem port.

Picking and Choosing

FOR MY EVALUATIONS, I TESTED THE BOARDS IN A Mac IIci with 8MB of RAM, System 7.0.1, QuickTime Starter Kit 1.0, a standard 80MB Quantum hard drive, and Apple's 13-inch RGB display. I used Apple's 8*24 display board if no display adapter came with the capture board; this improves performance over the IIci's built-in video. These tests were for video capture alone, without audio, at the small QuickTime window size (160 by 120 pixels).

I performed a second series of tests on a Quadra 950 with 32MB of RAM and a 230MB Quantum drive. All the Quadra tests included audio as well as video recording using on-board sound input if available. The sound was recorded in mono at 11kHz, 8-bit sampling if possible. I conducted one round of tests with the small QuickTime window, a second at the larger 320-by-240-pixel size. Although QuickTime 1.5 wasn't available at the time of my testing, the latter size provides a good indication of how well the board will perform when mastering movies in the new, larger QuickTime window format.

Except for a special version of the VideoSpigot, I don't recommend these boards for the IIci because of that machine's power and space limitations. The VideoSpigot is also the only board available for the Mac LC and LC II. I didn't test any boards with hardware compression, which were either much more than my $3500 price ceiling or were not available in time for review.
### VideoSpigot

**JUDGING FROM THE TESTS I PERFORMED, SUPERMAC'S VideoSpigot (the least-expensive video-capture board available) boasts the fastest frame rate by far on an IIC—20.8 fps, twice that of the VideoVision. The VideoSpigot even manages 16 fps in a large QuickTime window on the Quadra.**

The VideoSpigot is a single NuBus board that works with a video-display board or built-in video; it also comes in Mac LC and IIsi versions, which are electronically equivalent but are sized to fit in those computers. The $1299 VideoSpigot Pro is a bundle of two boards—the VideoSpigot and SuperMac's Spectrum/8 24 PDQ video-display board—which supports a range of color monitors from 12-inch to 21-inch, a savings of $299 over buying the two boards separately. The VideoSpigot Pro is also available in an IIsi version for $1299; it supplies more capable display support than do the circuits built into the IIsi. SuperMac also packages the VideoSpigot NuBus in two more bundles—Spigot & Sound NuBus ($579) and Spigot & Sound Pro NuBus ($1399)—that add a MacRecorder to the package.

Capturing video with the VideoSpigot and MovieRecorder, the recording component of the Apple QuickTime Starter Kit, turned in an average performance—9.9 fps on an IIC. But with SuperMac's ScreenPlay, a proprietary video-capture program, performance improved to 20.8 fps. The Spigot achieves its fast capture performance by skipping a conventional input buffer and going straight to an efficient color-coding format. As a result, the VideoSpigot displays only a tiny (80-by-60-pixel), very jerky, monochrome image during capture. Not to worry, though; Adobe Premiere, the video-editing program that’s bundled with the VideoSpigot boards, enables you to adjust colors and hues after capture.

The VideoSpigot doesn’t produce the sharpest picture, unfortunately, and the board offers no provision for adding a hardware compression piggyback board. On the other hand, it’s the only board that doesn’t need hardware compression for mastering QuickTime 1.5 movies, and it’s inexpensive enough to buy simply for experimentation purposes.

### The RasterOps Boards

RASTEROPS PRODUCES THREE VIDEO-CAPTURE boards with the same capture circuit but with different video-display adapters. The $999 24STV, $2199 24XmTV, and $3499 24XLTV boards support small (13-inch), medium (16-inch), and large (19- and 21-inch) displays, respectively. All the boards offer 24-bit color; all have hardware pan and zoom. The MediaTime board is the same as the 24STV with the addition of stereo sound input.

RasterOps supplies Media Grabber, a proprietary capture program, with all of its boards. It offers unusually flexible adjustments to the incoming video signal, not only for brightness, contrast, hue, and saturation, but also for tone reversal, solarizing, and much more. The overall picture quality is slightly sharper than that of the VideoSpigot and comparable to that of the VideoVision.

MediaTime delivered 9.9 fps on a IIC, which is average performance. On a Quadra, the RasterOps boards produced only 5.3 fps in a large QuickTime window, so the boards aren’t suitable for mastering QuickTime 1.5 movies. And 15.2 fps for a small QuickTime window on a Quadra isn’t impressive, either.

The performance limitations may not be a problem if you add a piggyback board, for hardware compression. RasterOps plans to ship the MoviePak, a JPEG compression piggyback board, before the end of 1992 for $1999; for at least a limited time, Adobe...
Premiere will be bundled with the MoviePak. If the JPEG compression works well, this could make RasterOps a leader in full-screen, full-motion desktop video.

Among the RasterOps boards, the 24STV is the best bargain. The other models are much more expensive, and the 24STV still gives you plenty of editing flexibility—for example, you could hook up a 13-inch, 24-bit color monitor to the board for video capture and preview, as well as a larger 8-bit color monitor for editing and other work. The MediaTime board will suit users who want higher-quality stereo sound recording. Unfortunately, RasterOps doesn’t offer any major software packages with its video-capture boards.

**WTI-Moonraker**

The WTI-Moonraker is a single NuBus capture board that doesn’t have a video-display adapter. The Moonraker performed well for small QuickTime window movies on the Quadra 950, but when I changed to the larger QuickTime window, the Moonraker essentially died. It recorded the sound fine but could capture only 1 or 2 fps. According to Workstation Technologies, a software bug in the Moonraker’s interface to QuickTime is the culprit. At $695, plus $100 for the sound-input accessory board, the Moonraker is competitively priced but just isn’t in the running.

**VideoVision**

At $299, Radius’s VideoVision is one of the most expensive capture boards I tested. From a video-production standpoint, it’s also the most complete, with two sets of video and stereo audio inputs and full video-out and audio-out facilities.

The NuBus slot opening on the back of a Mac doesn’t have space for all those connectors, so a heavy umbilical cord connects the main VideoVision board to a large breakout box with the connectors. The built-in video-display adapter supports 24-bit color on 13-inch monitors, 8-bit color on larger displays.

A connector on the main board supports piggyback boards, not only for hardware compression but also for effects such as superimposing titles; connectors on the breakout box accept separate video and audio inputs for effects. Specific accessories on piggyback boards and pricing weren’t available at press time.

The VideoVision’s performance was similar to that of the RasterOps boards, except it did better with a small window on the Quadra. Although the capture rates certainly fell short of the VideoSpigot’s, the picture quality was cleaner and sharper.

The VideoVision should appeal to those in a video-production environment, for which input and output features are essential and the cost of adding a hardware-compression piggyback board probably isn’t a major barrier. Although the VideoVision doesn’t offer the wide range of image controls that come with the RasterOps boards, many video-production facilities have other means to accomplish the same ends. If your video work includes full Mac screens—such as for training videos—then the VideoVision is really the only choice.

**Coming Attractions**

Full-motion video-capture boards are still a relatively new product category. As with any burgeoning technology, you can expect to see a lot of new product enhancements and advancements in the coming months.

Several video boards offering JPEG hardware compression should arrive on the market in 1993, priced at about $2000. Currently, MPEG (Motion Picture Coding Experts Group) chips offer video playback or decompression only; an author/publisher must compress the video movie on a high-power workstation, where a one-minute movie takes from two and one-half hours to ten hours to compress. Sometime in late 1993 or early 1994, boards using the first full MPEG compression chips should be available. Although the first generation of full MPEG chips will be expensive, adding more than $1000 to the cost of a video-capture board, it’s clear that they will mark the true birth of widespread desktop video. And further down the road is MPEG 2, a more advanced standard intended for broadcast-quality images.

The year 1993 should also see the introduction of QuickTime for Microsoft Windows, which will greatly expand the desktop video marketplace (and thus bring hardware prices down, no doubt). A full-blown market should emerge later in the decade when MPEG playback chips, or their equivalent, become a standard feature in desktop computers, just as every Mac has the ability to play back sounds today.

If you’re eager to start those QuickTime cameras rolling, now is as good a time as any to get started, particularly with an inexpensive product like the VideoSpigot. On the other hand, with all the exciting enhancements and advancements around the corner, a little patience could save you some money, for no matter which video-capture board you buy today, chances are you’ll want to upgrade or replace it within 12 months. 

See Where to Buy for contact information.

CARY LU, author of *The Apple Macintosh Book*, 4th Edition (Microsoft Press, 1992), has been an independent film producer for *Sesame Street* and an associate producer for the *Nova* documentary series. His monthly column on the PowerBooks debuts in next month’s Macworld.

Product-testing assistance provided by TIM WARNER of Macworld Lab.
**REMEMBER THE OLD DAYS,** when the type you saw on screen bore almost no resemblance to what came out of the printer? Remember making dozens of printouts just to get a few letter pairs kerned properly? Remember when what you saw wasn’t even close to what you got? That’s where we are today with color. Adobe

**MANAGING COLOR**

**WITH NEW COLOR-MANAGEMENT TOOLS,**

**WHAT YOU SEE IS VERY CLOSE TO WHAT YOU GET**

Type Manager (ATM) and TrueType have all but solved the problem for type, but color users still face the screen-printer conundrum. The colors on screen simply don’t represent the colors that are going to come out of a color printer or slide recorder, much less those that come off a printing press. Even choosing the same color in different applications results in very different colors on screen.

And with color, the problem is much worse than with type. Color printer output is expensive and (painfully) slow, and it’s nothing compared with imagesetter film and proofs based on that film—figure a day or so turnaround, and $75 to $200 per page.

**BY STEVE ROTH**
Defining Color As We See It

Without color management, the computer sends an RGB (red-green-blue) color selected on screen to the printer driver or printer, where the RGB values are converted to CMYK (cyan-magenta-yellow-black) values that can be used by the printer. Such conversions often yield disappointing results—the output may vary markedly from the screen image.

To get as close a match as possible, a color-management system (CMS) uses the appropriate monitor and printer profiles to transform the RGB values and map them to a device-independent perceptual color space. Those specifications are then sent to the printer driver or printer. The CMS thereby creates a common language for the printer and monitor, leading to output that more closely approximates the screen image.

Color-Management Systems

This is where color-management systems (CMSs) from Apple, Electronics for Imaging (EFI), Eastman Kodak, and Tektronix step in. The most significant system is ColorSynch, an operating system extension, due from Apple by the time you read this, that will provide basic color matching between devices.

ColorSynch is set up so that an alternate CMS software can simply “plug in,” effectively replacing the Apple ColorSync and Kodak Color Management System (KCMS) with Kodak’s line of products for color houses and service bureaus. Tektronix, likewise, now offers its TekColor CMS simply as a tool for users of its color printers, rather than as the industry-wide solution that was originally envisioned.

CMSs should operate on color the way ATM operates on type; they should make colors uniform and predictable across devices—monitors, scanners, and printers—as well as for color separations. CMSs will also offer several other advantages.

- A system-level CMS like Apple’s ColorSynch promises to bring uniformity to the way different applications display colors. A given color specification in Claris MacDraw, for instance, will display the same as that specification in Aldus PageMaker.
- A CMS can simulate on screen or on printouts what different kinds of output might look like—a photo printed on colored stock, for instance, and viewed in daylight; or the same photo printed on uncoated stock, viewed under fluorescent lights.
- With a CMS you can view on screen a simulation of how colors will look on your target output device.
- If you’re passing files around within a workgroup, a CMS can help ensure that colors viewed on one machine look the same on another.
- High-end CMSs from EFI and Kodak also manage color separation—conversion of color values into the four process colors, cyan, magenta, yellow, and black (CMYK), to produce film for offset printing.

But even with color-management systems, you shouldn’t expect exact correspondence between screen and output, or between different output methods. The media are simply too different. A monitor’s color gamut—the range of colors it can display—varies greatly from that of a color printer, slide recorder, or printing press. The standard example is bright blue: it looks great on screen, but with the inks a thermal-transfer printer uses, you get blue green or purplish blue.

Given that, it might seem that the best solution is to simply resort to printed swatch books, as I suggested in “All about Color” (Macworld, January 1992). That’s a reasonable solution if you’re working with flat colors—tinted lines, boxes, curves, and type. You can look at a swatch book, type in the color specs, and know what your output colors will look like—even if they don’t look right on screen.

Color-management systems can go a long way toward alleviating the need for swatch books, howev- er. Given a sufficient library of detailed device profiles, or characterizations, a color-management system can adjust colors as they move between devices to achieve remarkable uniformity. A profile describes the gamut of a device (the range of colors it can produce) and the dimensions of the color space within that gamut (how the colors are distributed). A profile can also contain one or more separation tables—lookup tables for converting colors to CMYK values. It also may contain mathematical hints that allow the color-management system to take greater advantage of a device or avoid some of its limitations.
Color-management systems are of special interest to anyone who works with scanned images, since swatch books aren't of much use with scans. Sure, you can examine a single pixel in a scan with an on-screen densitometer, determine its numerical RGB or CMYK values, then look at a swatch book to see what that pixel will look like off the printer or the press. But that's just one pixel out of millions. Professional color separators can look at the numeric values in a section of, say, a human face, and judge whether they're appropriate; but for most mortals, numeric values and swatch books are not much help for working with scanned images.

The goal of color management is to allow you to rely more on your monitor in predicting what color-printer or slide-recorder output will look like, and to rely more on your monitor and color-printer output to predict what offset-printing output will look like. Where professional color separators almost completely "fly by the numbers" (knowing not to trust the screen), the rest of us need more visual landmarks to get where we want to go.

Apple into the Fray
THE MOST SIGNIFICANT RECENT DEVELOPMENT IN color-management systems for the Mac comes, not surprisingly, from Apple. As part of QuickDraw GX (the Mac's revamped—but as yet unreleased—graphical toolbox), Apple includes ColorSync—a system extension and set of device profiles that implement a system-level CMS for the Mac. There's also a new extensible Color Picker tool kit to which developers can add their own models.

Since ColorSync works on the system level, expect almost every application to take advantage of it in the near future. Also expect to see ColorSync profiles for almost every device on the market— including scanners, monitors, and printers. (Apple is leaving it up to device manufacturers to create their own ColorSync profiles.) Apple provides developers with a profile-building software utility, and you can be certain that calibration tools such as the RasterOps CorrectColor Calibrator will soon be able to create ColorSync profiles, if they can't already. Since it uses a fairly simple color-management method—the software engine that converts colors between color models and device spaces—ColorSync is also relatively fast compared with the more complex systems discussed later.

That simple method, however, can be inaccurate and lacks certain features—notably process-color separation. While the new system lets one application pass CMYK information to another and converts RGB colors to CMY, ColorSync won't convert to the CMYK values essential to offset printing. ColorSync is great for anyone who is producing slides from Microsoft PowerPoint and just wants some improvement in screen-to-output fidelity. When color-matching accuracy and color-separation prowess is essential, however, you'll want to turn to one of the more robust CMSs, from EFI or Kodak.

Kodak Color Management System
KODAK HAS TWO COLOR-MANAGEMENT SYSTEMS, Kodak Color Management System and ColorSense. They differ markedly in operation and in their intended markets. KCMS, Kodak's high-quality solution to color management, is implemented in products for people producing imagesetter output for offset printing. KCMS is central to Kodak's Precision series of products (calibration tools for imagesetters, scanners, and digital color printers). It's also the heart and soul of Kodak's two complete hardware-and-software systems for service bureaus and color houses—Prophecy and PCS100.

Prophecy is an $89,500 combination of hardware and software using Macs and (primarily) Sun workstations. PCS100, a $30,000 Mac-based system, works with Adobe Photoshop to implement KCMS from scanner and monitor calibration through color proofing of film output. The Mac Quadra 950 and a SuperMac monitor make up the platform for PCS100, which includes a monitor calibrator, a custom accelerator board, and a software set of several applications and utilities (see "How the Kodak System Works").

PCS100 is designed so you create your own scanner and monitor profiles based on your equipment and environment. The system comes with one output profile for a given color-proofing system (such as 3M's MatchPrint and Enco PressMatch), as well as a profile for the Kodak XL7700 color printer. Profiles for other
Apple's ColorSynch Is the Most Significant Recent Development

Photoshop is the central working tool—and the only Mac application that takes advantage of KCMS for PCS100. Once you've created profiles for your devices, you apply those profiles as Photoshop filters. If you want a screen rendition of what the color proof of a separated scan will look like, for instance, you apply that simulation filter to the scan. KCMS (rather than Photoshop) is also responsible for creating the separations, which you can save to disk as Desktop Color Separation (DCS) files for placement in other programs.

RasterOps CorrectColor

KCMS is also available in an off-the-shelf package from RasterOps, dubbed CorrectColor Management System (RCCMS). For $2498, RasterOps provides monitor-calibration hardware and software and Kodak's color-management software. An optional accelerator board for Kodak's software (essentially the same as the one in Kodak's PCS100) costs $3999. The calibration tools can also be used for measuring color and density values in reflective and transparent media. Like PCS100, the RasterOps system achieves its color-management effects via Photoshop filters. Unlike PCS100, CorrectColor comes with scanner profiles (currently available for Microtek, Nikon, and Optronics scanners), although it offers no facility for creating new profiles or modifying those provided. RasterOps also offers output profiles for several color printers (the Kodak XL7700 and XL7720, the RasterOps CorrectPrint 300, and the QMS ColorScript series). You get a couple of scanner and output profiles for the base price. Additional input profiles are $199; output profiles run $299. But the system lacks output profiles for offset printing. That problem, and the inability to create or modify profiles for input or output, makes for a high-end CMS that's missing the tools for high-end output.

Radius PrecisionColor Matching System

Another monitor manufacturer, Radius, has also developed a system that combines KCMS with a monitor calibrator. Like PCS100 and the RasterOps
CorrectColor system, Radius's $1199 PrecisionColor Matching System (PCMS) is based on a Photoshop filter that calls on the KCMS engine and database of profiles. It uses different filters than in PCS100 or RCCMS, however; it's more convenient because it lets you choose profiles when you use a filter, rather than choosing them via a control panel. As with PCS100 and CorrectColor, the filters provide options for scanner simulation (showing on screen what the original looks like), output simulation, and output correction.

The 16 PCMS profiles, for scanners and printers, come on a locked CD ROM. The base price allows you to unlock one scanner profile and one output-device profile. Monitor profiles are created using Radius calibration hardware and software. No profiles are provided for offset printing (hence there are no tools for final separation output), though eventually they will be available for about $900, according to Radius.

**Kodak ColorSense**

**KODAK ITSELF ALSO OFFERS A SHRINK-WRAPPED, OFF-THE-SHELF COLOR-MANAGEMENT SOLUTION AIMED AT PEOPLE WHO AREN'T SATISFIED WITH APPLE'S COLORSENCH, BUT WHO DON'T NEED THE COLOR-SEPARATION FEATURES OF KCMS OR EFI COLOR. KODAK'S $495 COLORSENSE PACKAGE CONSISTS OF A MONITOR CALIBRATOR AND A SCANNING TARGET, PLUS TWO APPLICATIONS—ONE FOR CREATING SCANNER AND MONITOR PROFILES, ANOTHER FOR OPENING, ADJUSTING, SAVING, AND PRINTING COLOR GRAPHIC FILES.**

With the ColorSense Color Manager application, you can open a color bitmap or object PICT file, automatically adjust it based on your scanner profile so the image more closely matches the original scan, view on-screen simulations for different output devices, and then print or save the image with the appropriate corrections applied.

ColorSense also includes a control panel that implements its color-management method for any application. It adds a button to the top right of document windows; when you click on the button, ColorSense Extend simulates printed output on screen. With programs such as Microsoft PowerPoint or Aldus Persuasion, which use the standard Apple QuickDraw routines for printing, ColorSense Extend will also match printed output to what you see on the display. (This does not work with programs like Aldus PageMaker and FreeHand, QuarkXPress, or Adobe Illustrator, which bypass QuickDraw for printing.)

ColorSense comes with a wide variety of output profiles (but none for offset printing or proofing systems), and you can modify monitor and scanner profiles to match your hardware, making ColorSense a versatile and complete solution—as long as you're not going to press.

**EfiColor**

**EFICOLOR, FROM ELECTRONICS FOR IMAGING, WAS CONCEIVED AS A SYSTEM-LEVEL COLOR-MANAGEMENT SYSTEM (ORIGINALLY NAMED EPORT), AND THAT IS STILL THE INTENTION, ONCE COLORSYNCH SETTLES DOWN. IN THE MEANTIME, EFI COLOR IS USED BY ONLY TWO PRODUCTS—CACHET, EFI'S $595 COLOR-IMAGE-EDITING SOFTWARE (SEE REVIEWS, MACWORLD, DECEMBER 1992), AND THE EFI COLOR XTENSION FOR QUARKXPRESS. BOTH RELY ON THE EFI COLOR PROCESSOR (THE COLOR-MANAGEMENT "ENGINE"—SOFTWARE THAT HANDLES COLOR SPACE CONVERSIONS) AND THE EFI COLOR DATA- BASE OF DEVICE PROFILES TO MANAGE COLOR-MATCHING AND SEPARATION.**

Cachet currently provides profiles for six color printers and three offset-printing standards. Many additional output profiles are available for between $129 and $329 each. Cachet assumes that most photos need correction on screen, so the product de-emphasizes the importance of remaining as true as possible to the original. Therefore, Cachet provides no profiles for monitors or scanners, nor any method for creating those profiles. Market demands at the high-end will likely push EFI to provide those profiles and related tools for a system-level version of EfiColor, however.

EfiColor's latest implementation, the EfiColor XTension bundled with QuarkXPress version 3.2, which should be available early in 1993, takes the system—and color management in general—to a new
level. It allows you to tag elements on a QuarkXPress page, specifying their source profile (Apple 13-inch RGB monitor, SWOP-corrected scan, Pantone, and so on). EfColor handles the screen display and separations for all elements, using one of two gamut-mapping methods (Photographic and Flat Color), depending on which is appropriate to the source and output profile. EfColor will also read tags that are included in files in EFI's new Metric Color Tag (MCT) format.

**POSTSCRIPT LEVEL 2 USES A SOPHISTICATED COLOR-MANAGEMENT ENGINE**

(Cachet is currently the only program that includes these tags). The EfColor XTension comes with 4 output profiles and 10 or 12 monitor profiles. The XTension adds a gamut alarm—it goes off if a selected color falls outside the gamut of the target device—to the QuarkXPress color-picker dialog box. Additional monitor profiles will be available for free via online services and other channels. No scanner profiles are available, making this system most useful to Cachet users who can save MCT-tagged files.

Based on this innovative QuarkXPress connection and the enthusiastic initial response to Cachet—particularly its color matching and output quality—EfColor holds promise of being the CMS of choice (with KCMS as the other contender) in the high-end color-separation arena.

What's a Color?

Asking “what's a color?” may seem like asking “what's a tree?” but it's actually a tough question, and one central to understanding how color-management systems work. If you specify certain red, green, and blue (RGB) values, are you specifying a color? Not really, because those values yield very different colors depending on the device they're sent to. The same is true with specifying colors using cyan, magenta, yellow, and black, or CMYK (though with CMYK, printed swatch books can provide a reference, so most people agree that certain values yield a particular color).

The problem lies in specifying colors by what the colors look like, not by the numeric values they are composed of. To that end, all the color-management systems work internally with device-independent, or perceptually based, color models. These models (CIE XYZ, CIELab, and other cryptic monikers) all define the full range of human-color perception and use numeric values to specify colors within that space (see “All About Color,” Macworld, January 1992). Unlike RGB and CMYK values, which are dependent on the device they're displayed on, values specified using a perceptually based color model really do specify a given color.

RGB and CMYK values are useful in defining a color, however, if you specify which device you’re talking about. “The values r, g, and b as displayed on an Apple 13-inch RGB monitor,” for instance, does name a color. There's a reference standard (in this case the Apple 13-inch RGB characterization) that tells us what those RGB values look like. This method of specifying colors is often referred to as calibrated RGB. A CMS can use straightforward mathematics to convert between calibrated RGB and a device-independent color model, or vice versa.

**TekColor**

TEKTRONIX HAS BEEN A LEADER IN PIONEERING THE use of device-independent color on the Mac. In 1989 the company came out with TekColor, a CMS that it sought to promulgate as an industry standard. That effort has fallen by the wayside (the companies that Tektronix was trying to evangelize were primarily, and of necessity, its competitors), but TekColor lives on in printer drivers and utilities provided with Tektronix printers. It's also available in two products from TekColor licensees—SuperMac's SuperMatch monitor-calibration system and Savitar's ScanMatch scanner-calibration software. The latest incarnation of TekColor is TekColor PS, which comes bundled with the Tektronix Phaser line of PostScript Level 2 color printers. (PostScript Level 2 is the latest generation of Adobe's page-description language. It includes sophisticated color-management capabilities.) It combines a control panel and a Chooser-selectable PostScript printer driver that offers a limited set of tools and options for adjusting printed output. Tektronix also provides downloadable PostScript routines for use with applications that bypass normal QuickDraw printing methods. The most significant thing about TekColor PS is its use of PostScript Level 2 color commands to effect its color matching. No other CMS does that. The TekColor Picker that came with previous versions of TekColor is not provided with TekColor PS; instead you get an F-key that temporarily freezes the screen and adjusts the colors to simulate what printed output will look like.

**PostScript Level 2**

THOUGH DEVELOPERS LIKE TEKTRONIX ARE BEGINNING to scratch the surface, few if any are tapping the color-management potential of PostScript Level 2. There’s a sophisticated color-management engine built into Level 2, and programs can tap Level 2's powers in many different ways—to achieve color matching, color-model conversion, and even color separation—with color-management processing happening in the output device, rather than in the computer.

There are advantages and disadvantages to this approach. Service bureaus, which prize every second they can eke out of their imagersets, would much prefer to handle the processing on accelerated Macs that then send corrected data to PostScript. Other users, whose Macs are always busy but whose printers often sit idle, will be more likely to take to the correct-it-in-the-printer approach espoused by Adobe.

Another factor is screen previewing. If your system relies on Level 2 to handle color matching, it’s a one-way street. You can get the printed output to more closely match the screen, but not vice versa.

**The Future of Color Management**

A COMPLETE COLOR-MANAGEMENT SYSTEM SHOULD provide fast, accurate color matching between any two devices, and should include hand-tuned profiles for a wide variety of scanners, monitors, printers, slide recorders, and offset-printing methods (as well as the means to customize profiles). The system should work with all your software packages, providing scanner-to-
Color-Matching Options

Color-management systems attempt to map the colors in a source image, such as a scanned photo or screen drawing, to the closest colors offered by the output device, in this case a QMS ColorScript 100 Model 30. Two of the many color-matching methods are shown below. (Photo courtesy of PhotoDisk.)

Perceptual Matching
Screen colors are mapped uniformly within the printer gamut. None of the resulting colors are the same as in the original screen image, but they maintain the same proportional relationships, and the total number of colors in the image remains the same—albeit within the more narrow range of the printer. This makes perceptual matching best for photographs. Note the close approximation of skin tones in the baby’s face, with little blue contamination. But blue areas in the solid-color image were forced into a distinctly purple tone.

Colorimetric Matching
Screen colors outside the printer’s gamut are mapped to the closest match. But screen colors that fall within the printer’s gamut don’t change. This produces fewer colors, since several screen colors may be mapped to a single printer color. Colorimetric matching works well with spot colors, where the closest match is most important. In the pie chart, for example, the yellow is less polluted with cyan than in the perceptual matching test, and the blues appear more blue. In contrast, the photograph has an overall blue cast, and skin tones a purple tinge.

screen-to-output color matching, as well as on-screen simulations of various output methods. Unfortunately, no current system offers all these features.

Still, these are auspicious times for color management. In the next year Apple’s ColorSynch will become established as the standard, with just about every hardware and software manufacturer supporting it to some degree. KCMS, ColorSense, and EFIColor will emerge as plug-in, system-level adjuncts to ColorSynch, providing more-demanding users with the tools they need for higher-quality output.

EFIColor and KCMS, with their sophisticated color-separation engines, will slug it out for the dollars of higher-quality publishers. It remains to be seen which of these will be most widely supported by the industry—which will develop the largest library of device profiles and supporting calibration systems. (EFIColor seems to have the early lead with its newly announced library of output profiles.) ColorSense, with its low price, large library of profiles, and simple operation, will make good sense for the middle ground—those who want “good enough” color. TekColor will fade away, relegated to the role of a utility for those who happen to have Tektronix printers.

One thing is sure, however. In the next year, you will be able to trust your monitor, your printer, and your software more than ever. We’ll move much closer to the situation we now have with type, so that what you see, finally, bears a reasonable resemblance to what you’re going to get.

See Where to Buy for contact information.

STEVE ROTH is coauthor of Real World PageMaker (Bantam Computer Books, 1990), and editor of Real World FreeHand and The QuarkXPress Book (both Peachpit Press, 1991).
Among the LCD panels with the best image fidelity are (clockwise from top) the Chisolm TFT Rainbow HD Model 700, nView MediaPro, and Delch Prism Pr1050.
Crystal-Clear Presentations

by Suzanne Stefanac

After hours of hard work on your presentation, the text reads well, the graphics are riveting, and the splashy video segment is sure to clinch the deal. One dilemma remains: Which display technology will show off your presentation to best advantage?

An old-fashioned slide show lacks a dynamic edge. Exporting the presentation to video means giving up interactive control. A large-screen monitor is still too small for the audience you have in mind; besides, it's too heavy to take on the road. A three-gun cathode-ray tube (CRT) video-projection system is even heavier, and it requires the expertise of an audio-visual technician to focus the beams. And liquid crystal display (LCD) projection panels still aren't up to the task, right?

Wrong. It's true that LCD projection panels have generally been considered poor cousins in the display family. They've been plagued with limited color ranges, poor contrast ratios, narrow
CHOOSING LCD PROJECTION PANEL TECHNOLOGY is easy. Selecting a panel from the spectrum of products on the market is not. At first glance they seem to be amazingly alike.

Each of the 12 panels tested by Macworld Lab comes in notebook-size casing that connects fairly easily to a computer or composite-video output device (which can be a TV, VCR, video camera, or videodisc player). These panels represent the companies' best products; budget-conscious users will be able to find panels that offer narrower color ranges that nonetheless are fine for many business and education uses (see "LCD Panels in Focus").

You can also find some of the panels reviewed here from distributors such as Boxlight Corporation, MacLand, and NovaCorp International, for less money and with different names.

We also tested three products that combine the panel and an overhead projector in a portable unit. These have several advantages, of which the most important is that you are guaranteed enough light to display your images. Although an LCD panel may seem to be clear, it typically blocks more than 95 percent of the light going through it. That means you need a very bright light source, and that usually means you need an expensive, modern overhead projector with a brightness of 75 footlamberts or more.

Such a projector can cost several thousand dollars. And if you travel, there's no guarantee you'll find such a projector at each site. The LCD projectors with built-in light sources solve this problem, although at the cost of greater weight—anywhere from 20 to 40 pounds, versus 7 to 12 pounds for panels alone.

Whether panels or projection units, all products tested claim to display at least 256 colors. Although individual panels allow for a variety of adjustments, all include controls familiar to anyone who owns a color television: contrast, brightness, and tint.

Connecting to a Mac II or Quadra is no problem for any of the panels, although the necessary cables to connect to a Mac for Dukane Corporation's Magniview 494, In Focus Systems' TVT-3000, Sharp Electronics' QA-1050, and Teles Communications' MagnaView 1000 are optional, so be sure to specify that you need Mac cables when you buy. All the tested panels let you view images concurrently on the panel and on a standard 14-inch monitor. Despite the Mac LC II's nonstandard video signal, all the panels work with this machine, as long as you don't have a 12-inch color monitor attached to the LC II. The Proxima Corporation Ovation A822C further requires that you also connect the panel to a 14-inch monitor.

To run a panel using a PowerBook, you need a third-party adapter, such as the Radius PowerView, Envisio Notebook Display Adapter, Lapis Technologies PowerBase, or Aura Systems ScuzzyView. (Macworld will review several such adapters next issue.) But even with the adapters, we couldn't run the Dukane Magniview 494 or the In Focus TVT-3000 or System 6000 with PowerBooks.

Color Schemes

A GROUP OF MACWORLD EDITORS SPENT SEVERAL days in a dark room surrounded by images projected by LCD panels; we saw real differences among the panels, particularly in how they display combinations of color. All the panels reproduced a fairly wide spectrum of color—even the passive matrix ColorWorks A522C from Proxima Corporation, although its projected images had a faint blue cast. The other LCD panels use the better-quality but more-expensive active matrix technology that prevents such casts.

Despite the fact that promotional materials for LCD projection panels often contain the phrase "true color," the term is not being used the same way it is used elsewhere in the computer industry, where it has come to mean full 24-bit technology yielding 16.7 million colors. Vendors claim all sorts of num-

*CRYSTAL-CLEAR PRESENTATIONS*
bers for their panel's color range. The differences are not due to the capabilities of the liquid crystals, since most of the liquid crystals within a display are made by the same few Japanese firms. Instead, the differences are due to how the LCD panel vendors control the amount of light passing through the liquid crystals.

Each company installs in its panels controller boards that apply proprietary schemes that create the perception of a different number of colors. These schemes control the amount of voltage applied to each pixel on the panel; the more levels of voltage you apply, the more shades of colors you can see (see "How Color LCDs Work"). We found some schemes to be more successful than others.

But before we could evaluate a panel's color range, we first had to get the panel to display its maximum number of colors. That was almost always a challenge, since the controls were often unintuitive and since the color settings usually had to be tweaked for each new image.

First, all the panels offer more than one level of color; for example, the Sharp Electronics LCD Products Division QA-1050 (and a beta version of the new QA-1150) toggles between 512 and 185,000 colors, while the Magniview 494 offers seven levels: 8, 64, 729, 2000, 8000, 21,000, and 117,000 colors. Most panels require that you choose the number of colors to be displayed from a control panel or from a remote-control device; the Sayett Technology Mediashow projection unit and nView Corporation's Mediashow panel and Luminator projection unit automatically configure themselves to the highest number of colors your computer can handle.

At the Controls
IN VIEWING OUR VARIOUS TEST IMAGES—COLOR wheels, block text, high-resolution full-color scanned photographs, and composite video (music videos played on a VCR)—we found, predictably enough, that the lower numbers of colors proved best for text and simple graphics, and the highest number of colors generally improved the display of composite video and scanned photos. Still, we found trying all the options to be a good idea—you can't always predict which setting will best suit a given image.

Each panel offers a unique set of knobs, buttons, and menu items that let you further tweak the image. Most let you nudge the image to fill the screen to best advantage, and you generally have the option to clear the screen. Many let you invert the image, a feature designed for DOS users, since the white-text-on-black-background DOS display can be hard to read when projected.

How Color LCDs Work

Left to their own devices, the liquid crystals in an LCD panel align themselves between the glass plates in a twisted pattern; light can then pass through the panel undisturbed. When an electric current is applied, the liquid crystals untwist (A) and light is blocked by the polarizing filter on the glass plate. Different amounts of twist result in different amounts of light passing through.

In color LCDs, there are three subpixels per pixel—one each for the pixel's red, green, and blue components. A film with alternating stripes of blue, red, and green adds color (B) to the light emanating from the liquid crystals forming each pixel.

Passive Matrix

Less-expensive panels use a grid, or matrix, of electrodes (flat wires). The intersection of current from the horizontal and vertical electrodes—called passive matrix technology—determines the charge at a particular spot in the panel. That charge determines whether that spot is on or off, and its intensity if on. Current moves from electrode to electrode in a cycle. Only one pixel at a time can be activated.

Active Matrix

Active-matrix panels are more complicated and more precise. Rows of horizontal and vertical electrodes, called thin-film transistors, form a grid, or matrix, of pixels. Each pixel can be controlled individually, staying on as long as needed, rather than having to be refreshed periodically the way pixels in a passive matrix display are. Several pixels can be activated simultaneously.
CRYSTAL-CLEAR PRESENTATIONS

Connection Options The nView Luminator supports the widest variety of inputs, making it a good example for showing standard video ports. The three types of video ports at left are the common forms for standard TV and VCR video. The fourth type of port handles the standard computer video (EGA and VGA). Mac II and LC owners can connect their Macs to the VGA port by using a VGA-to-Mac adapter, which most vendors now bundle with their LCD units. A VGA-out port lets you duplicate the projected image on a second monitor (handy for the LCD's operator). A VGA-to-Mac adapter is also needed.

The Vision 16.7 from Apollo includes the fewest controls, since it is preconfigured at the factory, which makes it good for plain old plug-and-play operation. The In Focus TVT-3000, Proxima Ovation A822C, and Sayett Mediashow boast the greatest number of controls, giving you more flexibility in how to display a variety of images.

For the daring, several panels offer special effects. If, during your presentation, you find that you need to access your hard drive to check a database or to edit text, the Chisholm TFT Rainbow Models 600 and 700, Dukane Magniview 494, and Proxima Ovation panels let you freeze the current image on the panel while you navigate elsewhere on the computer. The nView MediaPro panel includes a nice set of "curtain" effects that smooth transitions from one image to another—just like higher-end presentation programs offer. The Dolch Computer Systems Prism Pr1050 and the Sharp panel let you zoom in on the center of the screen, a boon for presentations with more-sophisticated graphics. (People usually center a graphic object of interest, while text usually runs from one side of the screen to the other.) The Dukane Magniview 494, nView MediaPro, both In Focus units, and both Proxima panels let you set the panel for rear projection.

Gauging the Trade-Offs

TO ACHIEVE THE SHARPEST POSSIBLE IMAGE with the truest color reproduction often involves trade-offs. For example, we found that the Apollo Vision 16.7, nView MediaPro, and In Focus Systems panels displayed impressive color, but fine lines in text and images appeared a bit blobby despite our best knob-turning and button-pushing. This blobbiness is caused by the LCD panels' equivalent of moiré patterns, in which the matrix of the liquid crystals doesn't quite match the matrix of the screen image's pixels. Other units, most notably the Proxima ColorWorks and Sayett Mediashow, managed to display fine lines with aplomb; but alas, we were never able to bring up really wonderful color. The only panels to display a true gray—a good test of color fidelity because it requires equal amounts of red, green, and blue—were the nView MediaPro and the Chisholm TFT Rainbow HD Model 700.

While most of the panels display the 640-by-480-pixel standard resolution of a 14-inch monitor, the In Focus System 6000 is unique in that it relies on a resolution of 480 by 440 pixels. The projected image is very crisp, but because the panel is displaying fewer pixels than the computer is generating, you must choose between compression and cropping. The default setup, which we found to be quite satisfactory, applies a compression scheme to the horizontal pixels and deletes the bottom 40 pixels. You
can also choose a cropping mode that lets you pan about the image to choose which 480-by-440-pixel selection to display.

Sharp's new QA-1150 panel has a 640-by-480-pixel resolution, but its display area is smaller than the QA-1050's—8.4 inches diagonally as opposed to 10.4 inches. Based on the beta unit we saw, the projected image does not seem to suffer from the miniaturization, and since the smaller format means more efficient manufacturing, the QA-1150 lists for only $4995, or more than $1000 cheaper than the QA-1050. That's as inexpensive as some passive matrix panels, and it includes a video composite adapter for TV and VCR.

**Multimedia Bound**

**IF A PRESENTATION IS REALLY GOING TO WOW** the crowd these days, you almost have to incorporate video. Any of the panels let you display video if you already have the proper video hardware installed in your computer, but many panels come with their own composite video converters, letting you display video without extra boards or software. "LCD Panels in Focus" notes which panels offer this support.

Until recently, incorporating full-motion video into a presentation using an LCD panel was the stuff of dreams—full of blurs and barely discernible images. The refresh rate on passive matrix panels is too slow to keep up with composite video's 30 frames per second, which is why the Proxima ColorWorks terminator and MediaPro, Proxim a Ovation A822C, QA-1050. That's as inexpensive as some passive matrix panels, and it includes a video composite adapter for TV and VCR input.

**Setup Tips**

**When preparing for a presentation using an LCD projection panel, here are some important points to keep in mind.**

**Transport** The panels are fragile, and great care should be taken in transporting them. The nView MediaPro and the Apollo Vision 16.7 come with hard carrying cases; most of the other vendors offer hard cases separately. They are a good investment. Also, avoid exposing the panel to sunlight and try not to leave it in a car. They are quite sensitive to extremes in temperature. Should the LCD panel be exposed to extreme heat or cold, leave it at room temperature at least 30 minutes before turning it on.

**Overhead Projector** Unless you already have an LCD panel with a built-in projector, you need to rent or buy a good overhead projector—a projector using a metal-halide bulb with at least 360 watts is generally adequate; 500 watts is better. A unit you've had for several years may run too hot and not be bright enough.

Also, make sure that the projector is a transmissive model, not a reflective one—the light should shine from beneath the panel, not reflect from above.

**Screen** You can, of course, project the image onto a bare wall, but a good screen greatly enhances the quality of a presentation. There are three main varieties of screen: matte, lenticular, and beaded.

Matte screens are a bit dull, but because they have a wide viewing angle, they are a good choice when there are people off to the far sides.

Lenticular screens reflect light from very thin ridges, and the image is quite sharp directly in front of the screen.

Beaded screens combine the best of both worlds, reflecting light very well and allowing a wide viewing angle.

**Temperature** Once you are all set up, let the LCD panel warm up for about 20 minutes before adjusting the color. It is more likely to remain constant through the presentation if you do. Also, condensation sometimes clouds the glass during warm-up.

**Over time, heat may build up inside an LCD panel. They all come equipped with fans to counteract the intense heat from the overhead projector (so don't block the fan), but you may see some discoloration if the panel becomes too hot. Take it off the projector immediately, let it cool, and try again.**

Also, because many of the fans on the panels are light-sensitive—they shut off when you remove them from the projector or turn off the projector—remember to unplug the panels when you are done with your presentation. Otherwise, the panels might overheat from the heat they generate internally, which could damage the panel.

**MANY PANELS COME WITH**

**COMPOSITE VIDEO CONVERTERS, LETTING YOU DISPLAY FULL-MOTION VIDEO FROM A TV, CD ROM, OR VCR**

**Lab Notes**

Optional video adapters are available for the Apollo Vision 16.7 ($1099), Sayett Mediapluš ($1200), and Dukane Magniview 494 ($1000) for NTSC, PAL, SECAM, and S-Video formats; adapters are available for the Sharp QA-1050 ($300) for NTSC and PAL formats; and for the In Focus TVT-3000 ($595) for NTSC format. (A new composite video adapter adding PAL and SECAM capabilities for the TVT-3000 should be available by the time you read this.)
And what would a good multimedia presentation be without sound? In most cases, you have to rely on a VCR or another playback device to control sound. But the Proxima Ovation lets you adjust volume from a remote control, and the In Focus System 6000 and nView Luminator projection units come with volume controls that can be set separately. (These menus appear on the projection panel.)

We found only one serious problem with the Proxima Ovation. When the control unit is placed on the back of the projector, it doesn’t have an infrared connection to the remote. You have to place the remote control on top of the projector, or you can opt for the deluxe Telex RPC-1S remote mouse. The Proxima remote offers more features than the Mac’s control, and it can be used in front of an audience. (Remotes are $125 options for the Chisholm and Telex panels; the Vision 16.7 remote comes with the optional video adapter, not with the panel itself.) We also appreciated one nice feature in our dark testing room: the small backlit LCD screen on the Dolch, In Focus, and Sharp remotes.

We found only one serious problem with the remotes. Though vendors often tell users to aim the control wand that can access the panel’s on-screen menus, which display LCD control options like image centering, these menus appear on the projection screen, not on the Mac’s display.

Most remote controls merely duplicate the panel’s handy little infrared remote-control units—the equivalent of a TV’s or VCR’s remote control, used to adjust color values, image centering, and the like—are a definite boon when you are trying to focus or adjust the color of an image in front of an audience. (Remotes are $125 options for the Chisholm and Teles panels; the Vision 16.7 remote comes with the optional video adapter, not with the panel itself.) We also appreciated one nice feature in our dark testing room: the small backlit LCD screen on the Dolch, In Focus, and Sharp remotes.

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THE ADVANTAGES OF ACTIVE MATRIX TECHNOLOGY over passive matrix are many: broader color range, better contrast ratio, faster response times, and wider viewing angles. The disadvantages can be distilled down to one point: price. Active matrix technology is extremely difficult to manufacture. Because each panel with a resolution of 640 by 480 pixels has three transistors (one each for red, green, and blue) at each site, there are 921,600 points at which a panel can go bad. And a few always do. Consequently, some vendors state the usable dot ratio for their product. For example, those citing a 99.996 percent figure are saying that up to 37 pixels on the panel may be permanently inactive when you buy it. The greatest number of allowable defects cited in our sample was 50 possible inactive pixels.

This is not a problem for fast-moving images. Hand-held TVs with 2-inch LCD screens may have as many as 20 percent of their pixels on the blink and you won’t really notice. But with static images generated for computer-based presentations, a tiny white spot here or there can be annoying. At worst, that spot may obscure a decimal point in your set of sales figures.

Even though a few inactive pixels are tolerable, many panels that roll off the production line exceed the allowed limit and must be discarded. The subsequent low yield of panels that pass the muster means higher prices.

On with the Show

ASSUMING YOU’VE ELECTED TO SPRING FOR AN LCD projection panel, there are a few final points you ought to consider. If your decision is driven by budget, check out the Telex MagnaByte 1000 and Chisholm TFT Rainbow Model 600, but bear in mind that their remote controls and carrying cases are optional. The Apollo Vision 16.7 was the easiest panel to set up, being preconfigured at the factory, but you don’t have much control over the image. If you’ll be heading for sites that might not have easy access to appropriate overhead projectors, consider one of the panel-plus-projector units (see “Setup Tips”).

Finally, given the rapid improvements in LCD flat-panel technology, it’s worth noting that it might not be long before these panels replace our loud, bulky, power-hungry CRT displays. The color is vibrant, crisp, and flickerless, and there are no extremely-low-frequency emissions to worry about. Until then, presenters who choose LCD technology will be the main beneficiaries.

See Where to Buy for contact information.

SUZANNE STEFANAC is a contributing editor to Macworld and she looks forward to the day when flat-panel liquid crystal displays are the norm.

Macworld Lab testing supervised by CHIP CARMAN.
It's happened to you a thousand times. You're deep in the equatorial jungle making a presentation. Suddenly you're captured by cannibals who speak only Kbonji, and you're thrown into a crude bamboo hut. As the frenzied cocktail-hour drums pound louder, you remember that you have an English/Kbonji-dictionary HyperCard stack—on your Mac back home in Hoboken, New Jersey. Clutching your PowerBook, you stare longingly at the lone phone jack in the corner of the cell. If only you had that dictionary now!

Because of a technology called remote-access computing, that kind of story always has a happy ending. Using a modem and a program called AppleTalk Remote Access (ARA), you can dial in to another Mac, wherever in the world it is, and get stuff from it. Or read E-mail, transfer files, or even use programs on the faraway Mac.

That means you no longer need to nervously pack up the PowerBook for each trip you make, racking your brains to make sure you've copied everything you'll be needing from your main Mac. If you forget a file, you can always phone home. And remote-access computing has even bigger implications if your office has networked Macs; you can dial in not just to an individual computer, but to the entire network, and use any equipment that's part of that network. Distant Macs show up on your screen as normal icons, as though each were simply another hard drive attached to your PowerBook. The whole thing, once it's set up, is amazingly simple.

Home-Office Hardware

Of course, "Once it's set up" is the operative phrase. Let's begin with the simplest scenario. You have one Mac at home and a PowerBook on the road. Security isn't much of an issue—you doubt that some hacker is going to crack your modem's phone number, dial in, and download your last six grocery lists.

If that's your situation, your first task is to equip each of the two Macs with a modem (a telephone hookup). Today's modems come in three standard speeds: 2400 bps (bits per second), also called "baud," 9600 bps, and 14,400 bps. The slowest ones cost as little as $90, but they can be frustrating to use for remote-
With a PowerBook and a modem, you can work anywhere. Here's how.

access purposes. If you want the remote Mac to respond to your actions without a 20- or 30-second delay, you need at least 9600-bps modems, which you can get for around $300 each. People who frequently call in from the road will tell you that it's worth paying $400 apiece for the third, still-emerging flavor of modems—14,400-bps—which really makes ARA sing.

If one of your Macs is a PowerBook, you may find life easier if its modem is built in. You save a lot of size and weight, don’t have to plug in some 5-pound black power-adapter cube, and don’t have to remember to pack the modem’s various pieces when you go traveling. Global Village makes both 9600-bps and 14,400-bps internal PowerBook modems, called the PowerPort Silver and PowerPort Gold, respectively. You probably don’t need me to point this out, but when two modems with different speeds connect, they communicate at the lower speed—so don’t buy one 9600-bps modem unless the second modem is also 9600 bps. And while you’re shopping—don’t pay any extra for fancy features like V.42bis or MNP Class 5; part of the beauty of Apple’s ARA software (which comes free with each PowerBook) is that it has similar features built in. (V.42bis and MNP Class 5 are data-compression protocols, which make transmitted data take less time to send over phone lines.) And one final thought on modem purchasing: the ARA software requires a special piece of software (a script) that’s customized for your exact modem model. ARA comes with 15 scripts, and others are available from various modem manufacturers—but make sure a script for your modem exists, somewhere, before you buy an off-market, cheapo modem.

Once your Macs are decked out in matching modems, you have to worry about the phone line at home. If you have a separate line for your modem, terrific. If not, you need to buy a voice/modem line switcher. It’s a little box that acts as a smart phone operator; when a call comes in, the line switcher automatically detects who’s calling—a person or another Mac—and routes the call to the phone or the modem accord-

by David Pogue
AppleTalk Remote Access requires System 7. It uses System 7’s file-sharing feature, which lets you designate which disks, folders, and files you want to make visible to remote accessers. Finally, you have to prepare the home Mac for receiving calls. There are so many steps to this process that you should consult, clip, and save “The Macworld Remote Access Cheat Sheet” for details. Suffice it to say that you should test the arrangement from your next-door neighbor’s house before leaving for the airport, just in case you have omitted any small part of the software setup. There’s nothing worse than being in Borneo, dialing Dallas, waking up your Mac, seeing its hard drive icon appear on your screen, and then realizing that you failed to turn on File Sharing for the folder that contains your vital documents.

Of course, Apple didn’t invent remote-access computing, and ARA isn’t the only software that can bring about this wonder. Farallon’s PhoneNet Liaison, for example, doesn’t just connect a PowerBook to a remote network—it connects an entire network to another network at a remote location. And if the remote Mac will be manned instead of unmanned—that is, if you want to train somebody from afar, or collaborate on a document simultaneously, or otherwise require the next best thing to being seated there—then consider a remote-control program. There are two: Farallon’s Timbuktu/Remote, and Microcom’s Carbon Copy Mac. Instead of just seeing and manipulating files on the remote Mac, these programs let you manipulate the Mac itself: as you watch the remote Mac’s screen in a separate window, you can move its cursor, choose menu items, and so on.

The advantage of these programs is that they don’t require System 7, as ARA does. The disadvantage is that they’re not free: PhoneNet Liaison is $395 (you need two copies if you want to dial in from either network); Carbon Copy Mac is $99.95 for two copies, $299 for an entire network zone’s worth; and Timbuktu/Remote is $195 per copy, $295 for a pair.

**Moments of Truth**

Once the hardware and software are rigged, everything’s easy. Make your flight. Check into the hotel. Have a $5 Snickers from the minibar. Plug the PowerBook’s modem into a phone jack—if there is a phone jack. (Unfortunately, all too many hotels feature Eisenhower-era phone technology, where the cord is permanently fastened to the wall instead of having a handy plastic clip-jack. In that case, your remote-access experiment is doomed.)

Double-click on the ARA icon. Type in your name; whatever password you
The Macworld Remote Access Cheat Sheet

I. SETTING UP THE HOME-BASE OR OFFICE MAC

1. The home-base Mac needs a modem, System 7, and File Sharing. If you didn't install File Sharing, insert the first Install disk of the System 7 floppy-disk set. In successive dialog boxes, click on OK; customize: File Sharing; Install.

When everything has been installed properly, you'll find about ten new files in your System Folder, or in folders therein.

2. Insert the AppleTalk Remote Access installer disk, and double-click on Installer. Click on OK, then Install. When the installation process is over, your home-base Mac's System Folder will contain two dozen more files, control panels, and specific modem modules (scripts) that, collectively, take up 5.7MB.

3. Restart the Mac.

4. From the Apple menu, choose Control Panels. Double-click on Sharing Setup. In the Sharing Setup dialog box, enter your name, a password (optional—if you enter one here, you'll be asked for it every time you try to access this Mac), and a name for the Macintosh. Remember your owner name and owner password! If you try to dial in later and don't type this information precisely, you won't be granted access to your own Mac.

5. Click on the Start button in the File Sharing section. Eventually, the button will change to say Stop. When it does, close Sharing Setup.

6. Open the Users & Groups control panel. Double-click on the icon representing your own name. In the dialog box that appears, determine how much access you want to give yourself.

Be sure you select "Allow user to dial in" in the Remote Access section. If, for security purposes, you want the Mac to call you back at a certain number (instead of letting you in when you call), select "Call back at #," and enter the phone number where you'll be.

If you want to grant access to others, open the Users & Groups control panel, and choose New User from the File menu. Double-click on the resulting icon, and repeat step 6. If security isn't an issue, also repeat this process with the Guest icon, and select "Allow guests to dial in."—but understand that anybody with a modem can now access your Macintosh.

7. Click once on your hard-drive icon, and, from the File menu, choose Sharing. In the dialog box that appears, select "Share this item and its contents." Specify the level of access you want each user to have. Close the window, and save changes.

Repeat this step with any other disks or folders you'll want to access.

8. Open the Remote Access Setup control panel. From the pop-up menu, specify the model and brand of modem attached to the home-base Mac. Make sure "Answer calls" is selected.

If you have an automatic-shut-down program, set it up now. The home-base Mac should now be ready for action.

II. USING THE POWERBOOK FOR REMOTE ACCESS

1. Install AppleTalk Remote Access, as described in step 2 above.

2. Open the Remote Access Setup control panel. From the pop-up menu, specify the model and brand of modem attached to or installed in the PowerBook.


Enter your name and password exactly as you entered them in step 4 of part I. In the Phone blank, enter the phone number of your home-base Mac's modem. (In this illustration, the number is preceded by #—to dial out from a hotel room—and a comma, which makes the dialing process pause for 2 seconds.) If you're not worried about the security risk, select "Save my password," so you won't have to retypew it each time you call in. Choose Save from the File menu, so that you create a connection document you can reuse. Click on Connect.


When you've successfully connected, the Status line will display the name of your home-base Mac. Don't forget to allow plenty of time for the home-base Mac to start up.

5. From the Apple menu, select Chooser. Click on AppleShare. On the right, you'll see the name of your Macintosh (and any other Macs on the remote network) and double-click on the one you first want to access. A dialog box appears.

6. Once again, enter your name and password, or click on Guest (if, in step 6 of Part I, you established access privileges for the Guest icon). Click on OK.

7. Now you see a list of any disks or folders available for file sharing. Double-click on the one you first want to access.

The drive's icon should now appear at the right-hand side of your PowerBook screen, where you can open it and use its contents as usual.

To save time, select the drive's icon now, and choose Make Alias from the File menu. Next time you want to dial in, just double-click on the alias; you'll be able to skip steps 2 through 5.
REMOTE POSSIBILITIES

gave yourself; and your home phone number, beginning with whatever digit is required to dial out of the hotel (usually 8). Choose Save from the File menu to create a connection document, so that you won’t have to type in all this information the next time you want to phone home.

Finally, click on the Connect button. The modem’s screeches and hisses will signal you when it’s successfully made contact with your home modem. (Your luck will vary, depending on the quality of the phone lines. Don’t expect a 100 percent success rate for overseas remote access.) You won’t immediately see your Mac to start up. Depending on what kind of system-extension fanatic you are, this loading process could take a while. In fact, you may even find that ARA gives up waiting for the home Mac to come online, and disconnects. It’s nothing to worry about; at least you’ve successfully turned on the home Mac. Dial it a second time, and you’re all set to go.

As directed on the Macworld cheat sheet, you’re now supposed to open the Chooser, click on the AppleShare icon, and select the Macintosh on which the disks or folders you want to peruse are located, entering a password for each (if you’ve set them up that way). They’ll appear at the right side of your screen. Here’s an important time-saver: if you think you’ll ever be calling your home Mac again (and I doubt you’d have spent $1000 on modems and hardware if you didn’t), make aliases of these disks and folders. The next time you need to sign on, just double-click on a disk’s alias. Just as any Mac prompts you to insert the correct floppy disk when you double-click on its alias on your hard drive, ARA remembers how it’s supposed to reach a remote drive: by dialing your home Mac, making the connection, bypassing all that AppleShare business, and bringing the drive online.

Once you’re connected, you’ve really accomplished two things at once. First, you’ve connected to your network, even if your entire “network” consists of one Mac at home. That means you can use any equipment attached to the network—laser printers, for example—or run any network-savvy software, such as Claris’s FileMaker Pro, On Technology’s Meeting Maker, or (most important) E-mail programs like CE Software’s QuickMail. These “network services” are available even if you didn’t turn on File Sharing to make a drive’s contents accessible.

If you did turn on File Sharing, you can also do anything to your files that you’d do if your home-Mac drive were attached to your PowerBook locally: open folders, trash or copy things, open and edit files, and so on. Each time the Power-

Plugging the Security Holes

Unless you’re the person in charge of an office network somewhere, you might reasonably wonder what the fuss over remote-access security is about. It might seem as though there are plenty of obstacles to unauthorized remote-network burgling. Obstacle #1: The intruder would have to know the phone number of the network modem. Obstacle #2: That person would also have to know the precise name and password of a legitimate user. Obstacle #3: Somebody has to have explicitly set System 7 to share the contents of any drive or folder containing sensitive files—and, furthermore, to share them with that particular user. Yet network administrators worry plenty. Their nightmares run along the following lines:

Figuring out a company’s modem phone number isn’t such a big deal to a patient intruder who’s willing to try a few combinations.

To obtain the phone number and a legitimate user name and a password, someone could steal your PowerBook—or just copy the AppleTalk Remote Access connection document aboard it. (Moral: For maximum safety, don’t use the “Save my password” checkbox in the ARA welcome screen. Instead, always type in your password.)

ARA has another security feature, called call-back. When you phone your network, ARA disconnects you and promptly calls you back, using a predetermined number. In theory, this system should prevent anybody but you from logging in. In practice, though, having the office Mac call you at a single number doesn’t work well—first of all, you’re likely to be moving from place to place as you travel; and second, the Mac can’t call you directly in a hotel room, since it would first have to speak to the hotel operator.

There are two levels of access involved in using ARA. First, you dial in to your network, where you have access to network services such as laser printers, E-mail, and network-accessible databases like FileMaker Pro. The second level of access: if Macs on your network have File Sharing turned on, you can actually open and edit individual documents on their disks.

Here’s the greatest gaping hole of all. For both access levels, there’s a special account called the Guest account. This account requires no user name and no password for access. Using the Users & Groups control panel, you can turn Guest access on or off independently for dial-in access and access to files. If the “Allow guests to dial in” checkbox is selected, anybody with a modem and ARA (without any idea of what a legitimate user name or password might be) can connect to your network, rename or tie up your laser printers, browse your network databases, dial out through your fax modems, and so on—even if Guest access to your files themselves isn’t turned on. The moral here: Make sure every Mac on the network has both types of Guest access turned off.

Some security-conscious people mutter about Apple’s failure to make ARA more secure. They gripe that there’s no way to vary a password over time, no way to trace an intruder, and so on. Still, the R and A in ARA stand for remote access; the program is designed to make remote networking as simple, not challenging, as possible. ARA was not designed to be a company-wide program; with ARA’s licensing limit of three Macs per copy, it’s clear that Apple meant ARA to be a personal solution. (The dial-in network servers from Shiva and Cayman Systems promise higher levels of security than does ARA alone.)

In any case, to protect the network, first eliminate the human holes:

(1) make remote users type in passwords manually; (2) at the office, turn off File Sharing for sensitive folders; and (3) most of all, turn off Guest privileges (using the Users & Groups control panel) for each Mac.

Even though you can take those precautions, the companies that make Macintosh security products hope you’re still worried—they’ve got an arsenal of added-security gizmos to sell you, ranging from software-based Mac lockers to card-size password generators that change the password many times a day.

If you are still worried, just unplug the modem and forget about remote access.
Book needs to access the remote Mac, you’ll see a little icon flicker in the upper-left corner of the PowerBook screen, and you'll notice a certain sluggishness (even at 9600 bps). If you can wait an ice age or two, you can even run programs that reside only on the remote Mac.

Office Alternatives
THAT'S ALL DANDY IF YOU'RE A ONE-PERSON operation. But what if you work in an office? What if the point of remote-accessing is not to retrieve something you've forgotten, but instead to work in your bathrobe at the kitchen table without even going into the office? (The word for this increasingly popular practice is telecommuting.) The other term for it is having a blast, as long as you've got the self-motivation and can keep the English muffin crumbs out of the keyboard.) More perplexing still: what if there are a bunch of you, all floating around the countryside with PowerBooks, and all of you need to dial in to the office every day?

One possibility, of course, is to take the personal approach described above and run with it—just multiply the number of phone lines and other gear times the number of participants. But since your office Mac is likely to be hooked, via network, into everybody else's Mac, somebody is going to start worrying about security. In fact, some people worry a lot about security; some big companies, in fact, hire a full-time specialist who does nothing but worry about remote-access security issues. Other companies, leery of making trade secrets vulnerable to any outside hacker (or rival) with a modem, have forbidden the use of ARA altogether (see “Plugging the Security Holes”).

Here's another problem with using AppleTalk Remote Access on a network. The ARA software has all kinds of sophisticated programming to speed things along: compressing data, checking for errors in transmission, and so on. In processing all these data manipulations, the home-base Mac has its silicon hands full. If somebody at the office has to use that Mac while you're connected to it, forget it—the office Mac will have all the pep and vigor of a slug on Sominex.

The security and speed problems of ARA on a network, however, pale in comparison with the task of the network administrator, the poor soul responsible for keeping the connected Macs safe, speedy, and running. As you'll see in the Macworld cheat sheet, you have to prepare the Mac using the Users & Groups control panel, which lets you identify, by name and password, the people to whom you want to allow access. Trouble is, you have to set up these names and passwords on each individual Mac, one at a time. Every time a remote-access user is added to or deleted from the list—or there's a change in somebody's level of access privileges—the network administrator must scurry from one Mac to another, making the change to each Users & Groups file.

High-Tech to the Rescue
AS IS ALWAYS THE CASE IN THE WORLD of Macintosh, a little money can buy a solution to these problems. One answer is the Shiva LanRover/E. It's an electronic gadget that you connect between your office modem and the network. The LanRover has the ARA software built into its circuitry. Since the host Macs don't have to be running ARA (or even System 7), they don't do all of the data processing necessary for remote access to work, so they don't slow to a crawl when some PowerBook user in the Midwest dials in. A second advantage: the LanRover's software contains its own version of the Users & Groups control panel—and it's all in one file. To change the user list (or a password), the network administrator has to modify the LanRover's User List file just once (not once per Mac). And when you've got the LanRover up and working, it lets you share your office modem over the network to access online services like AppleLink and CompuServe.

The LanRover, then, is a $699 solution to some of the ARA network problems—for small AppleTalk networks, anyway. Problems remain for larger (or EtherTalk-wired) networks; but new products are already in the pipeline to solve them. Cayman Systems' $1895 GatorLink does everything the LanRover does—but can also permit three modems to be attached, so that three remote users can be connected to the network simultaneously. Shiva's LanRover/E permits either four ($1999) or eight ($2999) users to be connected at once, and (like GatorLink) has an EtherTalk connector to accommodate that faster type of network wiring. (Both products should be available by the time you read this.)

Not So Remote
ONCE YOU'VE SET UP THE HARDWARE and software, you'll be astonished at how easy remote-access computing is. With one double-click, within a minute, you feel like you're home again (or at work again, as the case may be). The hardware may cost you something, but the software—System 7 and, if you have a PowerBook, the ARA software—doesn't cost a penny.

When you hook up to a Macintosh a continent (or a subway ride) away, your mind will certainly race: think of the possibilities! If a person can be productive without actually having to be somewhere specific, society's conceptions of the workplace, the workday, and even working in general will have to change. Remember these not-so-remote possibilities the next time you're stranded in the jungle—concrete or otherwise.

See Where to Buy for contact information.

As this article went to press, Macworld learned that Apple is no longer including a free copy of AppleTalk Remote Access with PowerBooks. ARA is now available for $199.

Contributing editor DAVID POGUE is the author of Macs for Dummies (IDG Books Worldwide, 1992), and is a leading authority on phone-jack technologies in cheap American hotels.
2-D CAD packages have become flexible tools for artists as well as engineers.

BY ANN MEYER

The lines are blurring between illustration and design; architects, engineers, and illustrators should all take a look at the latest CAD applications. CAD (computer-aided design) is primarily used to prepare technical specifications for buildings, automobiles, and other products. But the better CAD packages now feature a number of special design tools, including font outline curves, Bézier curves like those in Adobe Illustrator and Aldus FreeHand, the ability to place encapsulated PostScript files the way desktop publishing packages do, and 32-bit color support.

For many, the word CAD conjures up the image of a program that requires months of specialized training and expensive peripherals, such as digitizing tablets and pen plotters. But the Mac experience has opened developers' eyes to a variety of tools and techniques, many of which make CAD easier to learn and use, and less expensive to implement.

As more artists and illustrators try out CAD, they may find themselves wondering how they lived without geometry and snap features. Geometry features make it possible to draw circles by radius or diameter, to construct parallels to existing objects, to produce tangents and perpendiculars, to generate mirror images across any line, and to extend lines to a common endpoint or trim them at their intersection. It is much easier to create an arch between two columns by drawing a diameter circle, for instance, than by drawing a bounding box for the circle.

Snaps make it possible to attach lines, circles, and other entities directly to the ends of other lines, to the vertices of polygons, to the centers of lines or circles, to the point where objects intersect, or simply along the edge of an object. When you use snaps, you shouldn’t see gaps between objects (or lines extending slightly past other lines) no matter how close you look, even when you print to a 3000-dots-per-inch imagesetter.

The better CAD packages are faster than Illustrator and FreeHand when working with complex files. Moreover, architects and engineers will find that they don’t have to accept inferior programs to take advantage of the Mac’s ease of use. A few Mac-based CAD packages provide features that rival counterparts on other computer platforms.

What Makes a Good CAD Package?

3-D SOFTWARE HELPS SELL CLIENTS ON A PROJECT, but CAD users need a strong 2-D foundation. Designs are generally conveyed to builders via 2-D plans and elevations—the clear and succinct way to show construction information. CAD users revert to 2-D for dimensioning, to sketch out proportions of a de-
sign when a 3-D shaded view would take too long to prepare, and to create elements that are difficult to draw in 3-D packages.

Architects and engineers must create drawings to scale, and it's easier to design a 60-foot building in a program where the rulers (or numeric display) actually say 60 feet than to draw it 15 inches long at ½-inch scale. Since builders often measure from blueprints, the final drawing must be printed or plotted precisely to scale as supported by the better CAD programs.

It helps to have good translators so that users of different packages can share drawings (see "Translation Navigator"). Most CAD packages include or offer an optional translator for AutoCAD's DXF format. A few offer support for IGES (Initial Graphics Exchange Specification—a format common in workstation CAD programs that is sponsored by the National Bureau of Standards) or make direct translations between specific packages. Many users want translators to products such as Illustrator; a few CAD packages even have illustration features such as a blend tool and commands for fitting text to a curve and converting fonts to outline curves.

A few CAD developers, including Graphsoft, Engineered Software, Intergraph, Ashlar, and Innovative Data Design, have added support for viewing 32-bit raster images so that users can trace data from satellite images and other graphics scanned into the computer. Features such as autotracing make it easy to use the mouse to trace highly magnified views of images that might once have been traced on a digitizing tablet. Because users can scan an image in, then compare both the scanned image and tracing on screen, they can correct mistakes they might not have noticed using a tablet, which shows only the tracing on screen.

Of course, CAD users also want features commonly found in drawing and illustration packages, including symbol libraries, fill patterns, adjustable line attributes, PostScript and TrueType fonts (preferably with the tab, indent, and superscript and subscript features currently offered by packages such as MacDraw Pro), addition and subtraction of filled polygons, and the ability to convert polygons to lines and to convert Bézier curves to smoothed or unsmoother polygons.

CAD packages should also offer layers (all of those reviewed here do) and should enable users to rotate, move, or rescale selected objects from multiple layers at once—operations that most drawing packages can't handle. An architect might put the outside walls of a building on one layer and establish ten layers per floor for items such as interior walls, plumbing, and electrical wiring. It would take an impractically long time to move or replicate the entire building to a new position if each layer had to be handled individually. On the other hand, architects also need the ability to select a single layer while displaying multiple layers (see "CAD Databank").

Midrange and high-end CAD packages often provide macro programming features, enabling third parties and sophisticated users to automate specialized tasks for specific markets. Architects want features to speed door and window insertion. Contractors need tools for estimating costs based on the lengths of walls; number of doors, windows, and fixtures; and length of plumbing lines.

Facilities managers need database connections to track the location of office furnishings and equipment with their serial numbers and value. Mechanical engineers may need tools to generate computer numerically controlled (CNC) code for computerized milling machines, or to automate tasks such as drawing gear sprockets. And many users depend on good connections between CAD and desktop publishing packages for producing technical manuals.

The latest must-have feature, offered in Ashlar Vellum, Autodesk's AutoCAD, Forthought's Snap, and Intergraph's MicroStation Mac, is reference files. Reference files allow users to view and edit a drawing (or portion of a drawing) within other drawings, then automatically update drawings or layers. A detailed view of, say, part of an electrical wiring system can be shown on the same drawing with a view showing the wiring layout in the structure without users having to draw the wiring system twice.

Reference files can also be shared over a network. A number of users—for example, the different people designing
PowerDraw’s Diverse Features  This detail of a hotel and office complex, created in PowerDraw by Sprankle Sprague Architects of San Francisco, shows some of the program’s many advantages. Each set of windows was created by constructing a single pair, then cloning that pair for placement up the face of the building. The highly detailed trees and finely drawn people show off drawing abilities that are as precise as those of high-end illustration packages.

plumbing, electrical wiring, and heating ducts—can work on the same project at once, each referencing the current version of the basic walls of the building. As System 7 is more widely adopted, more packages will probably offer some form of reference files—perhaps via publish and subscribe, as Deneba’s Canvas and Claris’s MacDraw Pro now provide.

Given the crowded field of 2-D CAD packages, I have grouped them into low-end, midrange, and high-end categories based on price. Each category discusses products in order, from worst to best.

Low-End CAD ($295 to $599)  All of the low-end packages except VersaCAD Drafter have an interface similar to that of the original MacDraw package, which makes them relatively easy to learn.

MacDraft ($399), from Innovative Data Design, provides basic drawing tools with Mac fonts and fill patterns, but seven years after its original release, the program is still extremely limited in its snap, construction, dimensioning, and translation features. I don’t recommend it.

Dreams ($599), also from Innovative Data Design, was intended as a successor to MacDraft. It was one of the first packages to provide 32-bit color support and 32-by-32-pixel fill patterns, but it lacks the snaps, dimensioning, and many of the construction features necessary to be considered a serious CAD package. Don’t waste time with this one either.

MacDraw Pro ($399), from Claris, has been updated to provide such features as slide presentations, publish and subscribe, 32-bit color support, text objects with margins and tabs, and a spelling checker, all of which CAD users would find useful. But the program lacks essential CAD elements, including geometry, snaps, dimensioning, and construction features.

Despite those limitations, MacDraw Pro suits inexperienced CAD users, such as managers who want to view and mark up drawings created in other CAD packages. When combined with the optional Claris Graphics Translator ($299), MacDraw Pro can edit documents from many computer platforms. DOS PC users often pay more for such capability.

VersaCAD Drafter ($595), from Prime ComputerVision, is a 2-D subset of the $1995 VersaCAD/Macintosh Edition. It provides most of the geometry, snaps, construction, translation, and dimensioning features necessary for technical drawings, but with the exception of PostScript fonts, lacks illustration features.

It takes time to learn the package, and VersaCAD is relatively slow. It uses menus and tool palettes, but works more like a package that originated on another computer platform than one designed especially for Macintosh users. For instance, VersaCAD’s group tool is used for selecting objects, rather than for organizing objects into hierarchies the way Mac-
CAD DATABANK

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Database connections | no* | no | no | no | no |

*Aperture Professional, which is networkable and includes relational database features; $1495.

**Does not always copy and paste properly between applications.

A third-order curve unlike the fourth-order curves found in Adobe Illustrator and Adobe FreeHand.

Includes internal database.

Draw-like packages do. Only one group can exist at a time.

**Canvas** ($399), from Deneba Software, was the first product in this realm to add support for new System 7 features such as publish and subscribe and 32-bit color support. **Canvas** is a vector-based CAD package that handles curves and shapes with precision, but it lacks geometry, snap, and construction features found in better CAD packages. Technical illustrators might find **Canvas** convenient for adding finishing touches to drawings created in other CAD packages, but architects and engineers will need a more substantial program.

**DesignCAD** ($299), from the company of the same name, is an integrated 2-D/3-D package with a complete set of snap and dimensioning functions. Dimension values update automatically when you edit an associated object. **DesignCAD** unifies its geometry by representing everything internally as 3-D splines (Bezier-like curves). Rectangles, circles, or any other primitive object can be changed into a free-form shape using the spline-editing tool. This unified approach makes for a sluggish program when redrawing or duplicating. And although **DesignCAD** claims accuracy up to 16 decimal places, its working accuracy for cumulative dimensioning tasks is only 2 decimal places—unsatisfactory for a CAD program. The program has other difficulties. For example, you can open only one drawing at a time, and Undo doesn't work with many tools and commands.

**Generic CADD** ($495), from Autodesk, provides good basic CAD capability, and for a package that originated on an MS-DOS platform it is surprisingly true to the Macintosh user interface. Unfortunately, most of the add-on modules available for the MS-DOS version of the product are not available for the Mac, and the Mac...
<table>
<thead>
<tr>
<th>Version</th>
<th>CAD Tool</th>
<th>File Formats</th>
<th>Layer Support</th>
<th>Dimensioning</th>
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**Version's File Translators**

Version's file translators are buggy. Still, Generic CADD makes an excellent beginner's package.

**Blueprint ($295),** from Graphisoft, is a relatively complete 2-D CAD package at a price that's hard to beat. It offers most of the geometry, snap, construction, dimensioning, and translation features that CAD users need. Blueprint's Smart Cursor automatically snaps to centers and aligns horizontally or vertically to existing vertices, speeding the drawing process.

While the package lacks high-end features such as macros and database connections required by some users, although editing is limited to individual layers, Blueprint is a superb beginner's tool, well suited for educational settings, and would satisfy the needs of many professional users as well.

**Midrange CAD ($695 to $1495)**

Several midrange products compete well with higher-priced packages for CAD functionality. The better programs demonstrate how well CAD packages can support a MacDraw-like interface without sacrificing speed and features.

**AuraCAD ($800),** from Aura Systems, was conceived primarily as an interface to the company's CAM (computer-aided manufacturing) software for controlling computerized machine tools. The awkward interface makes for a steep learning curve, and a variety of constraints in features sometimes make the program rigid and hard to use. For example, you must place endpoints before drawing lines, and define a group to move objects; and a group cannot contain any other groups. These problems, combined with a limited feature set, make the package clumsy for design, but machinists may want to consider it because it offers CAM extensions.

**Snap,** from Forthought, was designed for CAD users familiar with Intergraph—a dedicated CAD computer system favored by many serious users. The package is available in two versions, 3.17 ($695) and 3.27 ($1495), both of which support reference files. The high-end version adds...
features for facilities management, bills of materials, and other database activities. With optional translators ($195 each), Intergraph and DXF files can be opened and edited.

Those who haven't worked with Intergraph will need substantial training to learn various two-letter keyboard commands to access features that are not included in the tool palettes or menus. And since Snap provides only a subset of Intergraph's features, it's likely to disappoint experienced users.

Aperture ($795), from the Graphic Management Group, is a programmable graphical database designed for facility management. Its integrated 2-D drawing package is capable, featuring a snap collection and the ability to turn objects into HyperCard buttons. Clicking on one of those buttons pops up a user-defined view of any drawing.

Although Aperture offers keyboard shortcuts for most snaps, the tangent and perpendicular constraints force you to wade through a hierarchy of dialog boxes. Aperture also hides the trim and other editing settings in a menu that changes according to the selected tool. Those menu choices are really modifiers that belong in the tool palette, where you could tell at a glance if your drawing tool is set to trim, extend, align, or distance from end.

Amiable Technologies' FlexiCAD ($1495), from Amiable, drives home to work on, users must remember to keep the hardware key connected in-line with the keyboard or mouse. I find this device obnoxious, because having more than two keys attached at once makes the keyboard and mouse less reliable, and because you must shut down the Mac to add or remove the EvE. In workgroups where users share computers with cartridge-based hard drives, or where users take disk drives home to work on, users must remember to keep the hardware key with the disk on which the software is loaded. Occasionally the key breaks and must be replaced, making it impossible to run the software in the meantime.

Claris CAD ($899), from Claris, adds geometry, snaps, construction, and dimensioning features to MacDraw II, to produce a serious CAD package with bases. But after a long period with-
out an upgrade, Claris CAD has fallen behind the competition.

Claris provides database connections for ClarisCAD, and at one time indicated plans to expand these connections into strong enough links to its database program, FileMaker, to offer a low-end Geographic Information System—a type of mapping software similar to CAD that produces maps from queries to databases of demographic information. That project was never completed, but CAD users able to write code might readily find ways to access those database connections anyway. It won't be simple, however, since Claris CAD lacks provisions for macros.

Still, Claris CAD is one of the fastest products on the market for scrolling and zooming—an important advantage when working on large, complex drawings.

MiniCAD+ ($795), from Graphsoft, is a fast and accurate 2-D/3-D package. Those who are familiar with MacDraw will find MiniCAD+ easy to use, although its extensive feature set takes some time to learn. The spreadsheet, a particularly strong feature, makes it easy to count items such as doors and windows. MiniCAD+ has a clever feature for entering into a group for editing, then exiting back out without having to reselect the individual objects that composed the group. This program also provides a MiniPascal programming language, making it possible for sophisticated users to design special-purpose tools. MiniCAD+ also has a smart cursor for showing the alignment of different objects on the fly.

In the latest MiniCAD+ update, the division of functions between menus and the tool palette makes more sense. And curves can now begin as Beziers, where the curve’s tangents control its shape, and end as splines, where the curve’s control points determine the shape. The biggest addition, however, is a multipurpose wall tool that controls a wall’s appearance and geometry. The tool automatically adds user-defined cavity lines and fills for representing construction information. Segmented walls automatically close with the proper corner joint when the wall ends where it begins. MiniCAD+ automatically cuts walls at window or door symbol locations, and the cut follows the symbol when it’s moved.

PowerDraw ($795), from Engineered Software, is one of the best-kept secrets in the industry. The company paid close attention to the interface, and is so dedicated to elegance and speed that it has almost completely rewritten each new version of the package. Although anyone familiar with programs that build on the MacDraw interface will immediately feel comfortable working in PowerDraw, users should consult the manual to take full advantage of the software’s power.

PowerDraw provides one of the most extensive lists of 2-D drawing and construction features available, even when compared with high-end CAD packages, and it has a macro language. PowerDraw’s principal failing is its lack of reference files. Artists and designers will want to keep Illustrator or FreeHand for occasions when they need to wrap text around curves, but they will appreciate PowerDraw’s speed in editing complex files.

HIGH-END CAD ($1795 TO 53500)

Jac Bravo Detailer ($1995), from Schumberger, is the 2-D foundation for the company’s specialized 3-D programs. Early versions of MacBravo’s reveal its beginnings in the workstation market, but the latest version has scroll bars, multiple color palettes, tear-off menus, copy and paste between applications, and object translation by mouse dragging. Still, maddening workstation-style holdovers slow you down; moving a line endpoint or drawing a box requires cumbersome work in a dialog box.

MacBravo 3.0’s improved dimensioning tools give complete control over a dimension’s appearance, however. And the part-attributing feature—for adding properties such as part numbers to objects—is a welcome addition. Among drafting tools, Mac Bravo lacks only the double-line and elliptical-arc tools. The program has a spline tool, but it supports control of terminal slopes only. Mac Bravo falls down in its symbol work—it lacks thumbnail libraries essential for finding the correct symbol easily. And because the program places symbols as instances rather than copies, all symbol uses change when you change the master drawing. MacBravo limits networking (beyond System 7 capabilities) to DEC VAX machines—a major weakness compared with other high-end programs.

Ashlar Vellum ($1995). Ashlar originated the concept of the inference engine, a technique that has been copied by several other companies for snapping to points in alignment with existing reference points. The inference engine works
parts lists. Vellum also includes a "Movies" feature that analyzes a mechanism, for importing dimensions from standard motion. The program also allows the user to reference various parts of a document then records, animates, and plays back its network or between drawing files.

These fancy features have been implemented at the expense of more basic functionality. For instance, Vellum users can view but not manipulate objects pasted in from other packages.

Pegasys II ($1795). IGC Technology designed Pegasys for use in the company's own service bureau. For a package that ignores Macintosh interface standards, it is surprisingly easy to learn and use, but Pegasys II provides no features that set it apart from less expensive programs.

AutoCAD ($3500). Autodesk began shipping Release 11 for the Mac in May, a year after it shipped the DOS version, and the company started shipping Release 12 for DOS in June. While it was not possible to open a Release 11 file in Release 10, Autodesk says that Mac Release 11 and DOS Release 12 have the same file format. Therefore, Macintosh users won't have to change to a new system in the cold when it comes to sharing AutoCAD files with people working on other platforms.

AutoCAD now has pull-down menus, resizing handles, and tool palettes; but it is still basically a command-line-driven package that runs very slowly on all Macs. Where Release 10 could only copy graphics to the Scrapbook, Release 11 can paste vector graphics from the Scrapbook, as long as neither fill patterns nor raster objects are included. The program provides most of the geometry, snaps, construction, and dimensioning features offered in other CAD packages, plus reference files.

But it lacks features such as fill patterns, unproportionate scaling, Mac fonts, and text wrap. Many of the third-party extensions for which AutoCAD is famous are unavailable on the Mac. And AutoCAD users must distinguish layers by color to avoid selecting objects from the wrong layer. That's an antiquated and inefficient approach.

Although Autodesk recently added a support telephone line, users are expected to obtain primary support from their authorized dealer—always a gamble. For this much money, you should go for a faster package that implements the Macintosh interface more completely and provides direct support.

MicroStation Mac ($3300). Like AutoCAD, Intergraph has been slow to update the Macintosh version of MicroStation to match versions on other platforms. Intergraph decided to solve the problem by standardizing all computer platforms on the Unix Motif user interface, starting with version 4. The Macintosh version 4 should be available by the time you read this, about a year after version 4's introduction on PC compatibles.

MicroStation's interface is based on Intergraph's key-in command set, but most of the commands can be selected from menus or tool palettes. The icons minimize the need for memorization but do little to speed overall learning, since the user must become familiar with hundreds of icons.

MicroStation's implementation of reference files clearly puts the package a step ahead of its competition for huge projects that demand networks of designers. The package also provides connections to the Oracle database program. However, MicroStation is weak on illustration and, like FlexiCAD, uses the annoying EVE ADB hardware key.

Hatching Plots

There was a time when CAD users had to buy a plotter to obtain a hard copy of their drawings because the dot matrix and daisy wheel printers of the time couldn't handle CAD graphics. Today many users prefer to print on 11-by-17-inch laser printers to reduce the time spent from hours to minutes, and to reduce the expense for plotter supplies. But there are still a few die-hards who prefer the D- and E-size output from a plotter.

Three companies provide plotting software that can be used with a variety of Mac software, including CAD and illustration packages. Several CAD products include a subset of one of these packages.

Microspot's MacPlot is a set of Chooser drivers for various types and sizes of plotters, with prices ranging from $199 to $2495. MacPlot is capable of plotting solid and outline PostScript and TrueType fonts, can work in the background, and provides for network plot sharing. Fill patterns can be plotted dot by dot or by assigning a crosshatch to each fill pattern. (The versions included with particular CAD software packages may not provide all of these capabilities.)

Plottergeist ($495), from Palomar Software, is a set of Chooser drivers that supports a wide variety of plotters. It handles solid and outline PostScript and TrueType fonts and provides background spooling.

Engineered Software's MacPlots II ($250) is an application that opens PICT files and allows users to specify which color pen should draw each of the elements in the drawing. The package does a fairly good job of handling bitmapped images created in packages such as MacPaint or Photoshop. MacPlots II can convert text to stroked fonts or plot them as bitmapped images—but the program is not suitable for plotting font outlines unless the originating package can convert fonts into curves. MacPlots II can also convert fill patterns into hatch patterns.
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3-D Visualizing Software

Infini-D 2.0

PROS: Excellent procedural textures, rendering, and animation tools. CONS: 3-D modeling component lacks splines; no wire-frame vertex editing. COMPANY: Specular International (413/549-7600). REQUIRES: Mac II with math coprocessor; 4MB of RAM; hard drive; 8-bit video board; System 6.0.7. LIST PRICE: $995.

COMBINING 3-D MODELING, IMAGE rendering, and animation, visualization programs address the design cycle from conception to presentation. Infini-D 2.0 offers an excellent collection of visualization tools at a relatively affordable price. The software is easy to use and competent enough to serve in many professional applications. However, Infini-D’s strongest elements are its rendering and animation capabilities.

Version 2.0 adds the ability to directly import encapsulated PostScript (EPS) and Drawing Exchange File (DXF, the CAD standard) files; to save animations in QuickTime form; and to map QuickTime movies onto 3-D objects. Infini-D 2.0 also supports 32-bit QuickDraw’s alpha channel. The alpha channel allows you to composite (seamlessly superimpose) Infini-D models into photos using image processors, or overlay models on videotape. Improvements in the program’s rendering capabilities include better antialiasing, the ability to display shadows in Phong shadings, simulated halogen lights, colored fog effects, and faster speeds in all modes.

Infini-D models inhabit a 3-D world defined by x, y, and z coordinates. (Infini-D uses y to signify depth and z to denote height—it’s not the first program to do this, but the process is still nonintuitive.) You look into this world through six standard views—top, bottom, front, back, left, and right—plus any number of camera views. Cameras mimic photographic lenses from fish-eye to telephoto, letting you examine models from any perspective. Infini-D cameras are objects that you can move anywhere in the program’s 3-D world.

At the heart of Infini-D’s modeler are its Lathe, Extrusion, and Freeform Workshops, where you manipulate points and lines using simple drawing tools. Depending on the Workshop, objects are lathed around an axis; extruded into the third dimension; or formed by the interpolation of the object’s top, front, and side outlines. You can produce some fairly sophisticated objects in any of Infini-D’s Workshops, but understanding the interaction of the various outlines in the Freeform Workshop takes some practice.

Infini-D also offers five object primitives—a cone, a sphere, a cube, a cylinder, a square—that can be stretched and squashed but not otherwise edited. Similarly, the terrain tool can produce beautiful mountains or cliffs, especially when used with Mandelbrot (fractal) effects, but terrain objects can’t be reshaped. Infini-D can extrude TrueType fonts into 3-D objects; if you have PostScript fonts you must first use a third-party utility to convert them to TrueType.

As with most 3-D design programs, constructing models is an exercise in building and joining subassemblies. The
Object Floater lets you enter numerical values for the positioning, orienting, and dimensioning of objects; the resulting values can be locked to prevent accidental movement, and to make animation precise. Lacking advanced object-editing capabilities, such as splines and vertex editing (manipulating individual object points), Infini-D is not the best choice for designs that require organic shapes and free-flowing curves.

Version 2.0's ability to import DXF and EPS files (in addition to Macromedia's Swivel 3D Professional files) allows you to import complex models from Autodesk's AutoCAD, for example. (Note: DXF files come in different dialects; some may not be directly transferable.) DXF models are also imported as individual objects, so it can be difficult to scale and position them, but you can apply textures to individual objects. Infini-D can link objects and establish object-tree relationships but doesn't let you quickly group multiple objects.

With version 2.0, you can transfer EPS outlines from Aldus Freehand or Adobe Illustrator directly into Infini-D Workshops. In fact, under System 7, Infini-D can subscribe to these programs, effectively adding their more-extensive drawing capabilities to your desktop. Alter a two-dimensional outline in Freehand 3.1, and the change automatically appears in the subscribing three-dimensional object in the Workshop.

Infini-D really shines at rendering. Bucking the MacRender/Man trend, Infini-D offers an integrated approach whereby you can add light sources easily and you can choose from a large assortment of procedural textures, and Infini-D relies on its own rendering engine. Unlike simple surface maps, procedural textures become an integral part of a three-dimensional object—like the veins in a marble slab. Texture attributes, such as surface properties (reflectiveness, specular highlights, transparency, and so on), special effects (bump, wave, and corrosion maps), and color effects (tiling, marbling, noise, and so on), are completely editable. Infini-D lets you layer textures, as well as combine them with PICT images. And version 2.0 enables you to use QuartzTime movies or PICS files to produce animated surfaces. So, for example, you could model and render a television set, and then place a QuartzTime movie on the surface of the TV screen.

Infini-D's rendering engine supports flat, Gouraud, and Phong shading, and three levels of antialiasing (you can do these in all views). Naturally, when shading and antialiasing quality rises, so does rendering time. Flat shading is fast but lacks detail. Phong shading with high antialiasing produces excellent renderings with shadows and textures. Using environment mapping with Phong shading lets you add fog and reflection effects that are particularly attractive with Phong shading, giving you the look of ray tracing in a fraction of the time.

Infini-D's ray-tracing option produces exquisite renderings and—a particularly nice touch—lets you preview any selection. Ray tracing can operate in the background—an important option because complex scenes can take hours (or days) to complete, even with version 2.0's faster rendering. Nevertheless, as with most programs, it's best to set your rendering to run overnight, because background rendering slows down foreground operations.

Using a time-based, key-frame approach, Infini-D also excels at animation. You can animate any object, including lights and cameras, simply by moving them in the scene and taking snapshots of their positions; Infini-D generates the intervening positions or frames. Object activity is controlled with the sequencer, a logically conceived float that tracks the condition of every object at any moment in time. Using the sequencer timeline, it's easy to choreograph object movement and trigger events. A SMPTE time display allows cinematic precision. Infini-D even lets you metamorphose between objects that have different numbers of vertices—great for creating Terminator-like effects.

The manual and tutorial cover the basics but fail to scratch beneath the surface. Infini-D works well and is generally stable, but it is not without flaws. For example, high-antialiasing Phong shading of complex scenes (such as fractal terrains) in the Camera view can sometimes freeze the Mac (the company is aware of the problem). Save often—good advice with any program.

Minimum system requirements should be considered exactly that—minimum. I tested Infini-D on a Macintosh IIfx with 16MB of RAM and a SuperMac Technology Spectrum 8/24 PDQ video accelerator board. Even so, when building complex models I used only bounding-box rendering for speed. To fully exploit Infini-D, go for as much power as you can afford.

Infini-D may not be the best modeler, renderer, or animator compared with specialized products, but it offers a rich combination of capabilities and is reasonably affordable. Infini-D may well be the best all-around 3-D visualization package available. —CARLOS DOMINGO MARTINEZ

**Microsoft Project 3.0**

**PROS:** New scheduling and formatting features; customizable tool bar; stronger resource scheduling and analysis. **CONS:** Can have only 20 linked or open projects; advanced functions still hard to use. **COMPANY:** Microsoft Corporation (206/882-8080). **REQUIRED:** Mac Plus; 2MB of RAM (2.5MB for System 7); hard drive; System 6.0.4. **LIST PRICE:** $695.

**PROJECTIONS MANAGEMENT SOFTWARE IS OFTEN PERCEIVED AS DIFFICULT TO LEARN AND ESOTERIC. WITH PROJECT 1.1, MICROSOFT REMOVED A LOT OF THE MYSTERY OF UNFAMILIAR TERMS AND NONGRAPHIC INTERFACES, THUS ATTRACTION USERS WHO HAD NEVER TOUCHED PROJECT-MANAGEMENT SOFTWARE BEFORE.**

Keeping with that tradition, Project 3.0's improved tool bar helps novices schedule tasks and format reports with ease. 
push-button ease. Professional planners have not been forgotten, however; Microsoft has improved capacity and eliminated many scheduling glitches. Microsoft Project can tackle many jobs that were previously reserved for high-end programs, yet it is simple enough to turn out a presentation-quality Gantt time line in just a few minutes.

Ease-of-Use Focus

PROJECT'S TOOL BAR, LIKE THAT OF Microsoft Word and Excel, automates about 80 percent of common tasks. For example, there are buttons to link tasks in sequence; assign resources to jobs; and perform scheduling duties, such as marking tasks complete.

If you know other Microsoft applications, you'll be pleased with Project's consistent interface. You can add, remove, or customize tool-bar buttons—or double-click on the boundary of a column to automatically set optimum column width—the same as in Excel.

In fact, Microsoft Project 3.0 offers numerous "hot spots" that make it easier to view, enter, or modify project information. Double-click on a column heading in the spreadsheet view, say, to create a custom title or change the data field displayed. Or click on a subproject task, and the subproject file automatically opens for fast changes.

You don't need a formal project-management background to use much of Project 3.0 successfully. Start off with the simple outline, which now offers ten indent levels. Tool-bar icons move tasks to different levels and schedule a range of tasks in sequence. The link button even connects tasks spread throughout an outline.

When inserting, deleting, or moving tasks, Project 3.0 maintains the right link, which wasn't the case with version 1.1. And now there's true work-breakdown structure (WBS), a necessity for organizing large projects or sorting tasks into related groups.

Improved Look

PROJECT 3.0 OFFERS MULTIPLE views that can be customized and added to the menu bar for later recall. You simply pick the most comfortable way to enter and edit project data, from among the outline, PERT network, task and resource tables, charts, and various data entry forms.

As before, only two windows can appear simultaneously, though individual views show improvement. The outline, for instance, holds up to 102 data fields, plus the Gantt chart; version 3.0 includes 10 custom text fields and 5 note columns. Besides tracking dates, resources, and budgets, you use these fields to flag important milestones. Then, if you collapse an outline heading, the summary Gantt bar displays multiple milestones. The process is a bit inconvenient, but still useful when producing charts. The palette command changes the color or shading of Gantt bars and gives great control over charting styles.

As in version 1.1, you use the mouse to repurpose or extend task bars on the Gantt display, rather than entering dates or other status figures using tables. Microsoft has eliminated some annoyances such as misleading elapsed time that appeared between tasks—and the scrolling limit of the Gantt chart is now linked to the project's length. New resource views let you graphically compare the work of individuals to the whole group, chart resource availability, and see how resource costs accumulate over time. It's also easier to pinpoint where resources are overscheduled using the Go To Next Overallocation tool-bar button.

Beyond the ability to personalize views, you can also create custom filters, such as which resources are working on specific tasks, or which tasks are running late or over budget. Building this logic involves nothing more than selecting the desired conditions from a pull-down list. At the other extreme, Microsoft Project ships with an Easy View with short menus, no project-management terms, and simple filters.

Microsoft Project's new monthly calendar report shows the work schedules of individuals, groups, or projects using bars that span appropriate dates. You can also preview up to 28 pages on a standard 13-inch monitor—a nice feature, since Gantt and PERT charts often span many pages and can break at inappropriate spots. Additionally, Project 3.0 can reduce Gantt charts to print on one page (with a PostScript printer).

Greater Performance

VERSION 3.0 INCLUDES SOME IMPORTANT changes that make it appropriate for industrial-strength planning. First, you can track up to 9999 tasks per project and assign 100 resources per job. The program allows 20 open projects. Also, only 20 projects can share a common pool of labor or equipment; once you reach that limit, disconnecting existing projects from the resource pool is confusing. On the positive side, more information is gathered from subprojects, such as the percent complete.

Improved resource-management features let you delay when someone starts working on a task or assign resources to a task more than once. Project 3.0 lets you set ten priority levels for resource leveling or set a priority level only on open projects. The program also calculates schedules using shorter time periods, yielding more-efficient plans.

Project 3.0 includes comprehensive Dynamic Data Exchange (DDE) plus publish and subscribe support. DDE lets you link project data to an Excel spreadsheet. Furthermore, Project's dialog-box editor makes it easy to build special-purpose forms. Couple these forms with a macro—all run from a custom tool-bar button—and you get an easy-to-use front end to a corporate project manager such as Welcom Software's Open Plan. One problem with DDE is that it's also used to link projects, which can result in invalid logic (Microsoft says this is intentional).

Project does not include Planning Wizards (dialog-box prompts that take you through a procedure, available with Project for Windows and Excel for the Mac), but does include balloon help and a spelling checker. And Mac and Windows Project files are compatible.

I was disappointed that Project's error handling isn't bulletproof; situations where resources are scheduled outside a designated range and where tasks are allowed to start before a project begins might cause problems.

All in all, Project 3.0 is easier to use than Microplan Planning International's MicroPlanner Manager and has more reporting and formatting options than Seitor's Project Scheduler 5, though I'd still pick PSS for heavy-duty midrange planning. Microsoft has done a commendable job packing an amazing range of features while keeping the program generally easy to use. Even with the release of Claris's MacProject Pro, Project 3.0 clearly will draw a majority of project-management users.—MIKE HECK
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**Hard Drive-Management Utilities**

**Drive7 2.3**

**PROS:** Excellent interface; can click and drag to resize partitions; balloon help; custom icon options.

**CONS:** Resizing partitions erases previously stored data; documentation lacks glossary and index.

**COMPANY:** Casa Blanca Works (415/461-2227). **REQUIRES:** Mac Plus; System 6.0. **LIST PRICE:** $79.95.

**MW ★★★★**

**Silverlining 5.4**

**PROS:** Extensive and detailed testing utilities; offers two levels of password protection; scroll-free tech support.

**CONS:** Complicated, lackluster interface; no online help.

**COMPANY:** La Cie (800/999-3919). **REQUIRES:** Mac Plus; SCSI hard drive, removable drive, or optical drive; System 6.0.5. **LIST PRICE:** $79.

**MW ★★★★**

**Drive7 2.3 IS A UNIVERSAL HARD DRIVE UPDATER AND FORMATTER WITH AN INTERFACE THAT’s easy enough to use to make hard drive maintenance seem almost—relaxing. The program can update Apple drives and most third-party drives, including a variety of removable-media drives. The latest version also offers sound support for NEC CD ROMs and sound and data support for Apple and Toshiba CD ROMs.

Launch Drive7 and you are presented with a blank main menu (even the Apple menu disappears) and an attractive, uncluttered interface featuring six large three-dimensional buttons and a main message area. After selecting the drive you want to update, you click on the appropriate icon to install Drive7’s driver software, to format or partition the drive. Clicking on the zoom box reveals another four buttons for mounting and testing drives, customizing icons, and scanning the SCSI bus. Drive7’s well-implemented balloon help is activated by clicking on the Help button right on the main panel.

Partitioning a drive to create new logical volumes is simple with Drive7. The program includes several standard partition styles from which to choose (Maximum Macintosh, two equal-size Mac volumes, Standard AUX, and so on), or you can create a custom partition scheme. By clicking on the appropriate indicator icons, each partition can be designated read-only, set to mount automatically at start-up, or assigned a password. Best of all, the partitions—each represented as a separate rectangle in Drive7’s partition size window—can be resized simply by dragging the rectangles to make them larger or smaller.

One important caution: Drive7 completely erases and reinitializes any partition that you resize, even if there’s still adequate space for the data you’ve already placed within it. This means you need to do all your partitioning with Drive7 before any data is stored on the drive or backed up your data and restore it. The other two functionalities allow you to make some modifications to partitions while preserving the data within them.

Drive7 also offers great options for customizing the way volumes appear in the Finder. You can choose from more than 40 sharp-looking drive icons to represent your volumes on the desktop, with or without SCSI ID numbers superimposed on them. Unfortunately, you can’t assign names to drives or volumes from within the application; that has to be done on the desktop.

The program conveniently comes with two bootable floppy disks—one with a modified System 6.0.8 and the other with a minimal System 7.0.1. (You must boot from the floppy disk to have full access to all of your connected hard drives.) Along with Drive7 itself, you get Drive7’s companion control panel that lets you mount and unmount SCSI devices and scan the SCSI bus and your CPU. It’s great to be able to lock and unlock drives and change passwords without even launching the Drive7 application.

On the downside, Drive7’s testing functions are less than impressive, providing little feedback while tests are in progress. Testing with Drive7 is also slow; a full checkup on my 80MB hard drive took about 16 minutes.

A few other complaints: Unlike its competitors, Drive7 offers no keyboard commands to speed up your work. Also, the otherwise complete manual lacks an index and a glossary. And the documentation for version 2.3 was not updated to reflect changes in the program's main interface, creating some minor confusion.

**Easy Going** The simple Drive7 interface makes formatting and updating a hard drive easy. Clicking on the Help button activates balloon help.

**Before you go out and spend** money on a program to format, partition, and test your hard drive, remember: if your Mac came with an Apple drive originally, you already have Apple’s HD SC Setup, a modest little utility that lets you reformat, partition, and test the hard drive that came with your Mac in a few simple steps.

Some tasks, however, are beyond the scope of Apple’s limited utility. Suppose you’ve added an additional SCSI hard drive, optical drive, or removable-media drive to your system and you need to reformat or partition it. Or suppose you want to update the software that controls your hard drive and fine-tune the drive’s performance for optimum speed. Or what if you want to increase the security of your data by adding password protection to your drive?

These jobs call for third-party formatters such as Casa Blanca Works’ Drive7, La Cie’s Silverlining, or FWB’s Hard Disk Tool Kit Personal Edition—three straightforward utility programs that help demystify hard drive management and enable you to perform a wide range of tests and maintenance procedures on SCSI drives.

**Drive7**

**HARD DISK TOOL KIT PERSONAL EDITION** is designed as an entry-level, non-power-user version of FWB’s heavy-duty Hard Disk Tool Kit, which sells for about $129 more than the trimmed-down Personal Edition (PE). FWB has stripped out the more arcane features of the standard Tool Kit and left the basics. Still, everything you really need is here.

The program consists of three components: HDT Primer—the main application—is used to format, update, partition, and password-protect your drive. HDT Prober is a control panel that lets you mount and unmount SCSI devices and scan the SCSI bus for detailed information about your drives, system, and
CPU. The HDT Extension is an INIT that automatically loads device drivers for removable-media drives so that the drives will automatically mount a new cartridge when you insert one.

Primer's main functions are accessed through the Volume Selector Screen, which lists each volume, along with its SCSI ID, capacity, make, model number, and revision number. You can click on any of six icon-like buttons to format, partition, mount, umount, get information about, or test the selected drive.

Tool Kit PE tries to make hard drive set-up as foolproof as possible. For example, it provides not two, but three frantic warning dialog boxes before letting you reformat a drive ("LAST warning! Formatting will destroy ALL data on the disk."). The well-designed interface makes navigating the program easy, and online help can be accessed with a keyboard command.

Once you activate the Partition directory, you can set up, modify, erase, and delete partitions on your drive. Volume sizes are set by editing the number of kilobytes allocated to the volume in the Size field—more precise but less convenient than Drive7's drag-to-size approach.

When modifying partitions, Tool Kit PE lets you add password protection and designate a volume as read-only. But, unlike Drive7, Tool Kit PE doesn't allow you to assign custom icons to volumes on the desktop.

Tool Kit PE offers superior testing functions. A test-information window appears when tests are running, listing any bad sectors found during tests and showing both elapsed time and remaining time. The program begins the test cycle by first examining the computer's RAM, then it performs three diagnostic tests on the selected drive. Compared with Drive7, Tool Kit PE was a speed demon, racing through a cycle of tests on my hard drive in about seven minutes.

Unlike Drive7 and Silverlining, Tool Kit PE comes only with a System 6 start-up disk. If you're running System 7 and you have only one hard drive, you have to create your own System 7 start-up disk in order to use the application.

Silverlining

SILVERLINING ISN'T AS PRETTY AS ITS competitors; its clunkier interface is more confusing and less intuitive, but Silverlining offers a wider range of functions than either Drive7 or Tool Kit PE. It's also nearly twice the price.

Working from within Silverlining's Volume Manager window, you can rename volumes and customize their desktop appearance, choosing from 14 different icons (not as impressive as Drive7's 40-plus choices). The window also provides a graphic display of how a drive has been partitioned, showing the percentage of space allocated to each volume on a drive. Silverlining offers 32 partition-style options.

As with Tool Kit PE, you can change the size of volumes by clicking on the Size field and editing the number of kilobytes. The program tells you how much free space you have available for a new partition and lets you know how small the partition can be while retaining data stored within it.

Silverlining takes password protection a step further than Drive7 or Tool Kit PE. In addition to the usual volume-level password protection, Silverlining allows for the creation of master passwords, which can be used by a network administrator to override individual passwords; and Silverlining can open volumes even when an individual password is lost or forgotten.

The program is also unique in offering the capability of not only partitioning a single drive, but also of chaining together two or more drives into one logical drive—so two SCSI drives, a 40MB and an 80MB, can be represented on the desktop as a single 120MB drive.

Silverlining has extensive and detailed testing functions. You can run short or long versions of the drive tests. The short test, which involves reading and writing data at 16 disk sectors that have been set aside by Silverlining's formatter for testing purposes, took less than 2 minutes on my drive. The more comprehensive long test took about 11 minutes. If Silverlining's tests reveal that a file is written on a bad sector, a salvage function lets you recover the corrupted file to a more stable part of the drive.

A newcomer is apt to be befuddled by some of Silverlining's more advanced functions; it provides more options than most people need. Also, there's no online help at all, so you may have to do some research to decipher the significance of partition options such as "A/UX Root&Urs slice 0." On the other hand, La Cie is alone in offering its customers toll-free technical support (with a friendly, informed, and enthusiastic staff).

Included with Silverlining is Silver Volumes, a disk accessory that lets you mount, unmount, lock, or unlock volumes on a drive after start-up without opening the Silverlining application. You also get Drive Timer to test drive speed and a drive-duplication utility.

Any of these utility programs will keep your hard drive healthy—so which one should you buy? It's a tough call, but overall, Drive7 is probably the best choice, unless you absolutely require Silverlining's heavier-duty features. Drive7 offers the simplest and most polished interface, good online help, and the widest range of custom icon options. It also provides the most intuitive method for modifying partition sizes.—JOSEPH SCHORR

Volume Control

You can lock individual partitions on a drive and set two levels of password protection through the Volume Manager window in Silverlining. Volumes also can be renamed from within the program simply by editing the Volume name field.

PLI MiniArray 850MB;
PLI MiniArray 2GB

PROS: Good performance on Photoshop benchmarks; toll-free technical support. CONS: Only slightly faster than a conventional drive with similar capacity; requires a NuBus slot. COMPANY: PLI (510/657-2211). REQUIRES: Any Mac with NuBus slot; System 7.0.1. LIST PRICE: MiniArray 850MB $4999; MiniArray 2GB $6999.

DURING THE PAST YEAR SEVERAL vendors introduced storage systems called RAIDds—redundant array of inexpensive disks—that contain not one drive, but multiple drives that work as a single unit. Many of the drives promise increased data-transfer rates and shorter continues.
access times. And since some arrays write data to two arrays instead of one, they promise better data recovery. A few arrays even promise both high speed and data recoverability.

RAID drives fall into six levels—from Level 0 to Level 5—with Levels 1 through 5 offering different types of data-recovery schemes (see “High-Capacity Hard Drives,” Macworld, May 1992). Both the PLI MiniArrays we looked at are RAID Level 0, which means they divide their data between two drives but do not provide data-recovery schemes.

The biggest advantage of RAID Level 0 when compared with other RAID levels is better disk input/output (I/O) performance. This is achieved by splitting the data evenly over two drives, a process known as data striping. Since Level 0 drives don’t implement any data-recovery scheme, if one drive fails mechanically, it renders the other drive(s) useless. Of course, this should not be a concern—the 850MB MiniArray uses two Fujitsu M2623S mechanisms, each with a mean-time-between-failure rating of over 200,000 hours. Since with two mechanisms breakdown is twice as likely as with one, this translates to over 100,000 hours between failures for the MiniArray 850MB. The DEC Drive-based MiniArray 2GB mechanism is even more impressive—over 125,000 hours between failures.

In terms of performance, the MiniArray turns in excellent results on the low-level tests—as we had expected, since the QuickSCSI board uses a faster SCSI chip, which lets the drive bypass the slower IIC1 SCSI port. But in our real-world tests, the MiniArrays are not as impressive. We compared the two drives with a Storage Dimensions 800MB DEC-based mechanism on a IICl. Out of all the Macworld Lab applications tested, the only benchmarks where the MiniArrays performed significantly better than the conventional drive was opening and saving large (20MB) Photoshop files. The Storage Dimensions drive actually beat the MiniArrays in a couple of performance tests. And the Storage Dimensions drive costs $1600 less than the MiniArray 850MB.

We also tried our benchmarks on the inner tracks of the MiniArrays. To achieve maximum density, most conventional high-capacity drives use a variable zone-recording technique that places more sectors on the outer tracks of the disk platter than on the inner tracks. Since the rotational speed of the platters is constant, more sectors can be read or written on the outer tracks during a revolution than on the inner tracks. In our tests we saw up to a 15 percent speed degradation on some drives when we wrote to the inner tracks. The MiniArrays, however, showed consistent performance across all usable areas.

The MiniArrays ship with a NuBus-based QuickSCSI controller to handle a transfer rate of up to 5MB per second, a special SCSI-2 cable, and various PLI software utilities. The drives’ footprint is almost identical to that of a IICl or IIC2—oversized compared with the single-mechanism high-capacity drives available from other manufacturers, but the MiniArrays have a lower profile (they’re 2 inches high) than RAID drives from other vendors, and the MiniArrays sit nicely under a 14-inch monitor. Another nice feature is that they use external DIP switches for termination. Instead of adding or removing a terminator, you flip the switches to the on or off position. A rotary switch is provided for SCSI ID selection.

Installing a RAID drive is not as simple as installing a conventional drive. To set up the MiniArray, we first had to install the QuickSCSI board into a NuBus slot. We then connected the MiniArray to the QuickSCSI board with the supplied SCSI-2 cable. With the board installed, an additional six SCSI devices can be hooked up through the SCSI port on the back of the MiniArray. We had to install the QuickSCSI INIT on the start-up disk.

There are a few drawbacks to the MiniArray. Like most RAID Level 0 systems for Macs other than the Quadra 900 and 950, the MiniArray uses a NuBus slot for the adapter board, which means the slot can’t be used for anything else. And since the MiniArray works only if connected to the QuickSCSI board, hooking up the drive to another Mac means removing and installing the adapter board and installing the INIT—cumbersome in this plug-and-play world.

To configure the MiniArray as a start-up drive, you must use the QuickSCSI Manager utility instead of selecting the drive from the StartUp Disk control panel. With QuickSCSI Manager, you can also set up additional hard drives on the same QuickSCSI bus as mirror drives. That means any changes made to the main drive will be replicated on the backup drive. If the main drive fails, you can bring the backup drive online immediately. The mirroring options of QuickSCSI Manager, however, do not support the MiniArrays. PLI promises a fix to support mirroring to or from a MiniArray by the time you read this.

PLI also includes Finder Improve, an application that allows you to adjust the number of blocks available for data transfer within the Finder. The unmodified Finder transfers data in 32 (512-byte) blocks. With Finder Improve, you have the options of setting 200 (100K) blocks for reads/writes or using all but 20K of the available RAM for read/write transactions (called Infinity). Macworld benchmarks showed a major improvement in duplicating files and folders from the desktop with both of these settings. Other tests, such as loading Photoshop files, showed no improvement at all. Finder Improve is not recommended for use with System 7.0’s virtual memory.

The MiniArray comes with a one-year warranty, and PLI offers a toll-free support line.

The MiniArray is an excellent choice for image processing or any other task that involves importing and exporting large files. Unfortunately its price per megabyte is a lot higher than that of most drives. If you’re on a tight budget, you should probably check out some of the fast conventional drives instead.

—MARK HURLOW AND DANNY LEE
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Adobe Premiere 2.0

PROS: Produces stunning special effects with little effort; outstanding new animated-titles generator; exports to Photoshop for frame-by-frame editing; provides support for high-end pro equipment. CONS: Slow; heavy equipment demands; no quick way to view movie during editing; incomplete, unpolished manual.

COMPANY: Adobe Systems (415/961-4400) 

REQUIREMENTS: Mac II; 4MB of RAM; QuickTime movie source; System 6.0.7. Recommended: Iic; 20MB of RAM; 32-bit color; System 7.

LIST PRICE: $695.

ADOBE PREMIERE 1.0 WAS THE FIRST program that could edit QuickTime movies, the digital video format that plays color-and-sound movies on the Mac's screen. Premiere was so unusual and so promising that it earned the highest possible rating in its Macworld review, despite a thrown-together manual, no easy way to scroll through a movie, and a slow Preview feature that discouraged quick screenings of the work in progress.

Now, as the novelty of QuickTime has began to fade, and with competing programs available, Premiere 2.0 debuts with a 10-foot stack of new features. It has become a dream command post for the video professional. Only the program's appetite for memory, disk space, and computer horsepower keep it from being a dream for the nonprofessional.

Clip Joint
JUST LIKE VERSION 1, PREMIERE 2.0 eats, sleeps, and breathes clips—raw-footage QuickTime files that you import, individually or by the folderful, into the program. In version 2, you can record clips directly into Premiere, if you have a digitizing board installed in your Mac and an accompanying software module called a VDIG. (SuperMac VideoSpigot owners should avoid this method, however; it results in movies with only about half the frame rate of movies you record in the VideoSpigot's ScreenPlay program.) You can also record audio into Premiere but not with a MacRecorder, which produces only crashes and glitches. (Adobe blames Macromedia.)

Once you've imported a clip, you can manipulate it in an astounding number of ways: drag it to play before or after other clips; shorten it; make it play faster or slower; apply a Photoshop filter to it; play it backwards; superimpose text or video over it; make it spin, tumble, or rotate; or have it cross-fade to another clip, using any of 49 professional-looking transition effects (including dozens of new ones). Split-screen, scrolling credits, and TV-news-weather-map-style chroma-key effects are easy and gorgeous.

Unfortunately, Premiere still doesn't let you work with individual frames. To delete frames from the middle of a clip, for example, you have to create two copies of the clip, and truncate their endpoints to eliminate the unwanted material. Similarly, you can only apply a special-effect filter to an entire clip; to affect just part of a clip, you must first chop the clip up into multiple clipettes.

To construct a movie, you arrange clips in a time-line view called the Construction window. The Construction window offers seven parallel horizontal tracks: two for video clips, three for audio, two for effects. Because your movie is laid out horizontally, you'd need a monitor 750 feet wide to display every frame in a five-minute movie. Therefore, you spend much of your editing time just getting around in the horizontal landscape. Premiere 2.0 offers two alternatives to the sluggish scroll bar, which used to be the only navigational control. First, you can now place nine markers at various points in the movie; you jump to a marker simply by pressing the appropriate number key on your keyboard. Second, the Go To command scrolls the Construction window so that a certain moment of your movie (which you specify in minutes, seconds, and frames) falls somewhere on your screen.

When you look at the Construction window, you can't see the effects of any filters you've applied to a clip—a clip you've made brighter, for example, still looks dark. You must play the movie to see what you've got; and as in version 1, each of Premiere's playback methods has limitations. The first method is to com-
reimport the clip to Premiere (see "Film Strip"). You can now retouch video the same way you retouch photographs with Photoshop—edit a particular person out of the scene, for example, or change the hands on a clock face. Although the process is incredibly tedious—remember, you have to edit every one of 15 or 30 pictures for each second of finished video—the possibilities are mind-blowing.

At the High End

PROFESSIONAL VIDEO PERSONNEL HAVE a lot to look forward to. Premiere can now control a number of professional video decks (DiaQuest systems, Sony's Hi-8 VISCA machines, and others). It can also generate an Edit Decision List, a series of text codes used in postproduction studios that documents each cut, fade, and edit. (Premiere can even save an EDL in a format readable by machines that then automatically construct the movie you've mocked up using QuickTime.)

Some of Premiere's new features anticipate QuickTime products that don't exist yet. Premiere can support 16-bit, CD-quality audio (if you have a digital-audio board)—but QuickTime 1.0 doesn't, so the feature is meaningless until QuickTime 1.5 (and a new version of Apple's Sound Manager) is released. The Create Miniatures feature will mystify you at first—it creates saltine-size versions of your saltine-size clips. And then you realize that a new generation of QuickTime digitizing boards is being realized (such as SuperMac's Digital Film and RasterOps' MoviePack), which will play 30-frames-per-second QuickTime movies the size of the entire Mac screen. When they're available, working with miniature clips will save hours of processing time while you edit.

Premiere, the software, is exciting. The rest of the package—including the two slabs of foam rubber meant to make the box seem more imposing—needs some attention. The help-line staff, while easy to reach, is unfamiliar with the new features. Worse is the abrupt, almost cynically slapdash 150-page manual, which rattles off feature lists without indicating their usefulness or meaning. Descriptions of some features and techniques are missing completely. Not a word appears about the new MIDI music-file playback feature; about closing the gap created when you delete a scene; and so on.

On any Mac less powerful than a Iici, using Premiere 2.0 involves more waiting than editing. But owners of memory-packed Mac IIx's and Quadras, users of Mac-controllable video decks, and future owners of Digital Film (and other high-end QuickTime boards) should consider Premiere mandatory. If you appreciate the program's new high-end slant, then buy it, and surn the world with a premiere of your own.—DAVID FOGUE

**WorldPort 9600 Data Modem**

**PROS:** Compact; battery-powered; MNP Class 5 data compression. **CONS:** Poor indicator display; weak documentation; erratic behavior; bundled software for PCs only. **COMPANY:** U.S. Robotics (800/982-5001). **REQUIRES:** Mac Plus; modem cable; telecommunications software. **LIST PRICE:** $475.

J ust 1 inch high and slightly larger than a deck of cards, the WorldPort 9600 is a lot of modem in a little package. The pocket-size unit transmits data at a brisk 9600 bits per second and can employ MNP Class 4 error correction and MNP Class 5 data compression when connected to another modem supporting those features. Unfortunately, U.S. Robotics seemingly chose to ignore the Mac market when designing and packaging this modem, making it a less-than-perfect match for a PowerBook.

Everything about the WorldPort is geared toward PC users only. The user's guide does not mention Mac computers even once, so you're left on your own to figure out what kind of cable you need to connect the modem to a Mac (only a PC cable is included). As it turns out, you need not the standard Mac modem cable, but a high-speed "hardware handshaking" cable to use the modem's high-speed data-compression features. Unfortunately, this isn't mentioned in the manual. And the WorldPort comes bundled with a full-featured telecommunications software package—but only for IBM PCs and compatibles. No Mac version of the software is even offered.

Then there's the mystery of the acoustic coupler. The modem box says an acoustic interface adapter cable is included that lets you call from telephones lacking the standard RJ-11 jack. Open the box and you find not only that the cable doesn't exist, but also that the jack into which the cable is supposed to be plugged has been sealed, without explanation.

Some of these problems probably stem from the WorldPort's hybrid origins. U.S. Robotics bought the WorldPort from Touchbase Systems in 1991, added MNP Class 5 to the modem, and started selling it. But the souped-up version of the modem had so many problems, the company had to redesign it immediately and in August 1992 started shipping a new version with different features—in the old box. (Owners of the first MNP Class 5 version of the modem can upgrade to the current version for $59.)

Once the modem was connected with the proper cable, the redesigned WorldPort provided reliable data communications, particularly when connecting with BBSs and online services at 2400 and 9600 bps. The WorldPort supports communications from 75 bps to 9600 bps and readsjusts its own speed to match. With MNP Class 5 data compression enabled, the WorldPort always tries to negotiate an MNP 5 link, then drops down to non-MNP mode if necessary.

During some Mac-to-Mac communications, the modem behaved erratically. The Carrier Detect LED sometimes remained on after hanging up. And despite the error-correction features, the modem occasionally spewed lengthy lines of garbage characters amid my 9600-bps communications.

Still, the WorldPort is outstanding for its portability. The modem operates on a standard 9-volt battery. With the battery installed, the modem powers up automatically as soon as you load your telecommunications software and shuts itself off when you quit the program. In a world where batteries are almost never included, it's refreshing to find two alkaline batteries along with an AC adapter.

The WorldPort has only four tiny LED indicator lights—so, you don't always know what's going on during a session. No indicators flash to show when the modem is sending or receiving or when the phone is off the hook. The indicator lights that are there seem needlessly cryptic. For example, according to the manual, when the Low Battery LED is off, it means either "battery is OK" or "a completely dead battery is installed."

And, by the way, expect that "completely dead" message often; the WorldPort peters out pretty quickly on battery power. The user's manual says to expect two to three hours of use on a fresh battery. In my tests, batteries lasted only about an hour or so.—JOSEPH SCHORM

**MacWorld** January 1993 193
**Object Master 1.0.2**

**PROS:** Complete, customizable editor for C, C++, Pascal, Modula 2; project-management tools; Smalltalk-like browsers. **CONS:** Minor bugs. **COMPANY:** ACIUS (408/252-4444). **REQUIRES:** Mac Plus; 2MB of RAM; 4MB of RAM for System 7; hard drive; System 6.0.5. **LIST PRICE:** $395

**REVIEWS**

**PROGRAMMING MACINTOSH APPLICATIONS**

Programming was difficult from the start and got harder as the Mac family expanded; the ease of use you enjoy in Mac applications dictates extra challenges for the programmers who write them. Over the years, programmers have narrowed down the set of capable programming tools to a mere handful—the MPW (Macintosh Programmer's Workshop) products, Symanee's Think C and Think Pascal, Metrowerks's Modula 2, and versions of Smalltalk from Digital and ParcPlace.

Object Master from ACIUS is an attempt to combine the superior object-management facilities typically found in Smalltalk with a first-rate programmer's editor, and bring the whole package to the most popular languages—C, C++, and Pascal (Modula 2 with PI object extensions are also included). Object Master started life as the personal project of Lolie Vandereyken, a software engineer at ACIUS, but was soon found so valuable that many programmers began using it in-house, and then it was dressed up a bit, outfitted with a manual, and released as a commercial product.

Although this mode of product development may sound informal, it has yielded the advantage of unbeatable telephone support—typically you talk to Mr. Vandereyken or product manager Mike Graves, who both can answer questions authoritatively and also write small bug-fixes and send you the modified code.

The first recommendation for Object Master is its editor, which will also be useful to non-object programmers. Besides automatically adapting to the format conventions of specific languages, it supports customizable search and replace. You can paste procedure and method calls by name, with Object Master automatically searching your project's dictionary and the related MPW .H11 files for templates. The second strong point is navigation capability. The browser window displays scrolling lists of the classes, methods, and fields used by a project, with a separate on-screen editing area that brings up the text of highlighted methods. All types of modification of objects and methods can be performed directly through editing or menu choices in this window. Object Master here also includes some conveniences for non-object work—Pascal records and C structs in procedural programs will appear in class lists as bultered pseudoclasses, for example. The Class Tree window displays the class hierarchy in a variety of ways (you can collapse, expand, and change node presentation), and lets you enter the hierarchy at any point, so the Tree window becomes an overview working with the Browser. Finally, the project Make/Build facilities, which work with MPW Shell 3.3 ToolServer and the Incremental Build System from Jasik Systems, are particularly efficient. I used to think I would be happy with Think C's admirable project-management tools, but Object Master simply has more power—under System 7, for example, it can use Apple events to communicate with ReEdit 2.1.1 (the Resources Map itself is pretty helpful, too).

Developers are uniformly enthusiastic. John Penn, a custom-application programmer with Anapra (in San Diego), says that he uses Object Master constantly and is still finding goodies scattered throughout the program. Everyone we interviewed reported serious time savings on large projects. At $395 Object Master is not for hobbyists, but professionals are unlikely to want anything else. **—CHARLES SEITER**

**The Battle of Britain**

**PROS:** Easy to play; entertaining format; educational. **CONS:** Takes too long to complete game. **COMPANY:** Deadly Games (215/295-2284). **REQUIRES:** Mac Plus; 2.5MB of RAM; System 6.0.5. **LIST PRICE:** $54.95

Although at first glance you might take Rene Vidmer's The Battle of Britain for just another World War II flight-simulation game, this is a thinking person's game. It pits your military skill against the Mac's in a simulation of one of the critical battles of World War II. If you're in the market for an entertaining, easy-to-play military-strategy game—one that forces you to act and react quickly to sudden attacks—look no further.

The Battle of Britain opens to a map of southern England and eastern France on August 10, 1940. For the next month, the German Luftwaffe launches a relentless air attack on the British homeland. From your post at the underground Operations Theatre at Uxbridge, you take command of the Royal Air Force and its defenses. Using intelligence reports, radar, and a map table similar to the one that was used in 1940, your job is to turn back the Luftwaffe and save England.

For each raid you turn back, and for each day you survive, you gain points. The Germans score points for putting British squadrons out of action, launching bombing raids, and disabling air bases. If by September 10 you've amassed more points than the opposition, you win. A 50-point win qualifies as a major victory.

It's a good idea to read through all the reports and then determine just how many squadrons to send on patrol. Although you can patrol all the squadrons, it's more prudent to conserve your fighters. The reports don't tell exactly which targets the Germans will attack, but they do offer a good indication of their intentions for any given day of the campaign.

As they were historically, the British are badly outnumbered, so you should rely heavily on intelligence reports and detection—the Radio Direction Finder (RDF), England's early radar, and the Observer Corps (OC), both authentically re-created for the Battle of Britain. At the beginning of each day, check the Ultra reports at the top of the map. Reports from the RDF and OC may flash on screen at any time. It's better to get the RDF reports first because they give you enough lead time to get standing-by squadrons into the air and to move patrols to intercept the oncoming attack. You can move any squadron 20 miles in any direction by clicking on it and moving it with the mouse. Unfortunately, sometimes the OC's warnings are the first you receive, and then you're in trouble by the time the Germans are already over land, and it's too late to move any patrols.

The Battle of Britain fills only about three-quarters of my Mac LC's screen—a minor quibble, but it was sometimes annoying. Nevertheless, even though the graphics and sound on The Battle of Britain are not spectacular, I recommend the game. What it lacks in aesthetics it makes up for in strategy, historical insight, and entertainment. **—ANDREW MILLER**
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The Viva 14.4/Fax modem sends and receives data and faxes at 14,400 bps. The data slice includes the modem, MNP 4 and V.42 error correction, and MNP 5 and V.42bis data compression. The modem can send and receive Group III faxes at 14,400 bps and 9600 bps, as well as at the older, slower fax speeds. The package includes a cable, a power adapter, and software.

As a data modem, the Viva 14.4/Fax performs well. I was able to connect to several other modems at data speeds of 14,400 bps, 9600 bps, and 2400 bps. Once connected, the Viva modem automatically negotiates the maximum transmission speed possible with the other modem. Because of the data-compression features, the top data-throughput speed is theoretically 57,600 bps, but in the real world no modem reaches this speed. The Viva 14.4/Fax is no exception; in my tests I reached a maximum throughput of 18,500 bps. This is lower than the average maximum throughput I reached testing other 14,400-bps modems, such as Supra Corporation’s SupraFax-Modem V.32bis and Global Village Communication’s PowerPort/Gold. The average throughput of those modems was approximately 25,000 bps on the same test files.

The software bundled with the Viva 14.4/Fax is Quick Link II Fax by Smith Micro Software. It is, quite simply, bad software. Though it works most of the time, it lacks features found in other communications packages: the fax features are less than ideal. For data, the program includes the Xmodem, Ymodem, and Kermit file-transfer protocols but not the more useful Zmodem. I was unable to obtain successful Ymodem transfers, even though I tried sending from three different brands of modem. Xmodem transfers with Quick Link II Fax were about 30 percent slower than with the Viva modem using Software Venturers’ MicroPhone 1.7, a limited version bundled with other manufacturers’ modems.

Faxing should be almost as easy as printing, but the Quick Link II Fax software makes it just a bit harder. You need to choose the fax driver, QL Fax Print, in the Chooser before you fax, and there is no keyboard shortcut for temporarily selecting the fax driver. You must also go through two or three dialog boxes to address the fax. In my tests the fax software froze twice while trying to send. Received faxes didn’t fare well, either; on three multiple-page faxes, when I tried to read the received fax on screen, one or more of the pages had been squashed down to one line, making the received fax useless. The Quick Link II Fax log had reported that the fax had been received OK, however. Add to these problems an interface design that I can charitably describe as clunky, and it’s clear that Quick Link II Fax is a program that increases the user’s frustration. I discovered that the Viva hardware works with Fax/stf fax software, which is sold by STF Technologies and bundled with modems from Supra, PSI Integration, and others. This software is far superior to Quick Link II Fax in case-of-use and in features. In fact, if you buy a Viva 14.4/Fax, I suggest you throw away Quick Link II Fax and replace it with Fax/stf.

The manual for the modem is good, and technical support is adequate but hard to reach. There is an 800 number for tech support, but it’s usually busy. I was only able to get through once in several calls.

Because Quick Link II Fax is bundled with the unit, I would not recommend the Viva 14.4/Fax unless you are prepared to make the extra investment in better data and fax software. —TOM NERGINO
EVER SINCE THE FIRST COMPUTER was invented, there have been attempts to simplify programming it, while making the programs more powerful. The Macintosh introduced programming using graphical elements instead of text. Serius Programmer's graphical approach gives non-programmers tools for creating custom software.

You have to learn Serius's specialized vocabulary. A project (read: program) consists of objects and functions. An object can be as simple as a text string, or as complex as a window in a paint program. Each object type has its own unique set of functions that operate on it. A complex project can be broken into subjects—user-defined collections of objects and functions.

A program starts as a collection of related objects. For example, you might begin with menu bars, each of which also includes commands. Typically you then define windows and various data entry fields and buttons in them. Next you connect functions to these objects to control your program's behavior. For instance, you can attach window-opening and -closing functions to menu commands. For more-complex operations, you can chain functions together; say, close a window, open another, enter some data, make a calculation, and perhaps develop in-house programs, and it enables non-programmers to create simple custom applications.

SERIUS PROGRAMMER 3.0

**Pros:** Requires almost no programming knowledge to build simple applications; toll-free tech support. **Cons:** Program functionality is constrained by the object designers; too few examples in documentation, complex programs may need optional object sets. **Company:** Serius Corporation (801/261-7900). **Requires:** Mac Plus; hard drive; System 6.0.2. **List price:** $595.

**REVIEWS**

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**Medical Reference on CD ROM**

Stat-Ref 3.2

**Pros:** Can mark citations for future retrieval; simple interface. **Cons:** No Boolean operations; no images in current version. **Company:** Teton Data Systems (307/733-5494). **Requires:** Mac Plus; 2MB of RAM; CD ROM drive; System 6.0.2. **List price:** $95.

**CONS:**

- Requires Mac Plus; hard drive; System 6.0.2.
- REQUIRES:
- **List price:** $595.

**REVIEWS**

STAT-REF CONSISTS OF A MEDICAL database on CD ROM, and an application that lets you search by keyword. The $95 fee buys the Stat-Ref program and one year of tech support. For $200, you get a subscription to a CD ROM library of journal abstracts for one medical discipline, such as cardiology. (The company plans to release libraries for other specialties.) Each library includes abstracts from the past ten years of the National Library of Medicine's MedLine database; four quarterly updates are included in the subscription price.

In addition to journal citations, Stat-Ref offers full-text versions of selected books and references such as The Medical Letter, Stedman's Medical Dictionary, and the popular Appleton and Lange series. Costs range from $35 for most of the Lange titles to $395 for a one-year subscription to reviews from the Scientific American Medicine, updated quarterly. Fortunately, you don't have to purchase a separate CD ROM for every book—you can order code numbers to unlock titles on the disc by calling Teton's toll-free number.

Stat-Ref's search interface is easy to use, but not very powerful. After selecting textbooks or journals to scan, you search using keywords. The software doesn't understand Boolean operators like NOT, so you can't automatically exclude references that contain specified keywords. And while you can tell Stat-Ref to automatically look for words with common roots (like infarct and infarcting), true wild-card characters aren't recognized, so you can't search for words that begin with a given text string.

The next step is to scan. At the lowest precision level, Stat-Ref finds every reference that contains at least one of your keywords; the highest level requires that all the keywords appear adjacent to one another.

Stat-Ref gives you two options for displaying references. If you expect to find a large number of citations, choose Match Summary, which presents a list of references in outline format. Each journal or textbook appears only once, with the number of matches shown in brackets next to the title. To view the reference text, you expand the outline and display the subtitles.

For more-limited searches, Stat-Ref's Smart Match feature lists all of the relevant citations sequentially. In either case, double-clicking on an item retrieves the associated textbook section or journal abstract and presents it in a separate window. (This release can't display pictures or drawings, a feature that's planned for future versions.)

Stat-Ref lets you mark up to 50 citations with electronic bookmarks, saving you the trouble of repeating a search later. And if you simply want to browse, you can display textbooks and journal abstracts in outline form.

In my trials, Stat-Ref found references rapidly, although complex searches took longer. To make things easier, I took the manual's advice and copied the libraries' outline files to my hard drive. Although this lessened search times, just one of the outline files took almost 12MB of hard drive space. Because Stat-Ref provides access only to limited sets of journal citations, it's not well suited to searches for research or publication. What it can do is replace a small reference library in an office or hospital setting. Although Stat-Ref's search options are less comprehensive than some other medical-reference databases, Stat-Ref is easy to use and relatively fast. If you want reference texts that include a lot of pictures, though, you may want to wait for a future version.—STEVE MANN

**Connecting Objects and Functions**

To create an application, you drag objects and functions from the Object & Function palette (bottom) to the object area on a subject's window, then connect functions to objects and to each other by pointing and clicking.

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Flowchart Software

FlowChart Express 1.0

PROS: Inexpensive; horizontal and vertical split screens; automatic backup files; objects can be nudged, even with grid snap on; comments can be attached to symbols as note cards.

CONS: Must reset defaults for each chart; text wrap within decision symbols sometimes requires manual adjustment; no selective symbol shadowing.

COMPANY: Kaetron Software Corporation (713/890-3434).

REQUIRES: Mac Plus; System 6.0.5.

LIST PRICE: $49.

LOWCHART EXPRESS IS FOR PEOPLE who don't need all the features of Kaetron's more powerful flowchart program, TopDown. It has the tools you need to create process flowcharts and organization charts easily. Only users with extensive requirements will feel hampered by the feature list.

If you're familiar with any draw-style graphics program, you'll have little trouble with FlowChart Express. You construct flowcharts by selecting any of a dozen standard flowchart symbols, such as input/output, decision, and process symbols, from a palette and connecting them. Each symbol, connecting line, and text string is an object that you can move, resize, or color.

Options to display a grid and snap objects to the grid let you easily arrange objects on the page. You can also use the arrow keys to nudge objects into place, even overriding the snap-to-grid setting. You can align elements with each other or with the grid. Text wraps automatically within symbols (except in the diamond-shape decision symbols, where you sometimes need to manually readjust text to keep it inside).

You can set defaults for options such as symbol size, text font and style, and line-connection style before starting the chart.

But you can't save a general set of preferences for all new charts; you must reset the options for each new chart. (Under System 7 you can save chart documents as stationery and reuse your preferred settings.)

You can attach comments to any symbol in a pop-up note-card window. Since they are normally hidden, note cards are great for documenting steps in a process without cluttering the flowchart. FlowChart Express has no drawing tools, but you can paste graphics created in other programs into your charts. You can also use pasted graphics as custom symbols. Symbols can be displayed as standard outlines or with shadows. Shadowing, however, cannot be selectively applied—it's all or nothing.

To make it easy to see different sections of large flowcharts without scrolling, you can split the document window horizontally or vertically. The program automatically makes a backup of any file you open.

The only cumbersome procedure is binding a text string to a connecting line (associating the words Yes and No with the branches of a decision symbol, for example). If you type long strings of descriptive text, however, bound text doesn't disappear if you eliminate its connecting line. The text stays on the chart, so you can bind it to other lines or use it as free-form text.

FlowChart Express is an inexpensive, easy-to-use program that will readily meet the needs of most flowchart creators.

—STEVEN A. SCHWARTZ

Personal Information Manager

Hello

PROS: Inexpensive; easy to create mail merge documents.

CONS: Documents must be linked to contacts; cannot set tabs or line spacing in word processor; occasionally quits without warning.


REQUIRES: Mac Plus; System 6.0.5.

LIST PRICE: $99.

HELLO IS THE LATEST ENTRY IN A crowded field of utilities that track personal information like addresses and appointments. Instead of focusing on address-book and scheduling functions, though, Hello offers the unusual combination of contact management and word processing in a compact package. Unfortunately, this release has several notable deficiencies.

The Address Book module, Hello's strongest point, provides for each contact's name, title, company, address, voice and fax numbers, and E-mail accounts. Option-clicking on a field brings up a dialog box that lets you change the default field name. You can opt to have words capitalized as you type, and you can lock unused fields to prevent users from entering data in them.

Hello doesn't automatically check for incorrect data as you type, though.

Buttons at the bottom of the window let you delete, duplicate, and enter new contacts; scroll through the Address Book; and dial telephone numbers through the Mac's speaker or modem port. Hello ignores any area code you specify as local, and you can enter prefixes for outside lines and long-distance numbers. (The prefix fields should be larger to accommodate access numbers required by carriers like MCI and Sprint.)

The List View button switches you from the entry screen to a tabular format that shows each contact's name, company, address, and work number. If you're not satisfied with these field choices, you're out of luck—you can't control which fields show or how they're displayed. You can sort the list of contacts by one or two key fields, and you can search for entries that contain any specified text string. Like other contact managers, Hello lets you mark a subset of entries for later reference.

Hello's word processor, Typewriter, also suffers from a few limitations. For one thing, text documents that you create with it must be linked to specific contacts in the Address Book. This arrangement is designed to save keystrokes by automatically inserting contact information into memos and letters, but it's cumbersome if you want to write a document that has no related contacts. Even worse, if you delete a contact record by mistake, all its associated text documents vanish with it. Ouch!

The Typewriter module includes several unusual features—for example, you can insert Address Book fields into mail merge documents by choosing from a pop-up menu, and you can print envelopes with one mouse-click. It even has a spelling checker. But Typewriter lacks some features that Mac users expect; for example, you can change text attributes, but you can't alter the default tab stops or line spacing.

There are a few other problems. Typewriter uses Claris XTND filters to import and export files, but Atelier ships only the XTND translators for MacWrite and text files. Typewriter writes files to disk when you switch views, but I was also put off by Hello's lack of a file-save command. You should be able to save without exiting the document. And there are inconsistencies in the interface—for example, you change document titles by double-clicking, but it only takes one click to enter new field names in the Address Book. Finally, Hello sometimes quits without warning on my Mac IIci.

To be fair, Atelier plans to remedy many of these limitations soon, as well as provide additional plug-ins, including fax and calendar modules. I can't quite recommend this version, but I am eagerly awaiting the next release.—FRANKLIN N. TESSLER
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**Low-End Word Processor**

**LetterPerfect for Macintosh 2.1**

**PROS:** Inexpensive; fully compatible with WordPerfect file format; intuitive column control; wraps text around graphics. **CONS:** Lacks style sheets; requires more hard drive space and RAM than WriteNow 3.0. **COMPANY:** WordPerfect Corporation (801/225-5000).

**REQUIRES:** Mac Plus; hard drive; System 6.0.5. **LIST PRICE:** $149.

Don't be confused by the version number—2.1 is the first version of LetterPerfect released for the Macintosh. For the sake of consistency, WordPerfect matched the version number of LetterPerfect to that of WordPerfect for the Mac. LetterPerfect is a stripped-down version of WordPerfect, available for a street price of a few dollars more than an upgrade from WordPerfect 2.0 to WordPerfect 2.1. While LetterPerfect has a few minor options not found in its more robust sibling—including a split ruler that accommodates small screen sizes—its economies in other areas, particularly in the page-layout department, LetterPerfect lacks borders or shading options, parallel columns, automated figure captions, independent text boxes, master pages, a drawing window, an index or table-of-contents generator, a sort feature, macros, or style sheets.

So what does LetterPerfect have? WordPerfect's intuitive column control, thesaurus and 125,000-word spelling checker, mail merge feature, ability to wrap text around graphics, support for System 7 features such as balloon help and publish and subscribe, and graphics-import capabilities. That means that on its own, LetterPerfect measures up as a serviceable low-end word processor, adequate for users frustrated with the lethargic speed at which giants like WordPerfect and Microsoft Word run on Classics, LCs, and PowerBooks. While it sports WordPerfect's complicated code-based formatting architecture, LetterPerfect provides clean, accurate documentation and an uncluttered interface. But LetterPerfect isn't the only low-end word processor. At least one competitor, WriteNow 3.0 from T/Maker, works on the Mac 512KE; LetterPerfect requires at least a Mac Plus. The WriteNow application consumes less than 300K on disk, so you can work from an 800K floppy; LetterPerfect consumes over 650K and requires a hard drive. WriteNow needs 490K of RAM; LetterPerfect, almost twice that. In return, WriteNow provides both character-based and paragraph-based style sheets, and Reference Software's Grammatik Mac grammar checker. LetterPerfect lacks all of these. Admittedly, LetterPerfect's graphics capabilities overwhelm WriteNow's, but in a low-end word processor, that's the least of my concerns. In the final analysis, WriteNow retails for $100 more than LetterPerfect and earns every penny of it.

However, if you're a WordPerfect user, LetterPerfect's stock rises dramatically. Say that you use WordPerfect at the office but tend to rely on a PowerBook at home or on the road. In that case, you'll appreciate LetterPerfect's ability to open any WordPerfect 2.1 document, regardless of its complexity. You won't be able to edit the document in many of the ways that you can in WordPerfect, but every formatting attribute will remain intact, down to the automated captions and indexing markers.

Like Nisus Compact, the condensed version of rival word processor Nisus from Paragon Concepts, LetterPerfect is a good value for a small subset of the folks who use WordPerfect. But neither Nisus Compact nor LetterPerfect can match WriteNow's readiness to strike out on its own. The last word processor to make this mistake, Microsoft Write, a reduced version of Word, dropped quickly into oblivion shortly after its introduction.—DEKE MCCLELLAND

**CD ROM for Learning Japanese**

**NihongoWare Volume 1**

**PROS:** Exceptionally accurate guide to current Japanese business vocabulary and social customs. **CONS:** Small phrase set; Romaji only; expensive. **COMPANY:** Qualitas Trading Company (510/848-8080). **REQUIRES:** Mac Plus; 2MB of RAM; 4MB of RAM for System 7. **CD ROM drive; System 6.0.4. **LIST PRICE:** $623.

The computer in general and the Mac in particular hold great educational promise, a large amount of it yet unrealized. With its foreign scripts, sound capabilities, and simple interface to CD ROM drives, the Mac seems to be positioned as a nearly ideal instructional tool, especially for languages. As hardware it's pretty close to ideal—the problem is first-class instructional material. Ariadne Language Link of Tokyo has prepared some first-class material for Xerox Japan, and it's now available as Volume 1 of NihongoWare (Nihongo means Japanese language), distributed here by Qualitas Trading.

To be blunt, it's wonderful stuff, but there isn't $623's worth of it on the CD (Volume 2 will be $665 and should be available by press time). The ten HyperCard-based lessons amount to a hypertext phrase book with digitized sound. The lessons cover trains, taxis, restaurants, directions, greetings, requests, business meetings, telephone usage, socializing after work, visiting at home, and shopping. Additional topics cover (in sound and pictures) business card etiquette, bowing, introductions, and what is appropriate for you to do in front of Japanese business associates in a karaoke bar. The Grammar menu covers topics likely to be less than obvious to English speakers, such as Japanese verb constructions, social conventions in address, and negation.

Ariadne/Qualitas has done something unique in this material, which is to offer the real goods. With the exception of the business-Japanese course developed for Nissan, most other textbooks, tapes, and videos give you slightly stilted or slightly out-of-date expressions. After two years of university Japanese with standard textbooks, you would find yourself, when ordering sushi in Tokyo, in roughly the same place as an American tourist trying out high-school French on native Parisians in a Left Bank café—we're talking geek city.

So NihongoWare has probably enabled hundreds of Xerox employees to speak modest amounts of real colloquial Japanese—the problem is that the quantity of digitized sound and cartoons on the CD ROM gives you the equivalent of a mere 20 pages of phrase-book material. For a company that regularly sends employees on short trips to Japan, NihongoWare Volume 1 represents a worthwhile investment—the training is in solid, if limited, Japanese conversation. For an individual, the economics are much less favorable; for the price of this CD ROM you could take small-group lessons every week for a year, and the instructor might even help you learn to read hiragana and a bit of kanji as well. If Ariadne's pioneering product line expands and the prices come down, though, we may yet see the Mac become an important Japanese-teaching device.—CHARLES SEITER
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- Walk through complex tasks in fewer steps than usual with the Wizards online assistants

Microsoft Word Version 5.0:
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Aldus Gallery Effects

Winner of MacUser's MacEdgy Award for Best Visual Resource, Aldus Gallery Effects is a unique library of artistic effects that automatically turns grayscale or color scanned photographs and other bitmapped images into spectacular, breathtaking works of art. Gallery Effects is a "must have" for anyone using a scanner or doing desktop publishing, graphic design or presentations. Sixteen "master effects" are included:

- Graphic Pen
- Watercolor
- Charcoal
- Dark Strokes
- Dry Brush
- Poster Edges
- Smudge Stick
- Film Grain

And there are thousands of variations from each master effect! Each of the sixteen master effects has individual controls to let you customize the effect. For example, the Watercolor effect has controls to adjust the brush detail, the shadow intensity and the texture level. You can also apply multiple effects to a single image—the possibilities are endless. Aldus *#01121

Mighty Draw

Mighty Draw is the affordable, general purpose, object oriented drawing program that allows you to create pie charts, column charts, bar charts, flow charts, organizational charts, graphs, electronic schematics, network diagrams, flyers, news letters, greeting cards, advertisements, logos, clip art and much more. Mighty Draw comes with symbols for flow charts, electrical schematics and more. You can even add virtually any symbol from any other program through the clipboard, including color. Abracadabra *#06162

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Whether you are a professional or a do-it-yourselfer, Design Your Own Home can make your planning time more productive.

- Each program includes sample plans and a try-out section to get you started, plus command cards to keep by your side as you work.
- There are 4 programs: Architecture (floor plans to structural details), Interiors (furnishings to color schemes), Landscapes (trees to fences) and Sprout (design your own vegetable garden). Includes several sample plans. Abracadabra

- #03609 H4: Architecture ........................................... $58
- #03611 Interiors ................................................... $58
- #03610 Landscape ................................................ $58
- #05085 Sprout ...................................................... $42
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Fractal Design Sketcher brings revolutionary natural-media and imaging technology to grayscale graphics for the first time. Sketcher faithfully duplicates the expressive line of a soft lead pencil on rough sketch paper or the luminous glow of oil paints that have been layered on fine-weave canvas.
Fractal Design #06157

Smoothie
Smoothie removes the jagged edges from pictures in your drawing and presentation applications using true subpixel anti-aliasing for superior results. Smoothie also turns your pictures into a double-clickable application that contains all your slides and builds QuickTime movies from any collection of individual pictures. The program uses Publish and Subscribe to tightly integrate with your drawing program and it works beautifully with TrueType & ATM fonts. Not intended for use with bitmap pictures from scanners or painting applications. Perico Software #06001

DrawingPad
Improve the quality and productivity of your graphics with DrawingPad™, the unique drafting tool that combines the capabilities of a digitizer, a graphics tablet and a mouse. This low-cost, versatile, high-performance tablet is the perfect graphics solution for graphic design, illustration, desktop publishing, drawing, tracing, drafting, mapping, and other computer graphics applications. The pressure-sensitive pen and the tablet's surface (7.5" square) emulate traditional media feel, yet give you the full flexibility and power of the Mac operating environment.
CalComp #05086 DrawingPad™ 7.5 x 7.5

Star Trek: The Screen Saver
New from the makers of After Dark, one of our all-time best selling screen savers, comes Star Trek: The Screen Saver. It saves your monitor from phosphor burn-in with fantastic displays based on the original Star Trek series. Berkeley Systems #05934

Aldus Persuasion 2.1
Need to develop presentation graphics? Let Aldus Persuasion 2.1 do all the work. Just select one of the predefined templates (or create your own), and type your ideas into the outliner. Persuasion automatically prepares your slides from the outline. Aldus #02424

Claris MacDraw Pro
If ease of use and precision results are your objectives, MacDraw Pro can help you get there. MacDraw Pro has many powerful features. Requires proof of ownership of a competing software product.
Claris #04073

Aldus IntelliDraw
New from Aldus, IntelliDraw is an exciting new type of drawing program that gives you an easy new way to visually experiment, refine and draw your ideas. Full text and drawing options provide the flexibility you need. Aldus #05481

Morph
The hottest movie image effect of the '90s is now available on the Mac! Morph smoothly transforms one image into another, creating dazzling images and effects. Whether it's last year's car model turning into this year's, or changing a dodle kitten into a ferocious tiger, this effect has amazed audiences all over the world. Morph is fast, easy-to-use, and fully compatible with QuickTime. Gryphon #05925

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HitClb: We offer all the capabilities of a standard external hard drive, yet fits in the palm of your hand: Weigh less than 10 ounces, each drive is shock-mounted in a compact, rugged case that measures only 5.4" x 2.9" x 1.1" (13.7 x 7.5 x 2.8 cm). But don't let its small size fool you. Featuring the latest 2.5-inch drive technology, HitHiker gives you big drive performance and reliability. Just plug it into any Mac. It can be powered through the ADB port. Compact enough to carry in your shirt pocket or in your briefcase along with your PowerBook. MASS Microsystems #01612

DiamondDrive 120
Offering high capacity and high performance at an affordable price, the DiamondDrive 120 boasts access times as low as 12ms. It comes with software that provides easy-to-use formatting, volume partitioning and lost diagnostics. All Diamond Drives are Preformatted, and covered with a two-year warranty and a Toll-free support line. MASS Microsystems #00971

DataPak MO/128 Rewritable Optical Drive
Because optical discs use a laser beam to read and write data, they do not wear out, and are not vulnerable to head crashes. This makes them much safer than magnetic hard disks, so they're great for archiving valuable data. And the cartridges are interchangeable, so you can add extra capacity and transport large files. MASS Microsystems #00332

Everything You Need To Enter the Exciting New World of CD-ROM
You won't find a better value in CD-ROM than the new CD Express bundle from NEC. This affordable doorway package to the exciting world of CD-ROM saves you literally hundreds of dollars off the individually priced items. The 10 CD-ROM software titles alone are worth the asking price! But you get much more. Along with the software titles you get a quality MPC-compliant CD-ROM drive, self-amplified stereo speakers, Mac interface and 4 size C batteries—everything you need to go live with CD-ROM in one box!

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- 4 size C batteries

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- Software Toolworks World Atlas
  This comprehensive atlas, almanac and world fact book provides fast access to over 240 full-color, fully detailed maps.
- Lucas Film Games Favorites
  The most challenging Lucasfilm and LucasArts games—on one CD!
- Great Cities of the World Volume II
  A multimedia tour of ten of the world's most exciting cities!
- Best of the Bureau
  A collection of works of literature and history, selected from the Bureau Development library.
- Interactive Storytime
  Three delightful children's stories that both entertain and enhance reading development and language skills.
- Total Baseball
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- The Family Doctor Home Medical Reference
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PowerMerge

PowerMerge solves the problem of keeping track of changes made to your files while working on your PowerBook and your desktop Mac. It also features notification if files have been changed on both computers since the last update, history log of updates, include/exclude by file.

- Automatic reconciliation based on previously selected files, folders or disks
- Inclusion or exclusion of individual files, folders, disks or document types
- Disk locking
- Bidirectional updates
- Conflict notification if changes have been made to files on both computers before updating
- Background updates
- Balloon help, System 7 and more.

Leader Technologies #05690

WriteNow 3.0

Who says a professional word processor has to be slow and complicated? WriteNow 3.0 is one of the fastest word processors available for the Mac and has long been considered by industry experts to be the easiest. A two-time winner of MacUser's Best New Word Processor Award, WriteNow includes a lightning-fast 155,000-word spelling checker, complete thesaurus, the most powerful paragraph and character style sheets of any Mac word processor, a robust print preview, System 7 compatibility...and a lot more! Completely compatible with Microsoft Word, Works, MacWrite II, PC WordPerfect and other popular formats.

- Awarded four stars by Macworld, 1992 (version 3.0)
- Editors' Choice Award, Macworld, 1992 (version 3.0)
- "Very Good Overall Value" (second highest), MacWEEK, June, 1992 (version 3.0)
- Highest rating for Ease of Use, Speed, Value and Documentation, Government Computer News
- Highest overall rating, Software Digest, 1990
- Editors' Choice Award, Computer Reseller News, 1990
- Editors' Choice Award, Best New Word Processor, MacUser, 1989

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The next time you see a 'sad Mac' on your screen or your Mac's performance isn't up to par, diagnose from your desk with SNOOPER, the revolutionary new standard for Mac diagnostic and testing tools. SNOOPER performs a comprehensive suite of tests, checks all your hardware and identifies any problems. And the same SNOOPER software runs on all Macs. Until Dec. 31, 1992, buy SNOOPER and receive Norton Utilities FREE. Maxa Corporation

#05025 SNOOPER 1.0/ Norton 2.0 Bundle ............................... $128
#05026 SNOOPER 1.0 w/ NuBus Card/ Norton 2.0 Bundle .......... $168

Circle 70 on reader service card
MOST PEOPLE LOOK AT THIS SOFTWARE PACKAGE AND MISREAD THE NAME as Calculus Physics, probably thinking of the distinction between college physics for science and engineering majors (using calculus), and physics for everybody else (qualitative, no advanced math). Actually, this program is the everyday-else physics—it’s called Caduceus Physics because it’s the first in a series of programs to prepare people for the Medical College Admissions Test (MCAT) or other nationally administered tests. The people at Scientia assume you know that the caduceus is the staff with a small con­ceptual bite of physics. You can search the stack on specific topics and on multiple keywords, browse for topics in the well-orga­nized tree index, or start at the top and go through the whole stack. Some cards feature basic illustrations, and some add little bits of animation to the illustrations.

As a teaching device, this product has two great strengths. First, the writing is unusually high-quality—on a par with the best available undergraduate texts (alarming­ly similar to some of them in places, in fact). Second, CP is an efficient preparation for tests; there’s no physics-for-art-majors stuff and no material that’s too advanced to appear on a test in a standard U.S. college freshman physics course. There are, how­ever, a few problems. Since CP is a big HyperCard stack, it’s sluggish on anything

REQUIRES: Mac II; 13-inch monitor; hard drive. LIST PRICE: $159.95.

Nolo’s Personal RecordKeeper 3.0


FIVE-CARD DRAW

This card is linked to a card that tests you on the concept, to cards that contain refer­ence materials, and to cards on related topics. Topic­s with more kinetic possibilities have icons for min­i­malist movies.

Personal RecordKeeper includes Employment, Alimony, Royalties, and Worker’s Compensation. You enter account numbers, payment schedules, and other vital information in subject fields. NPR’s interface is uncomplicated and straightforward; both the manual and the online help files are good. It’s easy to learn, requires little memory, and runs well on a Mac Plus. But Nolo Press’s information materials succeed in helping the user much more than do the product’s actual features.

Two problems make the potentially useful application significantly less valuable to the average consumer. First, while you can export NPR databases to word processors or spreadsheets, you can’t import text from other applications. Your only option is to cut and paste with the Clipboard or Scrapbook, a frustrating and laborious task. Second, with a few exceptions, you can’t add, remove, or change the names of categories, subcategories, or subject fields. For example, there’s space for information about your boat alarm, patent, and airplane hangar, but you can’t add a place to note charitable donations or computer serial numbers. If NPR lacks a category or sub­category you want, you have to enter inform­ation into ambiguous “other” subcate­gories or in individual notes files. This is es­pecially egregious given the highly spe­cialized categories. It’s as if the program was designed with a particular user or socio-economic group in mind, and many people probably don’t belong to that group.

Another problem with NPR is its secu­rity system. You can lock a database or a cat­egory, but not a subcategory. Also, you can only use one password per file. This means everyone with a password can access all your information, a situation I’d rather avoid.

One of NPR’s nice features is its ability to evaluate your data and create Home Inventory and Net Worth reports. While the reports are good, you can’t edit them; you need to return to the entry field in question to change the value.

Nolo’s manual is well organized and quite helpful; it contains a useful legal guide to maintaining family records and financial affairs, even though the manual points the reader to Nolo Press books too often. Nolo’s free tech-support line (a toll call) is open Monday through Friday, 9 a.m. to 5 p.m. Pacific time. When I called, the tech­support staffer had to consult other people to answer my questions.

Do you need NPR 3.0? If you need to organize lots of information into numerous categories and subcategories, if you don’t mind typing in data, and if you want the sound legal advice provided in the manual, NPR might be for you. And hey, if you’re keeping track of your boat and vacation home, you can probably afford the $49.95.

—JOANNA PEARLSTEIN
**PathFinder**

**PROS:** Inexpensive; easy setup; great tech support. **CONS:** Not easy to configure when used as part of a large internet. **COMPANY:** Dayna Communications (801/331-0600). **LIST PRICE:** $899.

**FOR ANYONE ADDING ETHERNET CAPABILITIES TO AN EXISTING LOCAL TALK NETWORK, THE SHOPPING LIST AND ASSOCIATED PRICE TAGS CAN ADD UP QUICKLY. OFTEN YOU'LL ALSO NEED TO INCLUDE THE EXPENSE OF A NETWORKING CONSULTANT. DAYNA HAS SOME OF THE RATES OUT OF THIS COST CUNCH BY PRODUCING A LOCAL TALK-TO-ETHERNET ROUTER AT AN ATTRACTIVE PRICE. ALSO, CONFIGURING THE ROUTER IS A BREEZE—JUST PLUG AND PLAY, FOR A SIMPLE ETHERNET-TO-LOCAL TALK NETWORK. CONFIGURING THE ROUTER Becomes A LITTLE TRICKIER AND REQUIRES SOME NETWORK KNOW-HOW WHEN IT'S ADDED TO A LARGE MULTIROUTER INTERNET.

For the formation of a simple internet (a LocalTalk network and an Ethernet network connected by one router) the PathFinder comes ready to use right out of the box. The only configuration required is to connect the networks to the PathFinder. This involves plugging the LocalTalk network into the standard LocalTalk DIN-8 connector port and attaching the Ethernet hub into the other port using one of three cabling systems: RJ45, AUI, or BNC. This process took me less than five minutes and provided immediate access to and from devices on either network. The PathFinder automatically generates two default zone names and network numbers. No software configuration is necessary. This is a great breakthrough for non-techies who have been intimidated by the complicated setup required for higher-priced routers.

The PathFinder can also be used to extend an existing Ethernet zone over a single LocalTalk network, provided that there is no other router on the LocalTalk network and that you don't want to change the Ethernet zone name over the LocalTalk network. This provides transparent access to all devices on either network without the hassle of zone switching for the end user. A toggle switch on the back of the PathFinder makes this possible—again, no software configuration is required.

The PathFinder can also be used in a multirouter internet. For this, you need some networking expertise, since the documentation is sparse and software configuration is necessary. Using the PathFinder Setup Utility, you must indicate whether you want the router to be a seed router (seed routers transmit routing information over the network) and that any existing routers will absorb routing information from other routers on the network) and which phase of EtherTalk (Phase 1 or 2) you're running on the rest of the internet. You must also designate the zone name and network number or range of numbers the PathFinder will be using. If you don't know much about AppleTalk networking, the manual refers you to the book Planning and Managing AppleTalk Networks by Apple Computer (Addison-Wesley Publishing Company, 1990). According to Dayna's tech support, there's no detailed configuration information in the manual because internet complexity can vary greatly.

But don't worry if you need a little hand-holding through the installation. The tech-support reps I spoke with were knowledgeable, courteous, and patient. They even provided additional information on network numbers that was unclear in the manual and verified that I had correctly configured the router for my particular internet.

So what's missing? The PathFinder is a single-protocol router (AppleTalk). If you need to tangle with other protocols such as TCP/IP or IPX, you're better off using the higher-priced alternatives that provide protocol translation. The PathFinder is a great value for the dawn of internet and a great timesaver for the beginning network manager or MIS guru.—MATTHEW R. CLARK

**WonderPrint 1.0**

**PROS:** Speeds output of pictures on PostScript printers; improves output of graphics on QuickDraw printers. **CONS:** Doesn't improve output on color printers; some programs can't take advantage of WonderPrint. **COMPANY:** Delta Tao Software (408/730-9336). **REQUIRES:** Mac Plus; any black-and-white printer; System 6.0.5. **LIST PRICE:** $59.

**PRINTING PICT AND TIFF HALFTONE IMAGES WITH THE MAC USED TO REQUIRE PATIENCE AND AN EXPENSIVE PRINTER. WONDERPRINT IS A PRINTING EXTENSION THAT SPEEDS AND IMPROVES THE GRAPHICS OUTPUT FROM QUICKDRAW PRINTERS LIKE APPLE'S STYLEWRITER AND HUEWETT-PACKARD'S DESKWRITER. WONDERPRINT ALSO SPEEDS UP COLOR-IMAGE PRINTING TO BLACK-AND-WHITE POSTSCRIPT PRINTERS LIKE APPLE'S LASERWRITER PLUS AND IIIF. WONDERPRINT DOESN'T ACCELERATE TEXT-DOCUMENT PRINTING, NOR DOES IT IMPROVE THE PRINTING OF LINE ART OR TEXT ON COLOR PRINTERS.**

To install WonderPrint, you simply drag its icon to the System Folder. The manual says, "Once you install WonderPrint, you can pretty much forget about it." The manual is right. After you install WonderPrint, the print dialog box gives you additional option boxes—a check box turns WonderPrint on and off, and radio buttons indicate if graphics are to be dithered or printed as halftones. WonderPrint doesn't improve the quality of images printed on PostScript laser printers, but it does increase the print speed. Printing a 145K color PICT image on a LaserWriter IIIF took 163 seconds without WonderPrint and 70 seconds with it. On a LaserWriter Plus, a 1.5MB color PICT file printed in approximately 2 minutes with WonderPrint versus 20 minutes without.

Some applications, Photoshop for example, bypass the standard print drivers. They also bypass WonderPrint. Delta Tao doesn't provide a list of applications that bypass the driver, but it does include a separate application, WonderPict Printer, that opens PICT files and lets them be printed through WonderPrint. To improve color printing, Delta Tao recommends using a paint program that supports the ImageWriter, such as Delta Tao's own Color MacCheese or Microsoft's MacPaint II.

Delta Tao provided excellent tech support. My questions were answered patiently and correctly. When I left a message, my call was returned within an hour.

A rule of thumb: The cheaper your printer, the more you benefit from WonderPrint. A PostScript laser printer with WonderPrint prints graphics faster, but the output's quality remains the same. A QuickDraw laser printer with WonderPrint prints graphics with quality equal to that of a standard 300-dpi PostScript laser printer, but speed isn't improved. StyleWriters and DeskWriters with WonderPrint become a cheap means of producing halftones good enough for newsletters.

Those who would benefit the most from WonderPrint are owners of ink-jet QuickDraw printers such as the StyleWriter and DeskWriter. The reason many of us bought these printers was that they promised near-laser-quality text output. WonderPrint adds halftone graphics printing as well.—JIM FEELEY
Introducing Microsoft® Word 5.1 for the Macintosh.

The path to easier computing just got shorter, with new Microsoft Word version 5.1.

Now you can speed through your work with our intuitive new Toolbar. It puts all of the functions you use most into short and easy reach. With a click.

This powerful Toolbar features one-step bulleted and automatic envelope addressing. Two great new ways to get into the fast lane. Or hit the typecase button to quickly select cases. You can even personalize up to 30 buttons to shorten the trip through repetitive tasks.

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Now it's possible for you to easily create charts and tables or insert and edit your own text annotations. Your ideas look great in no time.

Microsoft Word 5.1 comes with special installation features and a new battery indicator for the Mac^" PowerBook. It also has QuickTime^" support, which allows you to add full-motion video as easily as inserting a simple graphic.

In short, we've made word processing easier than ever before. Thanks to you. Because we got there by listening to your comments and suggestions.

If you'd like to know more about where we've taken Microsoft Word for the Macintosh, just call us at (800) 323-3577, Dept. HY3. And we'll show you the direct route to easier computing.

Microsoft
Making it easier
REWRITING OF A TEXT: 500-7000, OR 8000-SERIES SHARP WIZARD DATA-TRANSFER PROGRAM

**Organizer Link II**

**PROS:** Merges Mac and Wizard data; tags records; prints reports; exports and imports ASCII and tab-delimited text files.

**CONS:** Business Card data transfers are slow; no search-and-replace function; no defaults for empty date or time fields; plain-text reports.

**COMPANY:** Sharp Electronics Corporation (800/321-8877).

**REQUIRES:** Mac Plus; hard drive; System 6.0.2.

**LIST PRICE:** $199.99.

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**Type-Specimen Generator**

**Spectacular 1.2**

**PROS:** Variety of templates.

**CONS:** Can't edit sample text size or leading.

**COMPANY:** FontHaus (203/846-3087).

**REQUIRES:** Mac Plus; hard drive; PostScript or QuickDraw printer; System 6.0.

**LIST PRICE:** $79.95.

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**REVIEWS**

**Just upload the 'Wizard data to the Mac and Mac's serial ports and exchange data.** Enables you to hook the Wizard to one of the Mac's serial ports and exchange data. Software, however, can perform a merge and ignore duplicate records. If an assistant updates your appointments and telephone databases on a Mac equipped with OL2 while you're making changes on the Wizard, it's easy to merge the databases. Just upload the Wizard data to the Mac and instruct OL2 to merge the information. Then download the revised data files back to the Wizard, overwriting the original files.

Transfers in either direction move along at 9600 bps. Transfers bog down only when moving data from the Business Card database. All other Wizard applications store their data as simple text files. The Business Card application, however, maintains an index file with pointers to linked records. That's how it can store multiple records without forcing you to reenter the address information each time. In a Business Card transfer, each record must be rebuilt and the pointers updated while the transfer is occurring. To transfer 300 such records takes about 20 minutes; transferring the same number of records for one of the three Tel (telephone) databases takes only about a minute. Therefore, if you will be updating telephone or contact information on both the Wizard and the Mac, you'll be happier working with one of the Tel databases than with the Business Card database.

OL2 also has importing and exporting capabilities. However, since you cannot select specific fields to be imported or exported nor the order in which fields appear, you may need to use a spreadsheet or database program to reorganize the information before moving address-book data to the Wizard. You can tag individual records or groups of records.

---

**A 5000-, 7000-, OR 8000-SERIES SHARP WIZARD can now talk to a Mac. The Organizer Link II (OL2) program and cable enable you to hook the Wizard to one of the Mac's serial ports and exchange data.**

The Wizard is incapable of handling merges, so all data sent to the Wizard is appended to the end of the current file or replaces all data in the file. The OL2 software, however, can perform a merge and ignore duplicate records. If an assistant updates your appointments and telephone databases on a Mac equipped with OL2 while you're making changes on the Wizard, it's easy to merge the databases. Just upload the Wizard data to the Mac and instruct OL2 to merge the information. Then download the revised data files back to the Wizard, overwriting the original files.

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**Symbols List** To maintain character compatibility, OL2 provides a pop-up Symbols list. To enter a Wizard symbol into a Mac record, you copy the character to the Clipboard, and then paste it into the record. Although option 8 produces a bullet symbol on the Mac, you must use the Symbols list to select the Wizard-compatible bullet.

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**Let's see now, I have around 5000 fonts in my collection, and sometimes I have several hundred installed at a time. (I'm counting each style and weight in a family as a separate font, mind you, but any way you cut it, I have a lot of fonts.) Whenever I embark on a new publishing project, I like to print out type samples to see which fonts are right for the job. The task of printing specimen sheets is greatly simplified with Spectacular, developed by Omega Systems and distributed by FontHaus.

Although you can create your own spec-sheet template in a page-layout program, you still have to apply a font to each spec sheet you want to print. Spectacular automates the job, allowing you to select several fonts and choose the Print command just once to print the whole batch.

You're confined to Spectacular's selection of templates, but the program offers seven formats, so you'll probably be able to find one that suits you. My favorite is the "Eliga" layout, which shows a large sample of those letters on a background of hairline ruling of ascenders, descenders, and so on. This layout also displays the font's basic characters—letters, numbers, and common symbols—as well as a copying chart that gives the average characters per pica. An optional second page shows a test sample in a variety of sizes and leadings; you can type your own sample text if you wish. Other layouts offer variations on this theme; some show all the characters in a font, including mathematical symbols, accented letters, and so on. Other templates print a keyboard layout, a list of all installed fonts (printed in each font's typeface), and a pica ruler and protractor that you can print on transparent film.

Spectacular works with all installed PostScript, TrueType, or bitmap fonts. (A handy option lets you exclude bitmap fonts if you want to print samples of outline fonts only.) The fonts can be installed in the System Folder, or accessed with a font-management utility like Fifth Generation Systems' Suitcase. You can either press a button to print samples of all your fonts, or select the fonts you want to print from a scrolling list. The program is smart enough to treat a four-style family (regular, bold, italic, and bold italic) as a unit, and it lets you print samples of all the styles on a single page if you choose.

Spectacular offers several nice touches that you won't find in Agfa's similar program, TypeChart ($99). For example, Spectacular provides more template options, offers Exclu deck Bitmap and Select All commands, correctly prints the names of all-caps fonts in its font list (whereas TypeChart prints just the first letter), and has a space-saving two-column format for its font list. TypeChart does have a few pluses of its own, however, including on-screen previews of templates, a check for font-ID conflicts, and more size and leading examples on its text-sample page.

Spectacular is a useful program, but there's a public-domain spec-sheet program called the TypeBook, by Jim Lewis, that has it beat in one respect: the TypeBook lets you customize the point size and leading of its sample text blocks. (On the other hand, the TypeBook offers only two template pages and comes with somewhat obscure documentation. Still, you can't beat the price.)

If you run a typesetting service bureau, offer Macintosh-based design and layout services, or simply own a large font collection, Spectacular can help you keep track of your fonts efficiently and attractively.

-ERFERT FENTON
New Microsoft® Word 5.1 for the Macintosh®: This new upgrade has such great shortcuts to work, that taking it home should be easier, too.

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Voice Navigator S¥ is the easiest way to add speech recognition to your system. (If sound input; 2MB of RAM; hard drive systems (617/935-5656). If your Mac came with a microphone, it's probably compatible . For other Macs, Articulate Systems sells Voice Navigator II, which includes a separate digitizer.)

Voice Navigator uses sounds to activate macros—sequences of basic actions, such as typing text, clicking, and dragging. Setting up an application for voice operation is a two-stage process: first, you choose the functions that you want to control by speech; then you assign the sounds that you'll use to activate them.

The first step should be familiar to anyone who has used a macro utility like CE Software's QuickKeys. Voice Navigator's macro software takes the form of a DA called Language Maker, which, though harder to use than QuickKeys, lets you create macros for almost any operation, from selecting tools on floating palettes to checking off items in dialog boxes. (Certain macro functions require special modules called Voice Extensions that come with Voice Navigator. One even lets you execute QuickKeys macros by name.)

The second step in using Voice Navigator is to assign spoken words to the macros you've created. Actually, any distinct, reproducible sounds will do—I trained Voice Navigator to shut down the Mac when I clap my hands, just like the lady in that annoying TV commercial. The process of assigning voice commands must be repeated for every user, to account for differences in inflection, pitch, and so on.

Voice Navigator macros are nested in a way that mimics the way most Mac applications work, although you can use the Language Maker DA to reorder commands. Defining a complete set of macros for a program can be challenging; fortunately, Voice Navigator ships with predefined macro files for many popular applications.

Defining a complete set of macros for a program can be challenging; fortunately, Voice Navigator ships with predefined macro files for many popular applications.

Managing Your Money 5.0

MANAGING YOUR MONEY 5.0 (MYM) is an everything-but-the-kitchen-sink financial program for families and for owners of small businesses. Version 5.0 introduces several enhancements, including passwords; the ability to import data from Quicken's Quickcheck; additional sort and search functions in check and transaction registers; and one-button distribution of investment interest and dividends.

MYM has five components: Remind (appointments and reminders), Money (check-writing and budgeting), Tax (displays IRS schedules that show your taxable expenditures and income to-date), Invest (portfolio and investment management), and Plan (insurance and retirement planning, loan analysis, and other financial calculations). You can navigate by menu items or HyperCard-style buttons.

Before you begin entering data, you must establish a chart of accounts (assets and liabilities) and budget categories. MYM includes two sets of sample accounts and categories: one for individuals and one for small businesses. You can use MYM's categories or create your own. Categories can be added or edited as you enter transactions.

You can associate any budget item with a specific IRS line item. Taxable interest, for example, can be assigned to Schedule B interest income. Still, MYM isn't tax-preparation software. TaxCut, a new tax package being developed by MECA Software, will be able to import MYM tax-related data.

MYM lets you set any of the five windows to automatically display at the start of each session. Reminders, however, don't actually notify you of pending events. It's up to you to notice and read them. The only other significant problem is that it's easy to allocate an expense to the wrong account—especially if you have multiple savings, money market, and checking accounts. I'd advise you to examine the check and transaction registers to see that everything ended up where you intended.

Getting the maximum benefit from MYM (or almost any other financial-management program) requires buying special checks for your printer, or using CheckFree to pay your bills via modem. Otherwise, you have to draft the checks by hand and then enter the same data into the program. And two separate check registers (one electronic and one in your checkbook) means two performing reconciliations each month—and twice the opportunity for error.

Version 5.0 breaks no new ground, but this popular program is now more powerful and easier to use. With its ridiculously low price, Managing Your Money is something you should definitely check out if you're in the market for a full-featured financial-management program.

—FRANKLIN N. TESSLER

—STEVEN A. SCHWARTZ
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THE DESKTOP CRITIC

The WellFiled Floppy

BY DAVID POGUE

I've heard various reactions to the heaps of floppy disks that adorn my cluttered office. One friend likened them to little plastic stalagmites growing from every horizontal surface. Another compared these stacks of blue and black plastic squares to 90 packs of American cheese singles about a year past their prime. To me, however, these disk mounds had become pure elbow hazard. One scramble for a phone call, and they would clatter to the floor like so many plastic potato chips. It was clear I needed some kind of system.

Fortunately, America's programmers have blessed us with a plethora of disk-cataloging programs. (Some bear the designation shareware, meaning not sold in any store; you get them from a user group or a dial-up service like America Online. As always, contact info is listed in Where To Buy later in this issue. And nope, I didn't forget Cataloger; it's in mid overhaul by Masters Publishing.)

I was awed by the apparent avalanche of answers. I thought: "Disk-cataloging programs—heck, that's for me! I'm sure even the lamest one lets me feed it floppy disks, look through my disks in a window, and print labels for the ones I want."

Boy, was I wrong.

DiskTrivia 1.1

This freeware HyperCard stack by Bradley Beaubien gobbles and scans 6 dpm (disks per minute). That's not mind blowingly fast, but DiskTrivia's interface wouldn't threaten a baby. Hand the Mac a floppy, and DiskTrivia neatly types its contents onto the life-size on-screen disk's label. Iconic buttons along the edge let you find a file, sort the disks, or view a list of all your disks. There's a wealth of clever touches: DiskTrivia can automatically give each disk a number ("23 of 40"); you can change the font or size of anything (it's HyperCard, after all); and it has a blank where you can type in the name of the box in which you keep each disk.

Alas, DiskTrivia doesn't catalog hard drives or SyQuest cartridges—only floppy disks. And incredibly (given its interface), the thing doesn't print disk labels. Still, at $0.00, it's worth a download.

P.S. Just so you'll know that I did my homework, I also tested a raft of other HyperCard shareware disk-catalogers: Disk Finder, Disk Indices, DiskBank, Disk-it, and Disks 'R Us. All are home-made-looking and not fast or automatic enough for actual humans who have lives.

Disk Ranger 4.7.6

If you squint at the densely laser-printed, copier-setting-was-too-dark manual, you find out that Disk Ranger's feature set is impressive (Graham Software). It can instantly catalog all disks on your desktop, including hard drives, cartridges, networked servers, and (though it takes forever) CD ROMs. It comes with a desk accessory that finds files on your hard drive or among the disks you've cataloged. There's a system extension that eyes your floppy disk drive; if it spots a floppy it hasn't seen before, it adds the disk's contents to the catalog. The program prints disk labels (although you can't specify fonts, sizes, or formats). The program also has features for password-protecting files, compressing files, and editing files (à la MacTools).

With all those features, who could complain? I'll tell you who: anybody who wants to see a plain old list of disks, or view a hierarchical folder display, or spot duplicate files. The program's primary view shows a list of files, not of disks. You can sort the list, and the program can highlight files that match a search request, but the found files aren't listed consecutively. Worse, the display takes up two lines for each file, making it almost impossible to scan as you're looking for something.

DiskQuick 2.10

Now this program has the makings of a darned fine floppy-disk manager. It's fast. It's pretty. And it shows the contents of your disks in a beautifully formatted list window, in your choice of font.

Unfortunately, this baby's a prototype, as far as I'm concerned. Under System 7, it either leaves ghost floppy-disk icons all over the desktop after cataloging them, or else it trips itself up on the second disk and stops cataloging altogether. You can't export the lists of disks or files. And it doesn't print labels. I'm sure DiskQuick (Icleaform) has some other good points—but if cataloging disks and printing labels aren't among them, I'm not sure they're relevant.

Cat Back 2.1

This program (Enterprise Software) is officially both a cataloger and a backup program (Cat Back, get it?). It catalogs disks so fast that my 12-per-minute rating is probably even a little low—each disk spits out of the drive almost before you're ready with the next one. It's fast at everything else, too—searching, sorting, selecting, and so on. And there are some wonderful cataloging features: the program slurps up hard drives, SyQuests, or individual folders, and the accompanying control panel automatically logs any new disks you insert during the course of your work.

Unfortunately, Cat Back, like Disk Ranger, is more about managing files than disks. Using the nicely organized menu commands, you can make the file list flip upside-down, turn inside-out, or stand on its head—but you can't see a simple list of your disks, let alone a hierarchical display of their contents. I have misgivings, too, about including a Shut Down command within the program—and particularly about its location at the bottom of the File menu, where Quit is supposed to be.

Although I'm sure they're terrific, I didn't work with the program's backup features. Once I discovered that you can't print labels or number your disks, this cat decided to send Cat Back back.

Offline 3.0.3

At least this contender (SNA) doesn't look like a relic programmed during the Reagan administration—it's not composed primarily of hideous Monaco-font text in rigid rows, like some of the older programs. Better yet, Offline does almost everything you'd hope. It catalogs any kind of disk—hard, floppy, or otherwise. It shows you (and sorts) a list of disks, and when you double-click on a disk, shows its contents (including what's continuous.)
inside Stufflt and Compact Pro archives; and—yes—it prints gorgeous labels. (By the way, please don’t think I have some kind of disk-label fetish. Listen, how many times have you inserted a floppy disk into your Mac just to see what’s on it? Now imagine that you could tell just by looking at the disk in your hand. Let me tell you: it’s a heady experience.)

OffLine is no speed demon; it catalogs disks at a poky four per minute, and takes its sweet time searching for files. Its views are great—one shows you the contents of a disk, and another shows the results of your searches—but you can’t see the contents of more than one disk at a time, nor can you see both the contents view and the search-results view simultaneously. And it could be smarter about printing labels—if there are too many files to fit in one column, it chops off the remaining names instead of starting a second column. Still, OffLine is, if not lovable, at least a practical librarian.

**Curious Cat 1.1**

A GLANCE AT THE FLOPPY TABLE MAY convince you that Curious Cat is a total feature wimp. It doesn’t do labels, or list disks, or catalog hard drives, or even export. It does, however, catalog a floppy every six seconds and show all the files in a list. **This program has a funny little gimmick, too:** it can search for fonts and desk accessories within other files (such as a System file). And when you click a font- or DA-containing file, a list appears in a second window that instantly identifies exactly which fonts or DAs are inside.

This program—and the similar shareware QCat—are really file listers. They’re not quite the Holy Floppy-Management Grail, but they do help you spot duplicate files (and, in this case, know instantly what’s inside a font suitcase).

**DupLocator 1.0**

**THIS BEAUTIFUL, PAINSTAKINGLY POLISHED file-finder/duplicate-killer isn’t really designed as a floppy-disk organizer** (Midnight Software). It does resemble one: it reads eight disks per minute, lists their contents colorfully and elegantly, and lets you search, sort, launch, copy, delete, rename, or get info on the files therein. The crisp interface design and intelligent manual round out the happy little package.

DupLocator’s raison d’être, as the clever title implies, is to ferret out duplicate files amid your disk collection; and this it does, nearly instantaneously. Once they’re found, you can easily compare the folder locations of the duplicates, compare their modification dates, and delete the ones you don’t want. Our quest for the elusive grail of catalogers goes on, however: DupLocator can’t show a list of disks, sort files by disk, or print labels. More incredibly, it can’t save your catalog. You read right: every time you want to find a particular file, the program has to re-create its knowledge of your collection by rescanning every single disk. Midnight Software hints that these frustrating limitations may evaporate in future versions of the program.

**Weber NoLabelSystem**

I WAS AMUSED AND IMPRESSED THAT this eccentric, eminently practical disk-labeling system—much touted when it made its debut in the early, news-litter days of Macintosh—is still for sale (Weber & Sons, $23.95 for 50 pockets/100 cards). On each floppy you affix a clear plastic pocket. Then you fill out a little index-style card, complete with a tab that protrudes above the disk’s edge, and slip it into the pocket.

The point is that you can now change the disk’s label as easily as slipping in a different card, without getting label goo under your fingernails. People will think you’re a little kooky, but those tabs sticking up might make it easy to browse a box of 100 disks and find the one you’re looking for. The additional $29.95 MacDiskManager software is the only label-printing program on the market that lets you see and edit a label before it prints. But that, it has at least one big-time bug. Instead of printing 12 little disk labels on the laser-feedable tagboard sheet of 12 perforated disk-cards, it prints just one humongous label across the entire sheet. The company had no idea how to solve the problem.

Incidentally, unlike companies like Adobe and Claris, who puff up their software boxes with pointless blocks of foam rubber, all of the companies whose products are reviewed here send you a manual and a disk—that’s it. No box, no filler. Weber & Sons does even better—they send a cardboard box, but it’s sized and shaped to double as a floppy-disk storage box. If we had more clever ideas like that, we’d worry a lot less about the environment.

**MacLibrarian 1.5.4**

**AS MY DEADLINE ROLLED AROUND, I began to panic. After immersing myself in the best the software world had to offer, I hadn’t found one single real, honest-to-gosh, lickety-split, plain-and-simple disk cataloger.**

I even tried to jury-rig some kind of disk-management setup using System 7’s alias feature. You know, make an alias of every single file on every single disk, and keep all those aliases in one folder on the hard drive. I’ll just say this once: way too much trouble.

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**FLOPPY-FILER FACTS**

<table>
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<tr>
<th>Floppies per minute</th>
<th>Price</th>
<th>Generates serial numbers</th>
<th>Catalogs nonfloppy disks</th>
<th>Prints disk labels</th>
<th>Exports text files</th>
<th>Shows folder hierarchy</th>
<th>Sorts/searches disks</th>
<th>Shows a list of disks</th>
<th>Balloon help</th>
<th>Choice of fonts</th>
<th>Updates changed disks</th>
<th>Background cataloging of new disks</th>
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* = yes; O = no; NA = not applicable. 1 Cataloging process halts after two or three disks. 2 By copying to clipboard. 3 Only four at a time.
When a bug showed up in a new program, the first to know was a guy in Montana. And everyone on CompuServe.

Why settle for always being the last to know when you can be among the first with a CompuServe membership? We put an entire world of up-to-the-minute information right at your fingertips.

Our online, interactive hardware and software support forums can put you in touch with thousands of experts. Even the authors of new and popular software programs.

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San Francisco January 6-9

Circle 319 on reader service card
Finally, at the eleventh hour, I stumbled across a shareware gem-in-the-rough that had just appeared on America Online: MacLibrarian. There are three windows, which may be side by side. One lists your disks (searchable and sortable); another, your files (likewise); a third shows the contents of any disk you double-click, in hierarchical tree format. All the info you could ever want is displayed in columns, very much like a spreadsheet: name, date, size, and so forth; you can hide, rename, or rearrange the columns.

This program prints labels—even comes with ready-made templates for popular labels, like Avery 5196 disk stickers. And if you don't like how they look, it's your own darned fault, because its mini-MacDraw graphics window lets you snazz them up with pictures, lines, any arrangers. And if you don't like how they look, it's your own darned fault, because its mini-MacDraw graphics window lets you snazz them up with pictures, lines, any arrangement of the file information, and your favorite fonts. (Warning: The program somewhat mean-spiritedly slaps a "Register your version of MacLibrarian" logo on top of each label, which goes away when you send in your $30 to the author, Behrouz Poustehi, and he tells you the secret code.)

I love discovering that a shareware program whamps its commercial competition in shine and polish. Therefore, it breaks my disk-filin' heart to say that some of MacLibrarian's features don't work ("The Arc tool does not work as intended so avoid using it," says the Read Me file with impressive candor); the cataloging process lurches along at a grueling three disks per minute; and I unearthed a handful of bugs. But no mistake: in design and convenience, MacLibrarian is the best thing out there.

### The Upshot

OBSOLETELY, MACLIBRARIAN IS THE PRIME PICK. Given its try-before-you-buy sharewareishness, there's absolutely no reason not to grab it and see if it can make some sense of your disk heap.

Some cranky streak of perfectionism deep within my soul, however, remains unfilled, yearning for a truly gorgeous, graceful, great disk-ographer. Something that reads your floppies fast, makes a searchable, collapsible disk list, and prints nice-looking labels that don't pointlessly truncate file names (and does clever things like turning the list sideways to fit more file names onto a label). Something like the fictional FloppyDex, pictured here. Is that such a tall order? I mean, sure, CD ROMs are great, and SyQuests are handy, but floppy disks aren't going to disappear anytime soon. Especially not the 750 of them on my desk.

---

### Contributing editor DAVID POGUE, author of Macs for Dummies (IDG Books Worldwide, 1992), has mastered the difficult art of handwriting on the 3/4-inch spine of a floppy disk.
New Products

Edited by Carolyn Bickford

Hardware

CM2070LR Color Monitor
Trinitron 20-inch monitor offers noninterlaced resolution up to 1280 by 1024 at 70Hz; treated with antiglare coating. Meets Swedish MPR II ELF-emission guidelines. $2999. Seiko Instruments, 408/922-5900, 800/888-0817; fax 408/922-9395.

Horizon Color Scanner
Flatbed scanner provides variable resolution up to 1200 by 1200 dpi to scan original up to 8 by 15 inches. Built-in transparence module allows scanning of transparencies. $22,500. Agfa, 508/658-5600, 800/685-4271; fax 508/658-4193.

LanGarde 400
Universal power supply has power-outage warning, monitors battery condition, and can shut down the network. Removable front panel allows remote monitoring. $1099.5. EFI Electronics, 801/977-9009, 800/877-1174; fax 801/977-0200.

Mag 128
Turbo Optical Portable 3.5-inch 12MB optical drive has 34-4ms average seek time and 768-Kbps transfer rate, according to the company. Comes bundled with cartridge and FWB's Hard Disk Tool Kit Personal Edition. $1299. MacProducts USA, 512/ 472-8881, 800/622-3475; fax 512/499-0888.

Nu32 SCSI Xelerator
SCSI-2 coprocessor board takes advantage of the parallel processing capability of the Macintosh NuBus. Supports data transfer rates up to 10MB per second when used with SCSI-2 storage devices, according to vendor. Also supports block- transfer mode on Mac Quadras, which can triple the data-transfer rate. $995. Procom Technologies, 714/852-1000, 800/800-8600; fax 714/ 852-1221.

PathFinder
Single-protocol, LocalTalk-to-Ethernet router creates Ethernet and LocalTalk zones on an internet while in Run mode; in Automatic mode, creates a single zone for both Ethernet and LocalTalk devices; in a period of inactivity and hibernation when a user chooses the device. Requires no additional software on any computer on the network. $199. Radiant Enterprises, 415/296- 8040; fax 415/382-6860.

Plusware Numeric Keypad
Keypad that connects to the Mac's ADB port and has an ADB of its own. Numeric input keys are arranged in standard format, with mathemati­cian function keys. A second-function key offers access to 15 program­mable functions, including forward delete; help; increase network performance by using active star technology, thus avoiding data collisions on crowded access by Novell and animations. $129. ld eaform, 408/922-5835; fax 510/524-3950; fax 510/ 524-9954.

SOFTWARE

Action for Macintosh
Product designed for on-screen multimedia presentations with sound, QuickTime, text, graphics, and animations. Includes templates for creating animated presentations; provides a library of graphics, sounds, and animations. 4MB of RAM recommended. $495. Macromedia, 415/252- 2000; fax 415/442-0190.

Bird Brain 2.0
Birding database includes all 1946 species of birds found in North and Central America, Mexico, and Hawaii, according to vendor. Lets user record bird observations and organizes sightings into life lists and reports for viewing or printing. Features include scoreboard view of life-list totals and automatic life lists in which the program notes the first sighting of each species. 2MB min. memory, $125, idealform, 515/472-7256; no fax.

Disk Café
Formatting utility for hard drives and removable car­continues

The Latest Macintosh Releases

MACWORLD January 1993 227
Even in today's econo
amazing growth

In these times when every budget dollar is precious, the new
Apple Macintosh Ilv personal computer is ideal.
It's fast. It's powerful. And it costs a lot less than you'd think.
But equally important, it's prepared for the next economic expan-
sion, when you'll want to add onto its already vast capabilities.

Inside its sleek exterior resides a 5¼" expansion bay —
room for an internal CD-ROM drive, SyQuest drive or other mass
storage devices — as well as a standard 3½" bay for either an
my, one can still find opportunities.

Another option in the 5 1/4" bay — a 44- or 88-megabyte DLT optical drive that uses removable cartridges for archiving or transferring large projects.

Out of the box, the Macintosh Ilvx supports up to a 14" monitor and 256 colors. Add a card and some VESA, and it can handle up to a 21" monitor and millions of colors.

Plug in a third-party card like the VideoQuick, and you can transfer video directly from a camcorder or VCR to your hard disk — for making your own QuickTime movies.

For those backups, you can buy a DLT unit for the 5 1/4" bay, and leave the 80megabyte or a 230-megabyte internal hard disk drive.

It also gives you three NuBus slots and an accelerator slot so you can add even more power and performance. To see the new Macintosh Ilvx for yourself, visit an authorized Apple reseller today. For the power you need most of all. The power of Macintosh. The power to be your best.

Introducing the Macintosh Ilvx.
New Products

Circle 127 on reader service card.

Figure 2.0.1 on page 21 of this issue.

New Products

Circle 127 on reader service card.

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Circle 127 on reader service card.

Figure 2.0.1 on page 21 of this issue.

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Circle 127 on reader service card.

Figure 2.0.1 on page 21 of this issue.
New from La Cie—80MB and 120MB high-performance hard drives for your PowerBook! Offering Quantum's 2 1/2" drive technology, 19ms seek time, whisper quiet operation, each drive comes complete with System 7, our award-winning Silverlining software, a special tool to open your PowerBook and an outstanding instruction manual.

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MacWeek, February 1991

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tracks user activity. Program also includes built-in screen saver and virus-protective software. 2MB min. memory. $59. Electronic Learning Systems, 904/375-0958, 800/443-7971; no fax.

**Petroglyph Font**

Comprises more than 40 Native American pictographs, including gods, bears, flutes, ravens, corn, suns, lizards, and people standing, sitting, and riding horseback. Also includes rock-scratched alphabet. 1MB min. memory. $45. The Electric Typographer, 805/666-7563; no fax.

**Resource Navigator II**

Media-integration tool for HyperCard 2.1. Enables user to incorporate multiple media resources—such as QuickTime compressed pictures, QuickTime movies, sounds, music from compact disc, and external videodisc sequences—into stacks. Creates, edits, and plays back QuickTime movies. Allows user to choose characteristics of media type, such as borderless windows, and does not require scripts or programming. 4MB min. memory. $99. Bliss Interactive Technologies, 512/338-2458; fax 512/892-5820.

**Space Quest I: The Sarien Encounter**

The mission in this game is to help space janitor and writer Roger Wilco recover the stolen star generator from the villainous Sariens. Game includes 8-bit color graphics, full-stereo soundtracks, sound effects, and new puzzles. Design emulates 1950s sci-fi movie: has mouse-driven interface. 2MB min. memory. $29.95. Sierra On-Line, 209/683-4468, 800/326-6654; fax 209/683-3633.

**Sprout**

Graphic vegetable-garden-design program lets user draft garden plans with predrawn vegetable and garden symbols; planting tool positions vegetables with the correct row and plant spacings. Program gives growing information and tips, shows the size of planted areas, gives seed and row spacings, determines the number of people a garden will feed, and estimates of the number of seeds needed. 1MB min. memory. $79.95. Abaracada, 503/673-3030, 800/451-4871; fax 503/683-1925.

**Square One**

This file launcher provides a palette of icons representing each installed application and lists documents that can be opened by each application. The launcher can open any folder, disk drive, control panel, or desktop accessory that has been installed. 2MB min. memory. $99. pbn software, 415/308-1536, 800/995-8077; fax 415/508-9436.

**Staplica 3d**

Reads and edits 3-D clip art libraries. User can rotate and scale images; edit light-source position, intensity, and color; and manipulate the object's perspective, viewpoint, and light position to create different viewpoints. Images can be exported as PICT, TIFF, or EPS files. 3MB min. memory. $69. Magento II, 408/352-9933, 800/776-9277; fax 408/352-9930.

**Sun Clock**

Displays the days and night for the current date and time on a world map. Display moves as time passes, to keep pace with the earth's rotation. The shape of the sun's light from day changes with the seasons, as the day lengthens and shortens. Also available as an After Dark or Pyro screen saver, $20. 1MB min. memory. $40. MTL Software, 503/452-0652; no fax.

**Tbx System**

Provides HyperCard developers with full access to the Macintosh Toolbox while remaining entirely within the HyperTalk language. Accesses more than 1200 Toolbox routines and 1800 records through two external functions. Requires HyperCard 1.2; also works with SuperCard. 2MB min. memory. $100. Tuesday Software, 805/962-7889; fax 805/564-8955.

**Beyond the Wall of Stars**

Interactive multimedia adventure involves user in future journey to the planet Tara. Participant qualifies for journey by describing personal characteristics, which the program factors into the situations that develop during the voyage. User faces decisions about what direction to go, strategy, tactics, and team working in the form of games, puzzles, and other problems to be solved. 3MB min. memory. $59.99. Creative Multimedia Corporation, 503/452-9933, 800/776-9277; fax 408/352-9930.

**C.P.M. Graphic Tutors**

Interactive animated tutorials complete with music and vocal explanations. CPM Graphic Tutor 1 covers Adobe Illustrator 3.0, Adobe Separator 3.0, Adobe Streamline 2.0, and Adobe Photoshop 2.0.1 and color theory. User can toggle between lessons and program. 2MB min. memory. $49.99. Tech Casey's Page Mill, 303/220-1463, 800/544-5620; fax 303/220-1477.

**Marble & Granite**

Set of two CD ROMs containing library of digitized marble and granite images. Includes medium- and high-resolution TIFF images for use in press production; specialized images for use in 35mm slides, multimedia presentations, and QuickTime movies; and beveled buttons and mortises developed from five different marble styles. Also includes images of 72 seamless marble tiles, 54 floor tiles, and 36 decorator tiles. 4MB min. memory. $349. Arktis, 503/863-4429, 800/444-9392; fax 503/863-9547.

**Sports Illustrated CD-ROM Sports Almanac**


**Chemistry Mousepad**

A mouselap imprinted with the periodic table, along with atomic weights listing up to five significant figures. Measures 9 by 7 1/4 inches with red printing on gray fabric background. $14.95. Cricket Technologies.
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Macworld Interactive™ is a trademark of Sumeria, Inc.
QuickTime™ is a trademark of Apple Computer, Inc.
Curtis Cable Organizer

Curtis Clean Screen
Cloths for cleaning coated or uncoated monitor screens and antiglare filters. Provide protection against static. Can also be used for cleaning keyboards, calculators, and other office equipment. Package contains eight premoistened cloths, eight drying cloths, and one lint-free towel. $9.95. Curtis Manufacturing, 603/532-4123, 800/955-5544; fax 603/532-6615.

Curtis Macfeet
Non-slip rubber feet tilt the front of the Macintosh up for an alternative viewing angle. Fits SE, SE/30, Plus, and Classic models. Lifetime warranty. $14.95. Curtis Manufacturing, 603/532-4123, 800/955-5544; fax 603/532-6615.

Curtis Macbit

MacStereo
Mac-be stereo transmitter attaches to computer speaker.弥补 any FM-stereo system up to 50 feet away, or uses internal speaker that is in it. Especially useful for hearing full-spectrum music, realistic synthetic speech, or game sounds, and for recording computer sounds onto audiotape, according to company. $119.95. Acerotech, 818/484-3256; fax 818/449-5628.

Mac-eye

PC SoftLens
Optical polynylcholoride film filter conforms to monitor surface and can be removed and reapplied repeatedly. Filter eliminates light glare around character and shapes on screen, according to company. Available in two colors to maximize contrast: light gray for color, and gray for black-and-white screens. Product fits monitors up to 14 inches. $34.95. ErgoTech, 714/729-1345, 800/729-1345; fax 714/279-1364.

Pears
Timer and hand exerciser, alerts computer operators to rest breaks from repetitive-motion activities, and offers gentle massage to hands and arms where muscle spasm and forearm tendinitis are common. Offers programmable break periods and has been revised to reflect current technology. Edited by Arthur Naiman, Nancy Dunn, Susan McCalister, and John Kadyk. $32. Peachpit Press, 510/548-4393, 800/283-9444; fax 800/598-5991.

QuarkPress: Making the Most of Your Negative Experiences
Step-by-step instructions for producing documents such as business cards and presentation folders using QuarkPress. Uses common printing terms such as "work and turn." Includes $3 offer for corresponding template disk, and E-castle and clear-film refrigerator-mail reply guide. Written by Cyndie Klopferstein. $19.95. BKlynner Productions, 303/465-3891; fax 303/465-6270.

The World's Greatest Computer Disk Stickers
Computer disk labels feature four different designs with sayings: the Chesire cat with a saying from Lewis Carroll, Stan Laurel with a quote from George Santayana, a laughing moon with a quip from Oscar Wilde, and a set of lips with words from Alfred, Lord Tennyson. $1.95 for pack of 12; $42.45 for set of 30 (12-sticker) packets. Black Eye Design, 415/425-8502; fax 415/424-8502.

Macintosh Bible, Fourth Edition
Fourth version of popular Mac companion containing tips, tricks, and shortcuts; contains more than 800 pages of new information. Offers totally revised and has been revised to reflect current technology. Edited by Arthur Naiman, Nancy Dunn, Susan McCaillister, and John Kadyk. $32. Peachpit Press, 510/548-4393, 800/283-9444; fax 800/598-5991.

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234 January 1993 MacWorld
Questions and Tips from Macworld Readers

BY LON POOLE

DOES YOUR TRASH EMPTY faster if you hold down the 3 key while System 7 counts down the number of items remaining to be removed? Several readers have written to report this as an undocumented feature of System 7, but it is not. It is a feature of FileSaver, part of Norton Utilities for Macintosh from Symantec (408/253-9600). Pressing 3 while System 7 empties the Trash prevents FileSaver from tracking the files being removed (making them harder to recover later with Norton Utilities' UnErase).

System 7 Keyboard Layout

FOR MORE THAN 30 SYMBOLS AND ACCENTED LETTERS, THE U.S. KEYBOARD LAYOUT that shipped with System 7 uses different keystrokes than the System 6 layout. To type E in System 7, for example, you press option-E and then type a capital E, but in System 6 you press option-shift-I (Quick Tips, September 1992, lists all the changes). In many cases the System 6 keystroke combination still works, but in 15 cases you must learn a new keystroke combination—a solid pain for people who work in more languages than English," says Juris Mazutis of Nepean, Ontario, Canada. He strongly recommends installing and selecting the keyboard layout oldUS (available in the Typography section of MacSymposium on Connect (800/262-2638, 408/973-0110) and in the Alpsys support forum on America Online (800/827-6364, 703/448-8700). However, this won't be necessary if you upgrade to System 7.1, which includes both the System 6 and System 7 keyboard layouts.

You install a keyboard layout by dragging it to the System Folder icon; Finder 7 puts the new keyboard in the System file for you. To select a keyboard use the Keyboard control panel.

Where Fonts Go

LIKE MANY MACINTOSH USERS who have gone to System 7, I am totally confused about where to put my fonts. Currently my TrueType fonts are loose in the System part of the System Folder. I also have a separate folder containing 1.9MB of PostScript fonts, and another folder containing 1.3MB of bitmap fonts. Both of those folders are in the System Folder. I use Suitcase II, so everyone tells me there should be no problem. But my ImageWriter II takes an inordinate amount of time to print—much slower than when I was using System 6. Holger Jensen Golden, Colorado

With System 7.0 and 7.0.1, TrueType and bitmap (fixed-size) fonts go in the System file, not the System Folder, and PostScript fonts go in the Extensions folder inside the System Folder (or loose in the System Folder). If you upgrade to System 7.1, all fonts go in the special Fonts folder inside the System Folder. You don't have to remember any of this. Just drag fonts of any type to the System Folder icon (not the System Folder window), and the Finder will put them where they belong.

With Suitcase II (from Fifth Generation Systems, 800/873-4384 or 504/291-7221) or Master Juggler (from ALSoft, 713/353-4090), PostScript fonts can go in any folder that has open TrueType or bitmap fonts.

To speed up an ImageWriter, either install Apple's System 7 Tune-Up 1.1.1 (described in November 1992's Quick Tips and available from Apple dealers, user groups, and online information services) or upgrade to System 7.1.

Pasting Custom Icons

TWO OF THE APPLICATIONS in my Apple menu have generic icons (a diamond with a hand holding a pen). I would like to change the icons under System 7 with the Finder's Get Info command. I copied the icon of a related file in the Extensions folder, but in the Apple menu's info window I can only use the Copy command from the Edit menu. Why is the Paste command dimmed (not available)? How can I paste an icon I have copied into an application in the Apple menu?

A. The Finder won't let you paste a copied icon into the info window of the System file, Finder, or special folders such as Apple Menu Items, Startup Items, Extensions, Control Panels, and System Folder.

Instead of using the Get Info command on the Apple Menu Items folder, open that folder. Select one of the items whose icon you want to change, and choose Get Info to bring up the item's info window. Then select the icon in the info window; the Paste command should now be available. If not, the item must be open. See if it's listed in the Application menu at the right end of the menu bar. If so, choose it from that menu and then quit it.

Not to get technical, but the items in the Apple menu that you are calling applications are probably desk accessories. Many desk accessories come with generic icons; few applications do. The generic icon for a desk accessory is left-handed, whereas the generic icon for an application is right-handed.

Permanent Page-Setup Changes

HOW CAN I MAKE my changes to the settings in the Page Setup and Print dialog boxes permanent? I tried to fix this with ResEdit but didn't succeed.

A. You can use ResEdit to change the standard settings in the Page Setup dialog, but not the Print dialog. ResEdit is available continues
from user groups, online information services, and with the book *Zen and the Art of Resource Editing* (Peachpit Press, 800/283-9444 or 510/548-4393).

Before doing anything else, use the Finder's Duplicate command to make a backup copy of the LaserWriter file's PREC 1 resource, and then change the duplicate's ID to 0 as shown here.

```
New Page Setup Standard You can replace the LaserWriter's standard Page Setup settings with your own. Use ResEdit to duplicate the LaserWriter file's PREC 1 resource, and then change the duplicate's ID to 0 as shown here.
```

Learning to Program

I'm a power DTP guy in a large ad agency who's ready to move on to bigger and better things. I love ResEdit, but neither it nor macros let me do all the things I want to do. So I bought Think C, figuring I could read the manual and be writing Quark extensions or Photoshop plug-ins in a couple of weeks. Boy, was I clueless. Can you shed some light on the secret of C? What program do you write C in?

--

Here's an update on the answer I gave to a similar question a year ago. Pascal is still probably the best language to start with because you need some familiarity with it to read Apple's technical documentation. The concepts and principles you learn about writing Macintosh software will transfer to C or another language if you decide to switch later. You can start with C, but you'll need to learn to read Pascal concurrently. (Of course, learning to read a second language is much easier than learning to "speak" it.)

```
Just Enough Pascal (from Symantec, 08/253-9600 or 800/441-7234) is an interactive tutorial book (with a disk) that teaches the fundamentals of Pascal; you must also purchase Symantec's Think Pascal separately. Symantec's Think Pascal and Think C have everything you need to develop software for the Macintosh. They don't have all the bells and whistles of Apple's Macintosh Programmer's Workshop (MPW), but the Think products cost half as much and are easier to learn.
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I must admit that I can no longer remember where I first read about the many suggestions for recycling those otiose and ubiquitous 256K SIMMs. Nonetheless, I remember one joking reference to making them into earrings, with my acquaintance to making them into earrings, the many suggestions for recycling those

To get these results you need a set of annual family Canadian fishing vacation approaching, I reconsidered the mcking advice and worked two 256K SIMMs into a tandem lure code-named RAM-Bam (see "The Lure of Silicon"). Laird, my 12-year-old son, demonstrating admirable faith in his father's wisdom, put the RAM-Bam to the test and teased a 17½-inch northern pike to byte. As far as I can tell, this is the most obscure feature of 256K SIMMs to date!

Larry R. Bedore
Largo, Florida

TIP Killer 11KHz Sounds

How would you like to sample sounds at 22KHz but have the sound file be half the size, play at 11KHz, and sound as good as the 22KHz original? To get these results you need a set of headphones like Sony's MDR-24 and the microphone that came with your Mac. If your Mac didn't come with a microphone, you can use a MacRecorder (from Macromedia, 415/442-0200). You also need a sound-recording program like SoundEdit (bundled with MacRecorder) and SoundMover 1.6 or later (shareware available from user groups, online information services, or from the author, Ricardo Ettore, 67 Rue de la Limite, 1970 W-Oppem, Belgium).

Put one headphone over the microphone and record the sound at a 22KHz sample rate with Macromedia's SoundEdit or another sound-recording program. Don't use an 11KHz sample rate; it filters out the high frequencies. Headphone placement on the microphone is critical. You will need to experiment a little to find the sweet spot. Trim any sound you don't want at the beginning and end of your recording and save the sound. (Consult the sound-editing program's documentation for specific editing and saving instructions.)

Next open SoundMover, and use it to create a new sound file and to open the sound file you just saved. Select your recorded sound, and SoundMover plays it and shows its waveform.

Now for the magic: Press option while you click SoundMover's Copy button. SoundMover drops half the bits as it copies the sound into the new sound file, halving the sound file size. The halved sound plays back at a sample rate of 11KHz but sounds as good as the original.

Using MacRecorder's line-input jack picks up too much source noise such as tape hiss. The headphone filters out the excess noise and adds its own character, making the recorded sample more natural. This old recording engineer's trick results in the best-sounding samples at half the size. More for less—I like it!

Jim Green
Fort Wayne, Indiana

The halved sound sounded good to me, though not quite as good as the original. The high frequencies seemed to shatter a bit.—L.P.

TIP TeachText Crops Graphics

Need to crop part of that 24-bit screen shot you just made but don't feel like cranking up Adobe Photoshop? Use TeachText. Version 7.0 of this free utility from Apple has the ability to edit PICT graphics files, such as those made when you press shift-3 to take a snapshot of the screen. [Apple distributes TeachText 7.0 with System 7.1—L.P.]

You can select part of a graphic by opening it with TeachText and dragging a selection rectangle across it. Then copy the selected area, close the graphic, create a new TeachText document, paste the copied graphic selection, and save the new document. You may discover that you can only select and copy a small area without TeachText apologizing that "there is not enough memory to perform that task!" Fear not, all is not lost! Quit TeachText, and back in the Finder use the Get Info command to increase TeachText's memory size to megapixels. (I set mine to 2000K.) Now open TeachText and try selecting and copying again.

Bob Rudis
Bethlehem, Pennsylvania

TIP Using PageMaker Links

Aldus widely trumpeted the new Hot-links feature between PageMaker 4.2 and FreeHand 3.1 in System 7, and it has proven a convenient time-saver for me (forget this publish-and-subscribe stuff). Sometimes I have reason to place Adobe Illustrator files in PageMaker publications. One day I tried option-double-clicking an Illustrator graphic in PageMaker as you would do to activate a hot link to FreeHand. To my surprise and delight, Illustrator started and opened the graphic file. Because I had turned on the Links command's Update Automatically option in PageMaker, the changes I made in Illustrator were updated automatically when I switched back to PageMaker.

Terry K. Ambtber
Washington, D.C.

PageMaker 4.2's Edit Original command (or your keyboard shortcut) can open any linked graphic in its originating application, not just FreeHand and Illustrator graphics. You can even open the graphic in an application other than the one that created it by pressing the shift key while choosing the Edit Original command. Technically, PageMaker 4.2 has hot links only to FreeHand 3.1 and Color Studio 1.5, which means a linked graphic is automatically updated in PageMaker when you save changes to it in those applications. This updating works with graphics in layout view and with inline graphics in the story editor. With other originating applications, changes to the graphic are not updated until you switch back to PageMaker, and only if you used the Edit Original command in layout view, not for an inline graphic in the story editor.—L.P. [b]

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System 7 Tricks

BY JIM HEID

ACCORDING TO APPLE, OVER 4 million people are now using System 7—that long-awaited, years-in-the-making version of the fundamental software that enables the Mac to run. Every new Mac now includes System 7; many models can’t even run earlier versions. In the fall of 1992, Apple released System 7.1, which includes better support for foreign languages. Although half of all Macs are still running earlier versions of system software, it’s clear that System 7 is where the action is.

One of the beauties of System 7 is that many of its advanced features are tucked beneath the surface, where they don’t get in the way of beginners. If you haven’t read the System 7 manuals (they’re not bad) or one of the 7438 books that have been written about System 7, you might be missing out on some of its slickest features. This month, I spotlight a few of them. Along the way, we’ll look at some free or nearly free utilities that make a good system even better. These utilities are available through user groups or online services (see last month’s Getting Started for details on how to download freeware and shareware).

Get Accustomed to Customizing

The System 7 Finder—that System program that gives you the desktop with its icons and Trash—provides many more built-in customizing options than did previous Finders. You can do the following:

• Control the appearance of directory windows (which show the names and icons of the application programs, files, and folders on your disks). Using the Views control panel, you can change the font and size of the text in directory windows and you can choose to see as much or as little information as you like about the items on your disks. Note that unchecking items such as size, date, and kind also eliminates those commands in the View menu. If you uncheck Kind, for example, you won’t be able to sort the contents of a window according to icon type (folder, application, document). Other tips: Think twice about checking the Calculate Folder Sizes box; it slows the Finder significantly. If you’re a neatnik, check the Always Snap to Grid box. This puts the Finder in Mom mode—it always cleans up after you.

• Get rid of the warning dialog box that appears when you choose the Empty Trash command. Select the Trash icon and choose Get Info from the File menu. In the info window, uncheck the Warn Before Emptying box. You’ll never see (or be rescued by) the warning again.

• Assign text labels and colors to icons. Using the Labels control panel, you can create descriptive labels (Personal, Work in Progress, Urgent, To Be Trashed, and so on) and then assign them to files or folders using the Finder’s Label menu. You can then use the View menu to sort directory windows according to either labels or colors. I don’t know anyone who uses this feature, but maybe you’ll be the first.

• Customize the Apple menu. Is there a program, control panel, or document you’d like fast access to? Make an alias of the item (as described later) and then move the alias into the Apple Menu Items folder, located within the System Folder.

• Customize disk, file, and folder icons. Not too long ago, creating customized icons meant a fantastic voyage into Apple’s ResEdit resource-editing utility (see “Getting Started with Resource Editing,” Macworld, June 1991). System 7 makes it easy. Select an icon and choose Get Info (or use the keyboard shortcut ⌘-I). In the info window, click on the icon (a border appears around it) and then choose Copy from the Edit menu. Now start up a paint program such as Aldus SuperPaint or Adobe Photoshop. Paste the icon, and then use the paint program’s tools to tweak the icon as desired. When you’re done, select the modified icon and copy it to the Clipboard. Return to the info window from which you copied the icon, be sure the icon is still selected, and then paste.

You can also create new icons from scanned images. When you paste a large image into the info window, the Finder shrinks it to fit a standard icon size. With this technique, you can easily turn a disk or folder window into a thumbnail catalog of scanned images.

Better Balloons

Most people either love or hate System 7’s balloon help feature, which explains menu commands, dialog box options, and tool palette icons when you point to them. One of the less-likable aspects of balloon help is that you must travel up to the menu bar to turn it on—a long journey if you have a big screen.

Using a shareware extension called Helium (by Robert L. Mathews), you can activate balloon help without leaving the keyboard. If you find the help balloons a little small for your tastes, you can use Helium to change the font and size in which help text appears.

CE Software’s QuicKeys keyboard-enhancement utility also lets you turn balloon help on and off from the keyboard. Open the QuickKeys control panel, pull down the Define menu, open the Extensions submenu, and then choose the System 7 Specials command. In the subsequent dialog box, choose the Toggle Balloon Help option and then type the key sequence you want to use. (Use control-help on my extended keyboard, and control-? on my PowerBook. Note that control, not command [⌘]. You could use ⌘-help, but some programs might use that sequence themselves. Besides, the control key is closer to the help key, making it easier to turn help on or off with one hand.)

Easier Aliases

One of System 7’s biggest conveniences is the alias. An alias is a small (approximately 1K) file that acts as a remote control for another item, usually another file, or a program, or a folder. When you double-click on an alias, the Macintosh opens the item that the alias points to. This enables you to keep programs and files within their folders but still have fast access to them from other places, such as the

From file sharing to shareware, how to get more out of System 7

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MACWORLD
To create an alias, select the original file or folder and then choose Make Alias from the Finder's File menu. Then, drag the alias to its final destination—perhaps the desktop, or maybe the Apple Menu Items folder. The Finder always tacks the word alias onto its new alias's name; you can rename the alias if you like. (If you'd like the Finder to append something other than alias to an alias name, use Insanely Great Software's shareware utility, by Adam Stein, System 7 Pack, which can perform several other useful System 7 modifications.)

There are even easier ways to create aliases. One is with an extension called FinderHack, by Donald Brown, the creator of CE Software's QuicKeys. FinderHack adds a menu to the Finder called Futz (I said it was easy, not poetic). Select an icon and choose Make Alias in Apple Menu, and FinderHack creates an alias of the icon and puts the alias in the Apple Menu Items folder for you. FinderHack's Make Alias As command gives you a dialog box that lets you name the new alias and specify where you want to store it. FinderHack also provides commands that instantly delete selected icons or move them to the Trash.

Another handy alias maker is AliasThis, by Bruce Oberg and Gordon Sheridan. Dragging an item to the AliasThis icon creates an alias of that item in the Apple menu. Better still is Laurence Harris's shareware Alias Director, which even lets you create aliases that don't have icons—a nice way to avoid clutter if you like to keep aliases on the desktop.

To show that an item is an alias, the Finder puts its name in italics. Bill Monk's Alias Stylist utility lets you specify a different type style for alias names.

One problem with aliases is that they remain on your hard drive even if you delete the items they alias. To fix that, try Maurice Volask's free TrashAlias, a control panel that automatically deletes an alias when you delete the item it points to. Cliff McCollum's shareware AliasZoo utility helps you keep track of aliases and can also delete orphaned ones.

**Fast Finding**

I've mentioned in previous columns that it's a good idea to organize documents and programs within folders. But as your filing system gets complex—with folders within folders within folders—locating and opening a particular file can become cumbersome.

If you know part of a file or folder name, you can use System 7's Find command to open the item with a few keystrokes—no matter how many folders it's buried in. Choose Find from the Finder's File menu (or type Shift-F) and then type part of the item's name and press return. When the Finder locates the icon, it displays and selects it. Press Control-O to open it.

If you click on the Find dialog box's More Choices button, the dialog box expands to reveal additional searching options, which you can use to perform some surprisingly powerful tasks. Want to create an alias for every program on your hard drive? First, create a new folder named Programs and move it to the desktop. Choose Find, click on More Choices and then set up the pop-up menus to read "kind contains application." Next, check the All At Once box and then click on Find. The Finder locates and selects every application program on your hard drive. Choose Make Alias from the File menu, and the Finder creates aliases and selects them. Drag one of the aliases to the Programs folder you created; the other aliases are still selected, so they tag along. Now you can use the Programs folder as the gateway to any program on your hard drive.

Here's how to use the Find command to perform a quick backup of all the files that you changed on a given day. Click on the Find dialog box's More Choices button and then configure the pop-up menus to read "date modified is," followed by the current date. Check the All At Once box and click on Find. After the Finder has located and selected all the modified files, drag one of them to the icon of a backup disk (the others will follow, since they're still selected). Of course, you need sufficient free space on the backup disk to hold all the files.

**Start Up with These**

**SYSTEM 7'S SYSTEM FOLDER CONTAINS**

A folder called Startup Items. Toss an icon in this folder, and the Mac will open it automatically the next time you start up—very handy if you always use a particular program. (To keep your file system orderly, don't toss an actual application icon into the folder—make an alias of the application and use its icon instead.)

You can use the Startup Items folder to automatically open documents, too. In fact, you can use it to open anything that you can double-click on—including sounds. Toss a sound into the Startup Items folder, and you'll hear a silicon serenade each time you start up.

If there's a sound in your System file you'd like to use, here's how to copy it to the Startup Items folder: Open the System Folder, then double-click on the System file to open it. Locate the sound, and then press the option key while dragging the icon to the Startup Items folder. This puts a copy of the sound in the folder instead of moving the original. (This option-drag technique for copying an item instead of moving it works throughout System 7.)

**File-Sharing 101**

Many MACS are islands, but at least as many are used where there are other MACs—offices, classrooms, user group meetings. If yours is in the latter group, you'll love System 7's built-in file-sharing features. On the simplest level, System 7 file sharing lets you zap files between Macs without using floppies—connect a cable, click a few times, and one Mac's hard drive icon appears on the other Mac's desktop. You can then shuttle files and folders between the Macs using standard click-and-drag techniques.

Say you want to set up a simple file-sharing scheme to zap files between a PowerBook and a desktop Mac (or any two Mac models). To connect the computers, use a pair of Farallon PhoneNet StarConnectors, which are often discounted to under $20 each. With the cable connected, open the PowerBook's Sharing Setup control panel. Type a name in the Owner Name and Macintosh Name boxes; then in the Sharing area, click on Start. When the control panel tells you file sharing is on, close the control panel. **continues**
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Images & Tools is a two-day seminar focusing on designers who use Macintosh-based graphics software. You will learn firsthand from the country's most experienced computer graphics artists and designers just how they do their work. They'll demonstrate their techniques and showcase the tools they use—from Aldus Freehand to Adobe Photoshop.

Invited speakers will take you through the creative process in their areas of expertise, from concept to finished piece, and then open the floor to questions. Jim Leitka is a graphic designer and 3-D animator who began his career as an airbrush artist. Rye Chan, formerly with the San Francisco Chronicle, illustrates for advertising agencies, design firms, and magazines. Anne Hurty, senior designer/Informational graphics at Macworld, was the winner of the first Aldus Freehand illustration contest, published in Print magazine.

Bert Monroy, illustrator, designer, and writer, is the coauthor of The Official Adobe Photoshop Handbook. His illustrations have been published in Macworld, MacWeek, MacUser, Personal Publishing, Verbum, and Byte. Anthony Redhead, former managing director of Electric Paint and now working in Tokyo, was involved with producing the artwork for Dances with Wolves, Silence of the Lambs, Terminator 2, Teenage Mutant Ninja Turtles 2, JFK, and Grand Canyon. Nick Wiggins is a freelance illustrator whose clients include Apple Computer, BusinessWeek, the Washington Post, Milton Bradley, Random House and MCI. Harry Marks is president of Marks Communications, Inc., which is involved with the design and production of graphics for motion pictures and television. The company has produced award-winning campaigns and graphic packages for NBC and ABC. John Hersey is an illustrator whose work has appeared in Esquire, 602, LA Style, and the Washington Post.

Conference registration is $495 and includes all sessions, conference materials, breaks, and luncheons. Pre-registration before February 15th is $445. Checks must be made payable to Sumeria, Inc. and sent to: Sandy Butler, Events Manager, 329 Bryant St., Suite 30, San Francisco, CA 94107. Or you can fax your credit card number (Visa or Mastercard only) to 415/804-0988. Be sure to include the name on the card, the number and the expiration date.

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Wild Should Wild Remain.

"Man always kills the thing he loves, and so we the pioneers have killed our wilderness. Some say we had to. Be that as it may, I am glad I shall never be young without wild country to be young in."

ALDO LEOPOLD

"We need wilderness preserved—as much of it as is still left, and as many kinds... It is important to us... simply because it is there—important, that is, simply as an idea."

WALLACE STEGNER

"The love of wilderness is more than a hunger for what is always beyond reach. It is also an expression of loyalty to the earth, (the earth which bore us and sustains us), the only home we shall ever know, the only paradise we ever need—if we had the eyes to see."

EDWARD ABBEY

"The clearest way into the Universe is through a forest wilderness."

JOHN MUIR

This space provided as a public service.
GETTING STARTED

If you don't see the Sharing Setup control panel, use the System 7 Installer disk to install file-sharing software.

Next, select the PowerBook's hard drive icon (if you just want to share a single folder on the hard drive, select the folder's icon instead) and choose Sharing from the Finder's File menu. In the Sharing window, check the box labeled "Share this item and its contents." Below that item, choose Any User from the Owner pop-up menu (see "Sharing Strategies").

Now go to the other Mac and open its Chooser desk accessory. Click on the AppleShare icon, and the PowerBook name you specified appears in the right side of the Chooser. Double-click on that name, and a dialog box appears. Click on Guest and press return. In the next dialog box, select the hard drive name and press return again. In a moment, an icon for the PowerBook's hard drive appears on the desktop. You can now copy files back and forth between the two Macs.

This scheme pairs up well with the Find command's daily backup trick. Once the two Macs are connected, you can use the Find command to locate the day's files for copying.

To avoid threading your way through Macintosh runs a bit faster if you turn off file sharing. You save memory, and the Macintosh runs a bit faster if you turn off printing documents.

Sharing Strategies

To share a hard drive and grant all privileges to anyone who accesses it, select the drive, choose Sharing (File menu), and configure the sharing window as shown at right.

To assign privileges to a specific folder, select the folder and choose Sharing. Then specify the folder's owner and (if applicable) group. Finally, specify the desired privileges for the owner, the user or group, and everyone else.

A shared drive or folder icon looks just like any other server. Make an alias of the icon for convenient future access.

Access Has Its Privileges

You can use System 7's access privilege settings to lock some people out of certain folders. First, open the Users & Groups control panel to specify a list of registered users—people who are allowed to access shared items. You might also want to assemble registered users into groups—collections of users who work on related projects or in the same department. After creating users and groups, you can control access privileges for a given folder by selecting the folder and choosing the Sharing command (see "Users & Groups" and "Sharing Strategies").

In the previous steps, you set up a peer-to-peer file-server system. The opposite of peer-to-peer networking is a dedicated file server—a Mac and hard drive, running a program such as Apple's AppleShare server, that provide centralized storage for a group of Macs. A central file server costs more to set up—the AppleShare software itself retail for $199—but provides better security and is easier to back up, since shared files are in one place instead of scattered across a network. If you outgrow peer-to-peer file sharing, you can upgrade to AppleShare and retain your user and group settings.

Users & Groups

The Users & Groups control panel lets you specify who can access your folders and disks.

Open the control panel, choose New User (File menu), and rename the new user icon. Double-click on a user's icon to change settings.

You can also assemble users into groups. To create a group, choose New Group from the File menu. Rename the group icon, then drag user icons to the group icon—here Peter Remy is being added to the Testing group.

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Expanding System 7

WITHIN THE PAST YEAR, APPLE HAS RELEASED some optional extensions that enhance System 7's capabilities. The Macintosh PC Exchange extension lets you work with DOS PC disks as if they were Mac disks—great for offices that use Macs and PCs. And At Ease provides a simpler way to start programs and protect your hard drive from modification. It's designed for families whose kids would just love to get in there and rearrange their folks' files (see "Mass Market Macs," November 1992). Another benefit of using At Ease instead of the Finder is the Finder provides about 200K more memory for programs. It's a good way to shoehorn more into a RAM-cramped Mac.

But few things get a System 7 guru's blood flowing faster than the notion of scripting—creating your own short programs that automate repetitive tasks such as backing up and then deleting older files. In the depths of System 7 is a mechanism called Apple events, which gives programs the ability to send commands and data to each other. System 7's publish-and-subscribe features (which I examined briefly in last July's column) rely on Apple events to beam data between programs without going through the clipboard.

With UserLand Frontier, you can write scripts that use Apple events to control the Finder and Macintosh programs. You can create scripts that automate chores you may now perform by hand, such as copying new files from a PowerBook to a desktop Mac, or deleting aliases of files or folders that you've trashed, or decompressing downloaded files and then deleting the compressed archives.

You use Frontier to write, test, and run scripts in a programming language, called UserTalk. When you run a script, Frontier broadcasts events to the Finder, and the Macintosh runs on autopilot. Writing scripts that run properly can be frustrating at first—programming often is. Frontier includes a large number of example scripts you can take apart and modify; more scripts are available through online services.

Whether or not you end up as a script writer, take some time to try out the System 7 techniques described here. Keep an eye on Macworld's monthly Quick Tips column for more ideas. You'll improve your Mac efficiency, and you'll get more work done in less time. In the end, that's what System 7's features are there for. m

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Contributing editor Jim Heid looks at a different aspect of Mac fundamentals each month. He covers System 7 and 7.1 in his latest book, the second edition of Inside the Apple Macintosh (Brady, 1992), which he coauthored with Peter Norton.

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EDITED BY SUZANNE COURTÉAU

THIS LISTING PROVIDES COMPANIES AND PHONE NUMBERS FOR PRODUCTS MENTIONED IN THIS ISSUE.

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- PC-Mac autoswitching

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- Canon engine
- 300 dpi • 35 Fonts
- 16 MHz RISC
- PostScript processing
- 3MB RAM, expandable to 16MB RAM
- PC-Mac autoswitching

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NewGen Turbo PS/600 Laser Printer
- Canon engine
- 35 Fonts
- 16 MHz RISC
- PostScript processing
- 3MB RAM, expandable to 16MB RAM
- PC-Mac autoswitching

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NewGen Turbo PS/880 Laser Printer
- Canon engine
- 35 Fonts
- 16 MHz RISC
- PostScript processing
- 3MB RAM, expandable to 16MB RAM
- PC-Mac autoswitching

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- Canon engine
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- 16 MHz RISC
- PostScript processing
- 3MB RAM, expandable to 16MB RAM
- PC-Mac autoswitching

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- Canon engine
- 35 Fonts
- 16 MHz RISC
- PostScript processing
- 3MB RAM, expandable to 16MB RAM
- PC-Mac autoswitching

NEW! 800 dpi

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- 35 Fonts
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Circle 81 on reader service card
### Video Boards, Monitors, and Packages

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Price</th>
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<tr>
<td>14&quot; Color Monitor Only</td>
<td>$359</td>
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<td>14&quot; Color Monitor - 256 Color Package</td>
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<tr>
<td>20&quot; GrayScan Monitor Only</td>
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<td>20&quot; GrayScan - 256 Package - Nullan</td>
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<td>20&quot; Trinitron Monitor Only</td>
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<td>20&quot; Trinitron - 256 Color Package</td>
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<tr>
<td>20&quot; Trinitron - 16 Million Pkg</td>
<td>$2,449</td>
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All Packages include Monitor, Video Board & Cable.

### 20" Trinitron $1,599

<table>
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<tr>
<td>16 Million</td>
<td>Color</td>
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Complete Package includes cables, carriage, and software. All prices are pre-tax and are subject to freight charges. Free software is available with all packages.

### 14" Color Monitor $359

### 14" Color Package $499

### 20" Sampo Grayscale

Includes Monitor, 8x11 Video Board, & Cable Complete! $799

### Supra Modems

<table>
<thead>
<tr>
<th>Model</th>
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### Rewritable Optical Drives

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### Hard Disk Drives

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<td>CoStar Printers</td>
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### Tape Drives

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### CoStar Printers

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<tr>
<td>Address/Write envelope &amp; LabelWriter II Plus personal label printers</td>
<td>$479</td>
<td></td>
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</table>
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- Quadra 950 $Call!

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  - Puma 128 MB 3.5" Drive $1399
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  - Puma 256 reads & writes ISO/ANSI standard 128 MB cartridges and a true, non-compressed 256 MB
  - Fast transfer rate up to 1.2 MB/second
  - Fast 35 ms access time
  - Optical reliability (10 year Data Life)

All Puma Optical drives include one cartridge, a universal power supply, 12 mgs of shareware, SCSI & power cables, and a one year warranty. Five Year Warranty available!

**256 MB 3.5" Optical**
- **Puma**
  - captured, but not tame" Puma 128 MB 3.5" Drive $1399
  - Puma 256 MB 3.5" Drive $1699

**CD-ROM**
- **NEC**
  - CDR 37 w/ MultiSpin $379
  - CDR 37 Gallery Bundle $499
  - CDR 74 w/ MultiSpin $569
  - CDR 74 Gallery Bundle $739

**NETWORKING**
- Asante Dayna
  - 16k Cards (Nubus) $169 EtherPrint $339
  - 64k Cards (Nubus) $219 DaynaPORT E/II-T $149
  - Asante Print $369 DaynaPORT SCSi $269
  - EN/SC PowerBook $368 DaynaSTAR MiniHub $269

- Cayman Shiva
  - GatorBox CS $1999 Lan Rover/L $599
  - GatorPrint $399 Netmodem/E $1479

**MODEMS**
- **Supra FAXmodem**
  - The Supra FAXmodem V.32bis is the only 14,400 bps modem with 4,400 bps speed and receive fast

**HARD DRIVES**
- **Falcon Micropolis Drives**
  - 385 MB 4.4 ms $1099
  - 760 MB 4.6 ms $1399
  - 1.2 Gig 4.1 ms $1999
  - 1.2 Gig 3.5" 10 ms $Call!
  - 1.5 Gig 4.1 ms $2299
  - 1.6 Gig <11.5 ms $2599
  - 2.0 Gig 3.9 ms $3399
  - 2.4 Gig <11.5 ms $3999

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  - UC84 800 DPI $3099
  - UC1200 1200 DPI $3699

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  - IX-320 $1499
  - Microtek ScanMaker II $899
  - 1850 ScanMaker $1499

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Prices valid 11/28/92 - 12/28/92
## Newgen Turbo PS/440B

**Price:** $3495

<table>
<thead>
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<th>11x17 · 400 d.p.i.</th>
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## Microtek II XE

**Price:** $1175

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## SYSTEMS

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<td>Mac LC II 4/80</td>
<td>$1195</td>
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<tr>
<td>Mac Iici - 5 meg</td>
<td>$2359</td>
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<tr>
<td>Mac Iici - 5/120</td>
<td>$2750</td>
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<tr>
<td>Mac Iisi - 5/80</td>
<td>$1895</td>
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<td>Extended Keyboard</td>
<td>$59</td>
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<td>Mac Quadra 700 - 4 meg</td>
<td>$3500</td>
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<td>Mac Quadra 700 - 4/120</td>
<td>$3959</td>
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<td>Mac Quadra 700 - 4/210</td>
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<tr>
<td>Mac Quadra 950 - 6 meg</td>
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<tr>
<td>Mac Quadra 950 - 6/120</td>
<td>Call</td>
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<tr>
<td>Mac Quadra 950 - 6/540</td>
<td>Call</td>
</tr>
<tr>
<td>Mac Powerbook 145 4/40</td>
<td>$1995</td>
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<td>Mac Powerbook 145 4/80</td>
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<td>Mac Powerbook 170 4/40</td>
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## MONITORS and CARDS

### IDEK

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<th>Monitor Type</th>
<th>Resolution</th>
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<td>15&quot; SVGA Color Display</td>
<td>640x480</td>
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<td>17&quot; Autoscan SVGA Color</td>
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<td>21&quot; Autoscan SVGA Color</td>
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<td>21&quot; Autoscan 8K Color</td>
<td>1024x768</td>
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<td>Radius 19&quot; Precision Color Display</td>
<td>1024x768</td>
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<td>21&quot; Color Display</td>
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<td>Color Pivot Interface</td>
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<td>II, LC, Iici, SE, SE/30</td>
<td>1024x768</td>
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<td>Pivots Display for Built-In Video</td>
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<td>Precision 8x</td>
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<td>Rocket Accelerator 25 MHz</td>
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### DRIVES

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<td>Quantum 210 Pro</td>
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<td>Quantum 240 Pro</td>
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<td>Maxtor 213</td>
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<td>Maxtor 340</td>
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<td>Maxtor 160 meg</td>
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<td>Seagate 1.2 giga byte</td>
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<td>Syquest 4.4 MB</td>
<td>$499</td>
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<td>Syquest 88 MB</td>
<td>$122</td>
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<td>Internal Drive Kit</td>
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<td>Syquest 4.4 MB cartridge</td>
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<td>Road Runner 60 meg for Powerbook</td>
<td>$260</td>
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<td>Fuji 425 meg 5 year warranty</td>
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### PRINTERS

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<td>Microtek True Laser TI Microlaser PS95</td>
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<td>OMS PS410</td>
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<td>NEC Model 95</td>
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<td>Apple Stylewriter</td>
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<td>Apple Laserwriter 6/5</td>
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<td>HP Deskwriter</td>
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<td>HP Deskwriter Color</td>
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<td>HP I1p for Mac</td>
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<td>HP III for Mac</td>
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<td>HP I1p for Mac II</td>
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<td>HP Deskwriter Ink Cartridge</td>
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<td>AppleTalk Connectors</td>
<td>$25</td>
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<td>HP Deskwriter 880C</td>
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<tr>
<td>Newgen Turbo PS 400P (400x400 dpi)</td>
<td>$1795</td>
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<td>Newgen Turbo PS 600B (600x600 dpi)</td>
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<td>Color Printers NEC PS 40</td>
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### SOFTWARE

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<td>Adobe Photoshop 2.0</td>
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<td>Quark Express 3.0</td>
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<td>Corel Office</td>
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### MODEMS

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<td>Zoom FX9624 Plus 2400 BPS</td>
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<td>Modem MX 2400S w/SendFax 9600 BPS</td>
<td>$95</td>
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<td>v.32 Turbo w/422 baud w/MNP Software</td>
<td>$329</td>
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<td>Super Fax Modem 14.4 v.32bis (ext)</td>
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<td>Super Fax Modem 9600 (ext)</td>
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<td>PSI for Powerbook 140 &amp; 170</td>
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<td>Internal 9600/2400</td>
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<td>Global Village Bronze 96/24 for Powerbook</td>
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<td>Global Village Silver 96/24 for Powerbook</td>
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<td>Global Village Gold 14.4/96 for Powerbook</td>
<td>$699</td>
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### ACCELERATORS

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<th>Accelerator</th>
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<tr>
<td>Daystals 40 MHz Powercase</td>
<td>$799</td>
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<tr>
<td>40 MHz Powercase w/68882</td>
<td>$899</td>
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<td>50 MHz Powercase</td>
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<td>50 MHz Powercase w/68882</td>
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<td>Radius Rocket</td>
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### MEMORY

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<td>1 meg for LCICVSI</td>
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<td>4 meg for LCICVSI</td>
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<tr>
<td>Powerbook 140 &amp; 170 4 meg</td>
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<td>Powerbook 140 &amp; 170 8 meg</td>
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<td>Empire Powerbook Display</td>
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<td>Adapter and memory</td>
<td>$Call</td>
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### CD-ROMS

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<td>NEC CDR-74</td>
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<td>NEC CDR-37</td>
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<td>Smart &amp; Friendly w/Cable and</td>
<td>$399</td>
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<td>Classic CD Collection</td>
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<tr>
<td>Super CD Collection</td>
<td>$499</td>
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### THE PRINTER CONNECTION

**Overnight and Federal Express Shipping Available**

(714) 758-8832
fax (714) 635-1752
DGR Technologies offers a new solution to hard disk storage with the 128REM Turbo™. This 3.5" 128MB optical drive boast over a 50% increase in performance over current optical standards, with a seek time of less than one millisecond track to track, and sustainable transfer rate of 768 kbytes/second. In addition, the 128REM Turbo™ offers a new portability, storing 128 megabytes of removable, erasable optical storage on 3.5" disks in a compact external drive format. The small external dimension saves desk space in the office, and easily slides into a briefcase for convenient transport. Ensuring future compatibility, the 128REM Turbo™ conforms to both ANSI and ISO standards for the 3.5" magneto-optical format. All DGR Technologies magneto-optical drives come ready to use – complete with a cartridge, toll-free technical support, and the DGR Technologies one-year warranty and 30-day money-back guarantee. DGR Performance. DGR Reliability. DGR Technologies.

DGR Technologies, Inc.

**128MB**

**“The Price/Performance Leader”**


-AppleLink: DGR
-Visa
-MC

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Performance</th>
<th>Price</th>
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<tr>
<td>DGR 128REM</td>
<td>Turbo Portable</td>
<td>128MB Epson Mechanism 768k/s</td>
<td>$1299</td>
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<td></td>
<td></td>
<td>3.4ms Access, 6ms Short Seek</td>
<td></td>
</tr>
<tr>
<td>DGR 128REM</td>
<td>128MB MOST Mechanism 512kHz/s</td>
<td>42ms Access, 9ms Short Seek</td>
<td>$1199</td>
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<td>DGR 256REM</td>
<td>256MB MOST Mechanism 1.23MHz/s</td>
<td>35ms Access, 9ms Short Seek</td>
<td>$1699</td>
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<td>128MB Cart 256MB Cart</td>
<td>$59</td>
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<td></td>
<td></td>
<td>256MB Cart 256MB Cart</td>
<td>$99</td>
</tr>
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FWB

FWB's Hard Disk Toolkit

Personal Edition Included

- One Year Warranty
- 30-Day Money Back Guarantee

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We accept MC, Visa, Discover, Pre-Paid, COD, & Wire Transfer Orders.

Circle 53 on reader service card

BW31
### Quantum

<table>
<thead>
<tr>
<th>Unformatted Capacity</th>
<th>Model</th>
<th>Description</th>
<th>Actual MAC Internal Capacity</th>
<th>External Capacity</th>
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<tbody>
<tr>
<td>80mb</td>
<td>7212KT</td>
<td>2.5&quot; Low Profile 15ms 80mb</td>
<td>$329</td>
<td>$429</td>
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<td>120mb</td>
<td>7213</td>
<td>2.5&quot; Low Profile 15ms 120mb</td>
<td>$479</td>
<td>$579</td>
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<tr>
<td>207mb</td>
<td>LJT-940</td>
<td>3.5&quot; Half Height 15ms 207mb</td>
<td>$679</td>
<td>$779</td>
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<tr>
<td>330mb</td>
<td>LJT-935</td>
<td>3.5&quot; Half Height 15ms 330mb</td>
<td>$1029</td>
<td>$1089</td>
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<tr>
<td>645mb</td>
<td>XT-1805</td>
<td>3.5&quot; Full Height 16.5ms 645mb</td>
<td>$1229</td>
<td>$1289</td>
</tr>
<tr>
<td>1.2GIG</td>
<td>SO-125</td>
<td>4.25&quot; Full Height 13ms 507mb</td>
<td>$1549</td>
<td>$1649</td>
</tr>
<tr>
<td>1.7GIG</td>
<td>PO-173</td>
<td>4.25&quot; Full Height 13ms 143mb</td>
<td>$1779</td>
<td>$1879</td>
</tr>
<tr>
<td>2.0GIG</td>
<td>PO-175</td>
<td>4.25&quot; Full Height 13ms</td>
<td>$1929</td>
<td>$2029</td>
</tr>
</tbody>
</table>

ELS drives include 32K cache, low power consumption, MTBF of 250,000 hrs and 5 year Warranty. LPS drives have 64K - 256K cache, MTBF of 150,000 hrs, and ONE Year Warranty.

### Maxtor

<table>
<thead>
<tr>
<th>Unformatted Capacity</th>
<th>Model</th>
<th>Description</th>
<th>Actual MAC Internal Capacity</th>
<th>External Capacity</th>
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</thead>
<tbody>
<tr>
<td>120mb</td>
<td>CMO-OD3000</td>
<td>Teac 120mb</td>
<td>3.5&quot; Half Height 45ms</td>
<td>$1179</td>
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<tr>
<td>207mb</td>
<td>CMO-LF3004</td>
<td>Panasonic 120mb</td>
<td>3.5&quot; Half Height 45ms</td>
<td>$1169</td>
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<tr>
<td>330mb</td>
<td>CMO-3100E</td>
<td>Ricoh 120mb</td>
<td>3.5&quot; Half Height 45ms</td>
<td>$1249</td>
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<tr>
<td>645mb</td>
<td>CMO-3051E</td>
<td>Ricoh 594/652mb</td>
<td>5.25&quot; Full Height 28ms</td>
<td>$2695</td>
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<tr>
<td>1.2GIG</td>
<td>CMO-50302E</td>
<td>Ricoh 594/652mb</td>
<td>5.25&quot; Full Height 66.7ms</td>
<td>$2149</td>
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Maxtor 3.5" Drives include a 2 Year Warranty. Maxtor 5.25" Drives include a 2 Year Warranty.

### SyQuest Drives for Quadcro 900/950

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<thead>
<tr>
<th>Capacity</th>
<th>External Capacity</th>
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<tbody>
<tr>
<td>44mb</td>
<td>(10 pack-$62 each)</td>
</tr>
<tr>
<td>88mb</td>
<td>(10 pack-$96 each)</td>
</tr>
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</table>

SyQuest Drives include a TWO Year Warranty, one cartridge & necessary cables, SCSI Director™ v.2.7, Formatting Utility. * Includes (1) 44mb & (1) 88mb cartridge. SyQuest Cartridges carry a ONE Year Warranty.

### Fujitsu

<table>
<thead>
<tr>
<th>Unformatted Capacity</th>
<th>Model</th>
<th>Description</th>
<th>Actual MAC Capacity</th>
<th>Internal Capacity</th>
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<tbody>
<tr>
<td>248mb</td>
<td>ST2288</td>
<td>3.5&quot; Low Profile 12ms</td>
<td>248mb</td>
<td>$635</td>
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<tr>
<td>1.2GIG</td>
<td>GH1220H</td>
<td>3.5&quot; Half Height</td>
<td>12ms</td>
<td>$1879</td>
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<tr>
<td>645mb</td>
<td>ST4767N</td>
<td>5.25&quot; Full Height W2</td>
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<td>$1529</td>
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<tr>
<td>1.5GIG</td>
<td>GH1420H</td>
<td>5.25&quot; Full Height W4</td>
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<td>$1858</td>
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<tr>
<td>2.1GIG</td>
<td>ST4A00H</td>
<td>5.25&quot; Full Height W8</td>
<td>12ms</td>
<td>$2029</td>
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<tr>
<td>1.5GIG</td>
<td>ST4A00H</td>
<td>5.25&quot; Full Height Elite-1 15ms</td>
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<td>2.4GIG</td>
<td>ST4A00K</td>
<td>5.25&quot; Full Height Elite-2 15ms</td>
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<td>3.4GIG</td>
<td>ST4A00K</td>
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### Seagate

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<td>234mb</td>
<td>C2030 3.5&quot; Half Height 12.6ms 623mb</td>
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<td>422mb</td>
<td>C2025 3.5&quot; Half Height 12.6ms 402mb</td>
<td>$1159</td>
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</tr>
<tr>
<td>1.2GIG</td>
<td>C2047 3.5&quot; Half Height 12ms</td>
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<td>677mb</td>
<td>97556 5.25&quot; Full Height 16.9ms 633mb</td>
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### Hewlett Packard

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<tr>
<td>1.8GIG</td>
<td>HP35470A DAT, DDS 4mm 10-15 MB/s</td>
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<tr>
<td>2.2GIG</td>
<td>HP35480A DAT, DDS-DC 4mm 10-15 MB/s</td>
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<td>2.5GIG</td>
<td>Exabyte EXB-8200 Digital Helical 8mm</td>
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### Micropolis

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<tbody>
<tr>
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<td>AT 2112 3.5&quot; Half Height Fast SCSI-2 10ms</td>
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<tr>
<td>2.0GIG</td>
<td>AT 1964 5.25&quot; Full Height Fast SCSI-2 11.5ms</td>
<td>$3129</td>
<td></td>
</tr>
</tbody>
</table>

### Call for Internal Prices

HP Disk Drives feature SCSI-2 embedded controller + MTBF of 150,000 hour warranty.
GUARANTEED LOWEST PRICES!

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<table>
<thead>
<tr>
<th>Quantum</th>
<th>Fujitsu</th>
<th>WREN</th>
<th>Maxtor</th>
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<tr>
<td>MB</td>
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<td>1969</td>
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<td>Go*Drives</td>
<td>Includes Fujitsu's 5-Year Warranty</td>
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<td>**Includes new 5-Year Warranty</td>
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<td>170</td>
<td>$469</td>
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</table>

*Battery-Powered portable case for the PowerBook
Ask about our $79 extended-life PowerBook Battery
Call us about Companion Drives for your PowerBook

APS Technologies
Macworld has selected this TEAC I55 tape unit as its Editors' Choice in the personal back up category. With a back-up rate of 4.5MB per minute, this compact tape unit backs up 145MB per 60-meter cassette. Each unit includes Retrospect by Dantz, one 60m tape and a premium SCSI cable. With TEAC's one-year warranty and APS's legendary service and support, what more could you ask?

SyQuest
Model  EXTL
SQ555    $399
SQ5110   499
Dual 44  799
Dual 88  959

All tape drives include Retrospect by Dantz Development.

DAT
Model     EXTL
INTL*    $1999
APSDAT $1699
2.6-5 GB Compression DAT
APSDAT $1299
1399
Desktop & Portable Units
Archive-based Mechanisms
Quadra 900 & 950

Digital Audio Tapes
Maxell 60-Meter $12
Maxell 90-Meter $16

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450 watt $220
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HD Preformatted-Mac $18

Toshiba
CD-ROM 33018 $599
Includes the five-disc APS Reference & Entertainment Library

Epson
MO $1099
Magneeto Optical Drive

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Circle 31 on reader service card
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Syquest Drives are the recipient of MacUser Magazine's prestigious Editors' Choice Award.

**SyQuest**

**44 Megabyte Hard Drives**

- $399
- Cartridges: 100 Pak-ea. $60, 10 Pak-ea. $62, 5 Pak-ea. $63, Singles $64

**89 Megabyte Hard Drives**

- $449
- Cartridges: 100 Pak-ea. $90, 10 Pak-ea. $92, 5 Pak-ea. $95, Singles $97

Talk about MacLand Removable Hard Drives come with our own installation and reference manual, DiskMaster Plus™ formatting utility software, cables, and a one-year warranty. Cartridge not included.

Sony Monitors

<table>
<thead>
<tr>
<th>Model</th>
<th>One-Year Warranty</th>
<th>Two-Year Warranty</th>
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<tbody>
<tr>
<td>1320</td>
<td>$399</td>
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</tr>
<tr>
<td>1304</td>
<td>$699</td>
<td>$899</td>
</tr>
</tbody>
</table>

**Monochrome Monitor Specials**

*Orion Technologies*

- Complete Page Display $329
- Dual Page Display $699
- One-Year Warranty

Video Training Tapes

4th Dimension Font Management
- Accountant Inc.
- Canvas 3.0
- ClarisWorks Design & Layout
- Design & Layout
- Datalers & Sense
- Excel 3.0
- Excel 4.0
- FileMaker Pro 1.0
- FileMaker Pro 2.0

- Formulas
- Freehand 3.1
- Hypercard 2.0
- Illustrator 3.2
- Lotus 1-2-3
- MacDraw Pro 1.0
- MacDrawPro II 2.5
- MacWrite II
- Macintosh 7.0
- Macintosh 8.0
- Microsoft Works
- Networking Small
- PageMaker 4.2
- Paints & Draw
- Persuasion 2.0
- Photoshop 2.0
- PowerPoint 2.0
- QuarkXPress 3.1
- Quicken 3.0
- Resolve Superpaint 3.0
- System 7
- Utilities, CDEV'S & Kicks
- Word 5.0
- WordPerfect

**$39 each**
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**Dataproducts®**

**LZR 1560™**
- **Price:** $3,195
- **Features:**
  - 11" x 17"
  - 300 or True 400 Dots-Per-Inch Resolution
  - Postscript Level 2
  - 15 Pages Per Minute
  - RISC-Based Controller
  - Dual Bin
  - Legal, Letter, Envelopes and Transparencies

**Qume Crystal Print Express**
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  - Legal, Legal, Envelopes and Transparencies
  - 3 Megabytes of Ram
  - 600 x 600 DPI!

**LZR 965™**
- **Price:** $2,395
- **Features:**
  - 8 Megs of Ram!
  - Postscript Level 2
  - Powerful RISC-Based Processor
  - Legal, Letter, Envelopes and Transparencies
  - 2-Year Warranty

**Limited Time Offer!**
From now until Dec. 31, 1992 you can purchase the MLI Cordless Supermouse and Symantec's Norton Utilities for **ONLY $129!**

### Scanners

**Microtek:**
- **ScanMaker II:** $899
- **ScanMaker IIxe:** $1199

**Relisys:**
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- **800 DPI Color Scanner:** $1099

**Limited Time Offer!**

**Introducing the MLI Cordless Supermouse!**

- Cordless Design
- Pin Point Accuracy
- 400 Dots Per Inch
- Uses Less Desktop Space

**Just $79**

Product names are trademarks or registered trademarks of their respective holders.

Circle 40 on reader service card
### Magic Hard Drives

<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity</th>
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<td>Magic Toshiba CD-ROM</td>
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### Magic Communications

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<td>2400bps mode</td>
<td>$89, pocket version $119</td>
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</table>

### MacProducts USA

**Holiday Coupons**

- **Macintosh IIGI**: $2100 off any Magic purchase of $1000 or more.
- **SuperMac Thunder 24**: $2100 off any Magic purchase of $1000 or more.
- **NEC SilentWright II**: $95 off any Magic purchase of $3750 or more.

*Not valid with any other promotions.*
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- **B SIMMs**: $69
- **B SIMMs for Ilsi, Ilci, Quadra**: $129
- **4B SIMMs**: $49
- **6MB PowerBook**: $99/$179/$349
- **B Classic Upgrade**: $99
- **VRAM**: $29
- **ddra VRAM**: $59

**R INTER RAM**

- **CLP II/1MB**: $49
- **960/RealWrite/Quickor 8MB Kit**: $499
- **SilentWriter 2 M90 2MB Update**: $249
- **SilentWriter Model 9j 2MB**: $139
- **1S P 410/15 4MB Upgrade**: $239/$349
- **lMB RAM Upgrade**: $49
- **Turbo 4MB RAM Upgrade**: $399

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**RAILGun 030 PRO SYSTEM**

- **030 Accelerators with built-in Video Output, 88882 Math CoProcessor, PMMU, & One or Two Page Display.**
  - **System Monitor**: 19" / 15"
  - **16MHz RailGun PRO**: $899 / $699
  - **25MHz RailGun PRO**: $999 / $849
  - **33MHz RailGun PRO**: $1199 / $999
  - **Add $99 for Classic or Plus Version**
  - **33MHz version includes Virtual 3.0**

**RAILGun 030**

- **Magic RailGun 16MHz**: $799
- **Magic RailGun 25MHz**: $749
- **Magic RailGun 33MHz**: $799
- **Math CoProcessor Upgrade**: $499
- **Virtual 3.0 Virtual RAM software**: $99

**MAGIC ACCELERATORS**

- **Magic LC300 with CoProcessor**: $199
- **Magic Math LC CoProcessor**: $59
- **Magic Math Classic II CoProcessor**: $59
- **Magic: IB Dual Slot Card with FPU**: $99
- **Magic Cache I I / I I a 64k**: $115

**MAGIC ACCESSORIES**

- **MagicNet LocalTalk**: $10
- **Magic EtherNet**: $10
- **Ethernet Nubus Cables**: $10
- **ThickNet**: $169
- **ThinNet**: $169
- **Ultra-T**: $169
- **Transceivers**: $169
- **SODI Accelerator**: $299
- **Magic SCSI II & Mirror Card**: $169
- **Magic SCSI II Cable**: $49

---

**MAC PRODUCTS USA**

- **Circle 175 on reader service card**

---

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Corporate, Educational purchase orders accepted. Returns subject to a restocking fee. Call for any RAM before ordering. International orders welcome. Magic includes a 30 Day Money Back Guarantee on all Magic Products-Exclusive Original Shipping. Prices subject to change.
Macintosh Classic II 4/40
Macintosh LC II 4/80...

Macintosh Ilxv 4/0/0...
Macintosh Ilxi 3/40
Macintosh Ilci 5/0...

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Pricing is for internal drive configurations. We have internals, externals, multiple drive configurations, 2.5", 3.5", 5.25", magnetic-opticals, CD-RDMs, and tape drives.

2. Video ...
We have monitors and boards from every leading manufacturer including Sony, Seiko, Apple, RastarOps, SuperMac, E-Machines, Sigma Designs and Radius. We can even help you mix and match to get the most value for your money.

3. Printers ...
We can help you make those tough decisions between TrueType vs PostScript, speed vs cost, and all these special features. These are just a few of the leading manufacturers we carry.

4. Removable Drives ...
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---

East Coast • 800-945-1MAC • 813-886-9534 International • 813-888-9535 Fax
### 7. PowerBooks ...

<table>
<thead>
<tr>
<th>Model</th>
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<td>PowerBook 145/4</td>
<td>4/40</td>
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The PowerBook 145 offers performance of a desktop computer in a portable design. It is a 68030 processor and a backlit Liquid Crystal Display. It comes with an internal SuperDrive and a 40 or 80 Mb internal hard disk.

### 6. Networks ...

**Ask about the ETC DataFlow II Family!**

#### 5. Keyboards ...

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>Apple Extended Keyboard</td>
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<td>Apple Standard Keyboard</td>
<td>$90.00</td>
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<td>ETC LAN Adapter (10baseT)</td>
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<td>ETC Magic Converter II</td>
<td>$149.00</td>
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<td>ETC Ethernet Repeater</td>
<td>$339.00</td>
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<td>ETC 10baseT Hub</td>
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<td>ETC DataFlow II thick &amp; thin</td>
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### 8. SoftWare ...

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<td>Aldus PageMaker 4.2</td>
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<tr>
<td>FileMaker Pro 2.0</td>
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<td>FileMaker Pro 2.6</td>
<td>$399.00</td>
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PageMaker is the most complete desktop-publishing package available, building on previous versions of PageMaker by defining new standards for writing, design, and production.

We also carry the full line of Adobe, Aldus, Claris, Pastel, Microsoft, and many more software lines! Just give us a call!
Monitors to the Macs!

See More for Less with Lapis Displays

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For Mac Plus, Classic, SE, SE/30, LC, LC II, Iis, II-family & Quadras

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Let's LC & LC II work with any TV

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15" Full-Page • 640 x 872 • For Mac Plus Classic, SE, SE/30, LC, Iis, & II-family

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Lapis Monochrome Display

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Mac Classic II, 4/80
1275
NEW Mac LC II, 4/40
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Mac Iis, 3/40
1545
Mac Iis, 5/0
Call
NEW Mac Iis, 5/0
NEW
Mac Quadra 700/950
3995/NEW
PowerBook
Call

Mac Systems

LC II Color System
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Mac LC II, 4MB RAM/40HD
Mitsubishi 14" Color Display, Apple Keyboard, Mouse, System 7 & Hypercard

Iis Color Productivity System
$22,455
Mac Iis 3MB/40HD, Mitsubishi 14" Color Display, Apple Keyboard, Mouse, System 7 & Hypercard

Software

Adobe Photoshop 2.0
579
Aldus PageMaker 4.2A
595
Microsoft Excel 4.0/Word 5.0
319/295
Quark Express 3.1
549
We carry a full line of software. Call us!

Printers

LAPIS

The Chicken & Egg Theory Whih Comes First?

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Seiko 14"/17"
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E-Machines T16 II/T19 II
1395/2395
E-Machines Color Video Cards
CALL
Lapis Color Server PDS30-17/21
399/499
Lapis ProColor Server-24/PDS30-17
699
Lapis ProColor Server-16/LC17
549

Displays & Cards

radius

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1545
20" Color Trinitron Display
2395
8XL 8-bit color
459
PaintBoard LiPaintBoard 24
849/1599
24STV/24STV
779/900
MediaTime, QuickTime Video Call
Video Expander (NTSC/PAL)
499

Modems

Quickset Xebra
9624 Fax/Receive
$139
Xebra 2400 data modem
69
Xebra 9600 fax/w/ V.42bis
279
Xebra 14400 fax/receive w/ V.42bis
299

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3 Resolution
632x480
832x624 &
1024x768
Quadra-Ready
Sony 1320/1304
Call/529

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NEW Scanner II
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$1200 DPI-40% faster Get Color for the price of grayscale!

NEW Scanner IIx
1139
For high-end prepress scanning, lightning fast, 1200 DPI, 24-bit color with ScanMac calibration software & full Photoshop 2.01

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$1475
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Sharp JX-320
1395
UMax 1200S
2895
HP Scanner H6
995

Drives & Storage

PLI Removable 44/88
569/699
PLI Optical 3.5/75.25"
1495/2895
PLI Floppical
469
PLI Quick SCSI
329

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Circle 172 on reader service card
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<th>Hardware</th>
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<tr>
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<td>COMSTATION 1</td>
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**SOFTWARE**

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<td>Deskwriter</td>
<td>$499.00</td>
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<td>NEW!</td>
<td>$729.00</td>
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<td>POWERPACKARD</td>
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**Our Policies**

- 30-day M/BG applies to desktop/ laptop manufacturers only. Call customer service at 1-800-548-2512 or e-mail authorization. All returns must be in the original box and must be sent back within 30 days of our issue date. No refunds for incorrect part ordered. Prices and availability of products are subject to change without notice. Products may require up to 10 working days to arrive. Include name, address, and telephone number, and a PO Box number (not P.O. Box) as well. Orders by credit card, include expiration date and billing address. Customers welcome to trade in old unit for 25% off listed price.

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8ppm printer engine • True Adobe Postscript Language
AppleTalk interface & 1.5MB RAM included on all models
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SUPERMAC

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Microtek 1800 Sharian $1999
Sharp JX335 w/Interface $999
Sharp JTX224 w/Interface $415
Tatamak 800C/EPD$1499
R. EX 600/EPD$1079
Unax 1200 w/PostScript $3575

DRIVES & TAPES

Interconnect External Drive Kit $299
Apple Engineering 1.44 Drive $39
Apple Engineering Plus Drive $295
Bemoro 5.25/3.5 w/Interface $318
Fujitsu 40MB/3.5MB $299

NEC 720 w/PostScript $495
NEC 620 w/PostScript $399

SOFTWARE

IBM Graphics $145
Adobe Illustrator 3.2/eW $249
Adobe Pagemaker 2.0 $499
Adobe Type 1 $82

ATI Type II RIP $2115
MacDraw Pro $199
MacDraw II $199
MacPaint $199
MacDraw II $199
MacPaint $199

Jettic Inkjet Refill

10ml Black Twin Pack $15.99
10ml White Twin Pack $15.99

Supra Fax MODEMS

15-20 ppm 12/24 line Interface $299
Neo-Fax S-150 Fax Machine $279
Neo-Fax L-150 Fax Machine $499
Nucom Nucom Fax Machine $499

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<th>Fax</th>
<th>1-900-420-8770</th>
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<tr>
<td>1219 West Sixth</td>
<td>Austin, Texas 78703</td>
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</tbody>
</table>

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40% faster scanning than 600ZS
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1200 DPI 24-bit Color Scanner with Photoshop LE

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1200 DPI 24-bit Color Scanner with Full Photoshop 2.01 & ScanMatch Calibration Software

ScanMaker 1850 $1399
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4MB TurboRIP RAM $399

PDF/15 Printer Upgrade $39

RISC Processor • Postscript level 2 • AppleTalk Interface
16ppm Turbo microlaser PS/35 XL $1299
8MB TurboRIP RAM $399

WACOM Pressure-Sensitive Tablets

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>6x9 Standard</td>
<td>$499</td>
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<td>12x12 Electrostatic</td>
<td>$699</td>
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<td>18x24 Standard</td>
<td>$2525</td>
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</table>

Painters $199

With purchase of Wacom Tabletop Wacom compatible Mac Drop-In Award Winner from Fractal Design

Intermec 1800 Sharian $1999
Sharp JX335 w/Interface $999
Tatamak 800C/EPD $1499
REX 600/EPD $1079
Unax 1200 w/PostScript $3575

NEC 720 w/PostScript $495
NEC 620 w/PostScript $399

SOFTWARE

IBM Graphics $145
Adobe Illustrator 3.2/eW $249
Adobe Pagemaker 2.0 $499
Adobe Type 1 $82

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MacDraw Pro $199
MacDraw II $199
MacPaint $199
MacDraw II $199
MacPaint $199

Jettic Inkjet Refill

10ml Black Twin Pack $15.99
10ml White Twin Pack $15.99

Supra Fax MODEMS

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Neo-Fax S-150 Fax Machine $279
Neo-Fax L-150 Fax Machine $499
Nucom Nucom Fax Machine $499

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<tr>
<td>1219 West Sixth</td>
<td>Austin, Texas 78703</td>
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BOTTOM LINE DISTRIBUTION

1-900-420-3636

2 PER MINUTE

Fax: 1-900-420-8770

HOW TO ORDER: Payment: Visa, Mastercard, Discover (no surcharges), checks, and CODs $6,000 minimum on CODs. Sales Tax: Texas residents add 8.25% sales tax. Prices and items subject to change and availability. International: We exchange on international orders Mail in: Orders accepted with a $5 surcharge. Terms: You are not charged until your order is shipped. Phone charges cannot be refunded. Shipments: minimum $5 UPS Ground, Blue, Red, Federal Express. Returns: must be in original condition and package and require an RMA. Seal must not be opened for software. Returns may be subject to a restocking fee. Ask for details when ordering. Bottom Line Distribution cannot be responsible for errors in typnography or photography.

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40% faster scanning than 600ZS
ScanMaker II $875
1200 DPI 24-bit Color Scanner with Photoshop LE

ScanMaker Ixxe $1169
1200 DPI 24-bit Color Scanner with Full Photoshop 2.01 & ScanMatch Calibration Software

ScanMaker 1850 $1399
1850 DPI Color Slide Scanner with Photoshop

4MB TurboRIP RAM $399

PDF/15 Printer Upgrade $39

RISC Processor • Postscript level 2 • AppleTalk Interface
16ppm Turbo microlaser PS/35 XL $1299
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<td>$699</td>
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<tr>
<td>18x24 Standard</td>
<td>$2525</td>
</tr>
</tbody>
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Sharp JX335 w/Interface $999
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<th>1-900-420-8770</th>
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</thead>
<tbody>
<tr>
<td>1219 West Sixth</td>
<td>Austin, Texas 78703</td>
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</table>
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<thead>
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<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LogiCache 32x 50MHz w/8K</td>
<td>$159.00</td>
</tr>
<tr>
<td>LogiCache 32x 50MHz</td>
<td>$139.00</td>
</tr>
<tr>
<td>LogiCache 32x 50MHz w/8K</td>
<td>$129.00</td>
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<tr>
<td>LogiCache 32x 50MHz</td>
<td>$99.00</td>
</tr>
<tr>
<td>LogiCache 32x 64K Cache</td>
<td>$129.00</td>
</tr>
<tr>
<td>LogiCache 32x 64K Adapter</td>
<td>$109.00</td>
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<tr>
<td>LogiCache 32x 20 Mhz chip for Adapter</td>
<td>$99.00</td>
</tr>
<tr>
<td>DayStar PowerCache 33,40,60 MHz</td>
<td>CALL</td>
</tr>
<tr>
<td>DayStar PowerCache 33,40,60 MHz</td>
<td>CALL</td>
</tr>
<tr>
<td>Radius Rocket and Radius Rocket 25i</td>
<td>CALL</td>
</tr>
<tr>
<td>Numac 404 Accelerators for the LC, LC, SE 30, Hi, and Mac II FX</td>
<td>CALL</td>
</tr>
<tr>
<td>LogiCard LC, LC II, or Classic II FPU</td>
<td>$99.00</td>
</tr>
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</table>

Display Systems

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>Seleco 14&quot; Trinitron</td>
<td>$558.00</td>
</tr>
<tr>
<td>SuperMac 17&quot;</td>
<td>$1089.00</td>
</tr>
<tr>
<td>SuperMac 20&quot; Trinitron</td>
<td>$2549.00</td>
</tr>
<tr>
<td>ThunderStrom, Spectrum, and Thunder cards</td>
<td>CALL</td>
</tr>
<tr>
<td>E Machines Complete Line</td>
<td>CALL</td>
</tr>
<tr>
<td>Iomega 20&quot; Trinitron with 24 bit Accelerator</td>
<td>$2699.00</td>
</tr>
<tr>
<td>Radius Pivot, Color Pivot</td>
<td>CALL</td>
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<tr>
<td>Video Spiegel Complete Line</td>
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<th>Third Wave DATdrive</th>
<th>Other Guys</th>
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<tbody>
<tr>
<td><strong>Warranty</strong></td>
<td>5 years</td>
<td>2 years</td>
</tr>
<tr>
<td><strong>Price: 28B</strong></td>
<td>$1395.00</td>
<td>$1399.00</td>
</tr>
<tr>
<td><strong>Compression (GB)</strong></td>
<td>1585.00</td>
<td>1899.00 (only 5GB)</td>
</tr>
<tr>
<td><strong>Firmware Upgrades</strong></td>
<td>From tape</td>
<td>Chip replacement</td>
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<tr>
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<td>User install</td>
<td>Vendor install</td>
</tr>
<tr>
<td><strong>Form factor</strong></td>
<td>3.5&quot;</td>
<td>3.5&quot;</td>
</tr>
<tr>
<td><strong>MTBF</strong></td>
<td>50,000 hours</td>
<td>40,000 hours</td>
</tr>
<tr>
<td><strong>Software</strong></td>
<td>Retrospect</td>
<td>Retrospect</td>
</tr>
</tbody>
</table>

## Storage Systems

### Removable Media

- Optical 128P: $1299.00
- Optical 128S (3MB): $1499.00
- Optical 600 (3MB): $2899.00
- 45 SR (SyQuest) w/cartridge: $445.00
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- Optical cartridge 128 MB: $46.00

### Special:
- Adobe Photoshop 2.01: $448.00

## Memory Upgrades

<table>
<thead>
<tr>
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<th>2MB</th>
<th>4MB SIMMs</th>
<th>Best Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1MB SIMM (2LS, 2LS, Quadra 800/865)</td>
<td>478.00</td>
<td></td>
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<tr>
<td>1MB SIMM (Quadra 730/750)</td>
<td>469.00</td>
<td></td>
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<tr>
<td>PowerBook 2MB</td>
<td>65.00</td>
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<tr>
<td>PowerBook 4MB</td>
<td>168.00</td>
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<td>PowerBook 6 MB</td>
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<tr>
<td>PowerBook 100 MB</td>
<td>258.00</td>
<td></td>
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</tr>
<tr>
<td>Quadra 700/800 VRAM SIMM</td>
<td>29.00</td>
<td></td>
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</tr>
<tr>
<td>Quadra 650 VRAM SIMM</td>
<td>34.00</td>
<td></td>
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</tr>
<tr>
<td>LC 512K VRAM SIMM</td>
<td>59.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SIMM Prices subject to change, reflect cash discount.**

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- PSI PowerModem: $208.00
- Global Village Ethernet FaxModem: $200.00
- Global Village Silver FaxModem: $468.00
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- Apple Laser II - $1,999.00
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**Apple Accessories**

- Mac Plus - $85.00
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- Mac SE/30 - $95.00
- Mac Classic - $125.00
- Mac LC - $125.00
- Mac LC II - $125.00
- Mac II - $250.00
- Mac IIx - $275.00
- Quadra 900/950 - $375.00

**Monditors**

- 12" Mono - $175.00
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- Portrait Display - $399.00
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- Mac SE - $225.00
- Mac LC - $275.00
- Mac LC II - $275.00
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- Mac SE/30 - $95.00
- Mac Classic - $125.00
- Mac LC - $125.00
- Mac LC II - $125.00
- Mac II - $250.00
- Mac IIx - $275.00
- Quadra 900/950 - $375.00

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- Mac Plus - $199.00
- Mac SE - $225.00
- Mac LC - $275.00
- Mac LC II - $275.00
- Mac IIx - $375.00
- Mac Portable - $350.00
- Laser IINT - $799.00
- Laser IINTX - $799.00

**APPLE ACCESSORIES**

- Mac Plus - $85.00
- Mac SE - $75.00
- Mac SE/30 - $95.00
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- Mac LC - $125.00
- Mac LC II - $125.00
- Mac II - $250.00
- Mac IIx - $275.00
- Quadra 900/950 - $375.00

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Powerbook RAM & HD upgrades

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Upgrades
- IICx to Iici............$799.
- IICx to Quadra 700....2499.
- IICl to Quadra 700.....1999.
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- Mac 512k to plus.......179.
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- 800k floppy mech....89.
- 1.44 floppy mech....279.
- Plus power supply.....89.
- AppleTalk PC card..49.
- SE analog board.....149.
- Plus logic board......149.
- SE logic board........149.
- LC logic board......449.
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- Mac II logic board....549.

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- Apple 8-bit........$99.
- Apple Portrait........99.
- Apple 2-page mono..99.
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- **QuickSilver 81 with FPU** $259
- **Transwarp SE** $525
- **Transwarp SE w/FPU** $720
- **Transwarp LC 25MHz** $449
- **Transwarp LC 33MHz** $919
- **Transwarp LC 50MHz** $1299
- **Transwarp 660** $1799
- **Transwarp CI 50MHz** $1399
- **FastMath LC** $119
- **FastMath Classic II** $129
- **QuadrantLink** $182
- **QuadrantLink DMA** $320
- **QuadrantLink DMA/Lan** $379

### Removable Drives

- **DRI Infinity 44 SYQuest** $519
- **DRI Infinity 88 SYQuest** $639
- **DRI 128MB Optical Turbo** $1279
- **DRI 128MB Optical** $1199
- **DRI 250MB Optical** $1699
- **PinNake Micro 650MB Optical** $3119
- **AE Floptical (21MB)** $459
- **PI Floptical (21MB)** $409

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- **Komag 128MB** $45
- **Verbatim 128MB** $49
- **DGR 250MB** $95
- **Floptical Disks (21MB)** $49

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- **NEW! TelePort Silver 96/96** $359
- **NEW! TelePort Gold 14/4/96** $449
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- **Supra 50/6FX 14/4/4/4/4** $495
- **Supra 50/25 (2x400 Band)** $74
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---

### Memory Upgrade

#### SIMM

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>1x8x80</td>
<td>$40</td>
</tr>
<tr>
<td>2x8x80</td>
<td>$65</td>
</tr>
<tr>
<td>4x8x80</td>
<td>$145</td>
</tr>
</tbody>
</table>

- **$40**
  - 1x8x80
  - 2x8x80
  - 4x8x80

- **$65**
  - 1x8x80
  - 2x8x80
  - 4x8x80

- **$145**
  - 1x8x80
  - 2x8x80
  - 4x8x80

#### Optical (21MB)

- **$459**

- **$409**

- **$29**

- **$3119**

#### Infinity, etc.

- **$199**

- **$969**

- **$699**

- **$539**

- **$459**

- **$325**

- **$325**

- **$325**

- **$325**

- **$325**

#### OMNI

- **$149**

- **$149**

- **$149**

- **$149**

#### Powerbook

- **$595**

- **$959**

- **$29**

- **$329**

- **$329**

- **$619**

- **$219**

- **$439**

- **$619**

#### SyQuest

- **$63**

- **$99**

- **$88 MB**

- **$305**

- **$305**

- **$305**

#### Miscellaneous

- **Kensington Turbo**
- **Mouse 4.0 Trackball**
- **Optima 32/Software**
- **Carry Networking**

---

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  - 85 Meg $279 $345
  - 120 Meg $390 $474
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  - 88 Meg Kit Write $559
  - Ar DAT Tape 2.1 $1400

- FUJITSU
  - 425 Meg $975 $1030
  - 520 Meg $1075 $1175
  - 1.2 GB $1700 $1775
  - 2.0 GB $2199 $2379

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- 1x8 80 ns $290
- 1x8 70 ns $262
- 2x8 80 ns $366
- 2x8 70 ns $290
- 4x8 80 ns $392
- 4x8 70 ns $406

**Ras terOps**
- 24-bit cards $892
- 24 XLI $1649
- 24 paintboard paintboard Li $849
- 24 SX $675
- Colorboard $2059

**CLEAR VUE**
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- XL $329
- GS30 $699

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- Spect. 24 PDQ plus $1644
- Spect. 24 $999
- Spect. 6.24 $975
- Spect 8 $499
- Monochrome Card $349

- Supersmatch Platinum
  - 21" 2 Pg $2725
  - 20" D. Tr. $2499
  - 17" Mult $1079
  - 17" Trin $1075

**ASANTE**
- MC3NB $209
- MC+I E64 $169
- MC+I ET64 $169
- MC3 LI $209
- MC+LC LI $209
- MC3 SE $209
- ENVC $319

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  - 256K Wram 0/800 $30
  - 256K Wram 050 $30
  - 1 Meg 70 ns $32
  - 4 Meg 70 ns $106
  - 8 Meg 70 ns $289
  - 16 Meg Q700 $535
  - 16 Meg Q900 $465

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- FAX (714) 847-5043

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**CATALOG**

**PERIPHERAL OUTLET**

**SIMMs**

<table>
<thead>
<tr>
<th>Memory</th>
<th>Speed</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MBYTE 70 ns</td>
<td>$33.00</td>
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<tr>
<td>1 MBYTE 80 ns</td>
<td>$31.00</td>
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<tr>
<td>1 MBYTE 100 ns</td>
<td>$30.00</td>
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<tr>
<td>2 MBYTE 80 ns</td>
<td>$57.00</td>
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<tr>
<td>4 MBYTE 80 ns</td>
<td>$103.00</td>
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<tr>
<td>8 MBYTE 80 ns</td>
<td>$201.00</td>
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<tr>
<td>16 MBYTE 80 ns</td>
<td>$519.00</td>
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</table>

**Video RAM**

- 4 Bit to 8 Bit Upgrade: $24.00
- 256K Quadra VRAM: $32.00
- 512K Mac LC VRAM: $59.00

**Cache Cards, Etc.**

- Ill si 64K Cache Card: $139.00
- Ill si 64K Cache Card: $128.00
- Ill si 2-slot Card and 68882: $119.00

**Quadra Memory**

- 256K VRAM Quadra 700/500: $322.00
- 256K VRAM Quadra 450: $30.00
- 16MB SIMMs Quadra 700: $549.00
- 16MB SIMMs Quadra 900/950: $519.00

**PowerBook Memory**

- 2 Megabyte Module: $91.00
- 4 Megabyte Module: $179.00
- 6 Megabyte Module: $260.00

**Miscellaneous**

- Mac Memory: $198.00
- 68030 Accelerator: $259.00

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- 68882 20 Hz: $65.00
- 68882 25 Hz: $103.00
- 68882 33 Hz: $135.00
- 68882 50 Hz: $175.00
- 68882 16 Hz: $45.00
- 68882 20 Hz: $49.00
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- Mhz for Mac LC: $129.00
- MicroCintex 1 MB Rd: $55.00
- MicroCintex 3 MB Rd: $110.00
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- Mac Portable RAM: CALL
- NeXT Memory: CALL

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### Memory Upgrade

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MEMORY ADDED</th>
<th>APPLE EQUIV</th>
<th>PART #</th>
<th>PRICE</th>
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<td>MAC II, IIx</td>
<td>4MB</td>
<td>WITH PAL</td>
<td>$514LIJLI44</td>
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<tr>
<td>MAC II, IIx</td>
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<td>WITH PAL</td>
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<td>16MB</td>
<td>WITH PAL</td>
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<td>32MB</td>
<td>WITH PAL</td>
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<td>MAC IIx, IIi, IIi</td>
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<td>MAC QUADRA 700, 900</td>
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### Hard Disk

<table>
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<td>2MB</td>
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<td>2MB</td>
<td>54 Meg</td>
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<td>58 Meg</td>
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<td>Quantum 5-1/4&quot; 144MB</td>
<td>M0105LIJLI44</td>
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<td>6x</td>
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<td>15K/Second</td>
<td>10K</td>
<td>$139</td>
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<td>15K/Second</td>
<td>10K</td>
<td>$159</td>
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2 FREE CDs - America Alive and Multimedia HandiDisc***1 FREE CD - AGFA Type (Includes 1 font: Garin Graphic)

CD-ROM Drive Bundles

CD Tech T3301 Porta Drive, 11 CD-ROM titles, speakers and headphones $699
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- World Atlas
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- Beethoven's String Quartet 
- Beethoven's String Quartet
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- The Family Teacher
- Great Cities of the World, v.1
- Access to Files
- Best of the Ruman
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811: #EDUCOMP 811
812: #EDUCOMP 812
813: #EDUCOMP 813
814: #EDUCOMP 814
815: #EDUCOMP 815
816: #EDUCOMP 816
817: #EDUCOMP 817
818: #EDUCOMP 818
819: #EDUCOMP 819
820: #EDUCOMP 820
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896: #EDUCOMP 896
897: #EDUCOMP 897
898: #EDUCOMP 898
899: #EDUCOMP 899
900: #EDUCOMP 900

QuickTime

1677 ClipTime v.1 $149.95
Add a new dimension to your applications with 250 movie clips.

1918 ClipTime v.2 $199.00
American Media, 350 movie clips, photos, sounds, stickers.

1701 Digital Video Library $199.00
Get their attention with 180 diverse quality video clips.

1925 Dinosaur Multimedia Encyclopedia $149.00

1753 Creepy Crawlies $99.00
Bug-related software.

1653 Wraptures One $95.00
Imagine over 120 seamless lifelike textures at your fingertips. Map to 3D objects, or create multimedia presentations.

1583 SoundFX $199.00
Over 225 high quality digitized sounds in 8-bit stereo and full 16-bit version. Put the power of a recording studio at your fingertips.

1990 Wraptures Two $95.00
NEW! More textures.

1565 Grooves $99.00
Make your presentation sound great with 100 quality 24-bit stereo music tracks. Most of the music is in MP3 and MIDI files.

1583 Sound FX $199.00
Over 225 high quality digitized sounds in 8-bit stereo and full 16-bit version. Put the power of a recording studio at your fingertips.

1990 Hi Rez Audio $99.00
63 professional, royalty-free audio tracks just right for your new multimedia project.
2032 Total Disillusion $69.95
SYN from the co-developer of Spaceship Warlock. A totally immersive multimedia experience. You are an adventurer, a master of the virtual world. Travel through the planes of existence to the plane of Distortion in search of the lost treasure of the Pharaohs. You'll find a detailed 3-D world of sound and animation. Meet a motley crew of rock animals, visit strange locations, and rock out to wild 3-D animation, psychedelic visions, and mad metal video.
Published by Pop Rocket

1946 Font Fun House $39.95
Featuring a total of 146 different fonts: 77 True Type and 1 Boy, 1 True Type Only, 1 Boy Only, 90 Shareware, and 56 Freeware.

1762 Space Time & Art $149.95
An exploration of discovery into outer space. QuickTime movies and animations illustrate some recent theories of creation in the universe. You'll also find original space images in 24-bit color TIF, PICT, and TSF, a database of astronomy organizations, illustrated reference stacks and graphic tutorials.
Published by Wajutta Technologies, Inc.

2031 Sherlock Holmes, Consulting Detective v2 $49.95
Bemoat works with the super sleuth himself. A genuine murder mystery experience. In these 3 new cases you question suspects and sift through clues to see if you can solve the mystery. A great game! Over 50 minutes of full-motion video.

1973 Sherlock Holmes, Consulting Detective v1 $49.95
Voted “Most Innovative Game of 1992.”
Published by ICOM Simulations, Inc.

1995 Publish It Easy 3.0 $139.95
The all-in-one desktop publishing program that combines ease of use with state-of-the-art features. Now page layout is fast, easy and fun. More than 3,000 clip art images and 100 fonts absolutely FREE!

1996 Color It 2.0 $199.95
The all-in-one desktop publishing program that combines ease of use with state-of-the-art features. Now page layout is fast, easy and fun. More than 3,000 clip art images and 100 fonts absolutely FREE!

1960 Who Killed Sam Rupert? $32.00
Could it be the woman he slept with and deserted? His long-suffering wife who watched it all? The barbermaid who was about to marry him? Test your wit against a colorful cast of suspects. Investigate the evidence through a virtual clipping. Solve the murder before time runs out.

1661 Beyond the Wall of Stars: Quest I $49.95
Published by Creative Multimedia Corporation

1300 EDUCORP Shareware 7.0 2-CD Set $199.00
Pick up your resource disk, drop your joy, and lose more than a little time with this great 2-CD set. You'll find EDUCORP's Centre collection of Public Domain Shareware. Check them down on education, business, graphics, disk accessories, utilities, sounds, games and much more. You'll also find an easy-to-use HyperCard Browser. A $45 OFF with CD-ROM drive purchase.
Published by EDUCORP

1583 Spaceship Warlock $69.95
It heralds the next generation of computer entertainment. Best 3-D animation graphics and story.面 a pirate ship. Warlock attacks. Captured and taken aboard, you are about to embark on a journey across the galaxy in the ultimate adventure...

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Published by Reactor Inc.

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QuickTime videos.
1916 Money $35.00
1918 Jobs & Professions $35.00
1877 Western Town $35.00
2034 Island Designs $35.00
1902 Majestic Places $35.00
1956 Wild Places $35.00
C (does not include QuickTime)
Priced at $40.00 each. Total value $100.00.

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Published by Artistic Entertainment

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## Best-Sellers

### January 1993

#### Business Software

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<th>Months on Chart</th>
<th>Last Month</th>
<th>This Month</th>
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<td>83 1 1</td>
<td>Microsoft Excel</td>
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<td>MacWrite II</td>
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<td>Aldus PageMaker</td>
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<td>1-2-3 for the Macintosh</td>
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#### Entertainment Software

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<td>21 4 3</td>
<td>Crystal Quest</td>
<td>Casady &amp; Greene</td>
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<td>33 4</td>
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#### Utility Software

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#### Education Software

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<td>45 1 1</td>
<td>Where in the World Is Carmen Sandiego?</td>
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<td>16 5 3</td>
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<td>The Learning Company</td>
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<td>1 5</td>
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#### Add-In Boards

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<td>Spectrum/B Series</td>
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#### The AmCoEx Index of Used Macintosh Prices

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<td>Mac SE/2MB/20MB</td>
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Source: Exclusive Audits & Surveys research from more than 250 Macintosh retailers and selected mail-order vendors. Covers sales during September 1992.
Mirror Introduces Desktop Performance For Your PowerBook...

With Mirror's exciting new peripherals, your PowerBook can function just like a desktop machine, with a high resolution monitor and plenty of storage.

The Mirror PowerVision, an internal video board for the PowerBook 140, 145, or 170, works with a variety of standard monitors, including our NEW 14-inch Color Display and 15-inch Gray-scale Display. With 0, 2 or 4 MB of on-board RAM, the PowerVision's pass-thru connector lets you use existing RAM, and our installation video makes setup a snap (professional installation also available).

The Mirror ViewPort” is a 15-inch monochrome display with a built-in SCSI video controller and QuickDraw acceleration for performance rivaling internal video boards. Ideal for PowerBooks, the ViewPort brings big screen power to any Mac with a SCSI port. (continued)

The NEW Mirror 14-inch Color Display
$399

Mirror PowerDock™ battery powered base unit and charger
$199

Mirror Pocket Hard Drives
80 MB $599
120 MB $699
Includes SCSI cable for PowerBooks and standard Macs—a $100 value!

PowerVision internal video adapter board includes tools and a comprehensive installation video
with 0MB $499
with 4MB $999
Systems including PowerVision board and display
from $898

*Use your PowerBook battery and AC adapter. **GB for other options.
Drives and DAT Tape Drives, Mirror offers the capacities, speed, features and prices you want.

Once you've used a Mirror high-resolution display, you'll wonder how you ever lived without it. Our mono-chrome full-page and two-page displays deliver bright, sharp screen images for word processing, spreadsheets, database management and publishing.

For graphic design, illustration or pre-press, choose a Mirror color display. Available in 14-inch, 16-inch and 20-inch models, there's a Mirror color display that's right for every job.

The top-rated Mirror Color Scanner makes it easy to add sharp, vivid color images to your work at an unbeatable Mirror price; just $1199 including Adobe Photoshop.

If you need a printer, take a close look at the MirrorImage 309 Laser Printer and the MirrorImage 415 Tabloid Laser Printer. With Postscript Level 2, RISC processors, sophisticated paper handling and durable, high-speed printing engines, these printers work hard, so you don't have to.

All Mirror products are backed by our famous 30-day, "love it or return it" policy, and the best customer support in the business. Call today to see for yourself.

MirrorImage 415, Tabloid Laser Printer, features dual paper trays and a 15 pages-per-minute print engine. Options available.

$2,999

MirrorImage 309, Postscript 2 laser printer

$1,699

19-inch Two-page Display w/ monochrome video card

$799

21-inch Two-page Display

$999

15-inch Grayscale Portrait Display

$399

w/ monochrome video card

$549

Makin' Tracks


Circle 125 on reader service card
...And Powerhouse Perip

The NEW Mirror 14-inch Color Display is the latest version of our best selling color monitor. Designed to work with the built-in video of your Mac LC, Ills, Ile, or Quadra--or with Mirror's PowerVision video board for PowerBooks--this display features razor-sharp focus and brilliant color and it's still only $399!

The Mirror Pocket Hard Drives and optional Mirror PowerDock redefine storage convenience. For moving data between machines, or to expand your PowerBook's capacity, these tiny drives fit anywhere. Slip the Pocket Drive into the PowerDock and use a standard PowerBook battery to power the drive while you travel. When you're back home, the PowerDock does double duty and charges your spare battery.

Whatever your need, whatever Macintosh model you use, Mirror has high performance peripherals to match. Our complete line of storage systems can handle any task. From our critically acclaimed hard drives and CD-ROM, to our high performance 128 MB Optical

<table>
<thead>
<tr>
<th>Drives</th>
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<td>DAT Tape Drive</td>
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<td>CD-ROM Drive</td>
<td>$599</td>
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<td>Now PHOTO CD compatible!</td>
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<tr>
<td>44 MB Cartridge</td>
<td>3 for $189</td>
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<td>128 MB Cartridge</td>
<td>$59</td>
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<td>Quick JPEG Board</td>
<td>$599</td>
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20-inch ProView Trinitron Display, 8-bit w/ 24-bit video card $2,499
20-inch ProView V Color Display, 8-bit w/ 24-bit video card $1,799
16-inch Trinitron Display w/ 8-bit video card $1,349
16-inch Trinitron Display w/ 16-bit video card $1,449
16-inch Trinitron Display w/ 24-bit video card $1,549
14-inch Color Display $399

Mirror 600 Color Scanner, with Adobe Photoshop $1,199

*You pay shipping costs (and consumables for printers). For business video. Prices are FOB origin. Prices are for U.S. customers only; call for international pricing. All prices subject to change.
While the cursor may hop or skip with some trackballs, Turbo Mouse® has always been known for its ultrasmooth movement.

Now, the latest version of Turbo Mouse is known for something else—jumping. Our new Brilliant Cursor technology makes it possible.

With it, you can move the cursor instantly to predefined HotSpots on the screen, such as the File and Edit menus and the Trash icon.

First, you define your HotSpots. Then, click a button and move the ball in the direction you want to go. The cursor automatically jumps to the predefined HotSpot. You can even program different HotSpots for different applications and for different users.

And Brilliant Cursor technology is not all that’s new with Turbo Mouse 4.0. Also new is advanced acceleration with three levels of control and Enhanced Mouse Buttons that let you execute one of seven programmable commands. For example, send a Print command with just one click using Send String. Or move the cursor with ultra precision using Slow Cursor. Even save different combinations of commands for each of your favorite programs.

Then there’s the award winning Turbo Mouse hardware. Hardware that has won more awards than any other input device. Hardware that has consistently been voted “Best Input Device” by Macintosh users worldwide. Features include a large comfortable ball, “easy-click” buttons, long-lasting precision stainless steel bearings, and two ADB ports for chaining other devices.

Turbo Mouse 4.0 is fully System 7.0 compatible. To receive information by fax, call 800-535-4242, dial 82 and request document 320. For general information, call 800-535-4242. Outside the US, 415-572-2700.