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Apple Sends out a Software Subsidary on the label. Plans call for the Apple's publishing program in part to enable other software developers for Apple machines "to participate in the market on a more equal footing."

In his announcement, Apple chairman and CEO John Sculley said the move was intended in part to enable other software developers for Apple machines "to participate in the market on a more equal footing."

In initial reactions, however, developers were not confident that the new structure would resolve the tension caused by Apple's publishing programs that compete with third-party products. One developer said, "It's better to compete against products that don't say Apple on the label, but we're still going to have to look at Apple as a competitor. Apple is not going to start this up and then let it fail, it'll make use of Apple knowledge, money, experience, and most important, its distribution network."

It's not such bad news from the users' standpoint. It probably means that improvements to Apple's staple software will finally be forthcoming, after a long period without upgrades.

Juggler

- Last month we reported on Tweeker, the context-switching Finder based on Andy Hertzfeld's Servant. The word now is that its code name has changed to Juggler. Though it reportedly contains none of Hertzfeld's code, it is said to remain faithful to the concept— you can have several applications open at once on your desktop. The new Finder will allow some tasks, such as printing, to go on in the background while you work in an application program. Full multitasking—the kind that lets you sort your mammoth database while you write the report to go with it—won't be available with the new Finder. That breakthrough may be announced by the end of the year.

Software Compatibility

- If you've tried to run MacWrite on a Mac II, you may have experienced some problems. Reportedly, Apple is readying MacWrite 4.0 to remedy incompatibility problems and to fix a few ancient bugs.

Expect upgrades to appear for other applications as compatibility problems come to light with the existing 2000-plus applications. To avoid some of the heartburn that accompanied its last major hardware release in January 1986, Apple has initiated a rigorous program to test applications with the new Mac SE and Mac II hardware and the accompanying system software. Apple has alerted developers that they'll have to go back to the drawing board if their products fail, but the incompatibility list has not been made public. Reportedly, fewer than 25 percent of tested applications have problems; most are the type that a programmer could easily fix in a day or two. Until upgrades appear, however, prepare for unpleasant surprises with programs that haven't been tuned to the new microprocessor.

Another IBM Convert

- Due to customer demand, Corporate Software, which distributes products directly to Fortune 1000 companies, has broken with its 3½-year tradition and added 51 Macintosh programs to its list of more than 400 IBM PC software titles. The distributor, based in Canton, Massachusetts, had been special-ordering Mac programs for its corporate customers; now they will order in bulk and offer discounts. "We finally reached the point where the demand reached critical mass," said Mary Harrison, national manager of software sales.

The titles include the full line of Microsoft products (well, almost full: Flight Simulator is conspicuously absent), plus Apple's programs and a range of graphics, database management, communications, and word processing software, along with Living Videotext's More, Borland's Sidekick, and utilities such as John Mitchell's Fedd Plus and FWB Software's trio of hard disk utilities.

Kamerman Labs Still Going

- Joel Kamerman of Kamerman Labs reports that the Macintosh side of his company's business is healthy even though the firm filed for protection from creditors under Chapter 11 of the bankruptcy code at the beginning of the year. The cause of the business problems, according to Kamerman, was isolated with its IBM PC peripherals. "Even since we started shipping our Mac Cirrus drives, the company has been profitable," he said. To reassure customers who might be jittery about support for Kamerman's compact Cirrus hard disks or tape drives, Kamerman explained that the Cirrus drives are 80 percent owned by a separate company. "Even if the creditors don't accept our reorganization plan, the Mac products will still be marketed and supported."

Dial-a-User-Group

- A few months ago we ran a Bulletin item about the meeting of user group leaders held in Dayton last April. The people in Dayton received so many calls—at all hours—from readers who wanted to know how to find a local user group, we figured we'd better publish the referral number again: 800/538-9696 ext. 500. (If you use a non-AT&T long-distance carrier, punch in your carrier code before dialing the phone number.)

(continues)
Game Maker Branches Out

- ICOM Simulations, the Wheeling, Illinois-based developer of TMON debugger and the Macventure game series (Déjà Vu, Unlimited, Shadowgate) published by Mindscape is striking out on its own as a publisher. ICOM will produce one more game for Mindscape to fulfill its contract but then will turn its full attention to marketing its own line of entertainment software, including role-playing games with high-resolution graphics and more games in the Macventure series. The first title to look for is Heliost, a science fiction adventure due out this fall. Gossip, developed by that notorious practitioner John Dvorak, is scheduled for release early next year. Both will be $49.95.

3-D in Color

- In the May issue, Macworld ran a long article about recent developments in 3-D programs for the Mac. Now it appears that yet another generation of 3-D graphics programs is already on the way, and the common denominator is color. Challenger Software of Homewood, Illinois, is adding color to its Mac3D program this summer, with color shading from a palette of 256 colors selected from the 4096 available on the Mac II.

Microsoft to Fix Word 3.0

- By the time you read this, Microsoft will probably already be mailing version 3.01 of Microsoft Word to fix problems users reported in the early days after 3.0's release. The new Mac II-compatible version—mailed free to registered users—includes name stamping and allows unlimited fonts.

Apple Stock Splits

- For the first time, Apple Computer announced a stock dividend—12 cents per share—for the first quarter of 1987. In addition, the stock was split two-for-one on May 15. Apple head John Sculley explained, “A stock split will lower the price of our stock, which has recently recorded new highs. These actions should allow a broader group of investors to participate in our future.”

The Waiting Game

- Still holding out for an upcoming program? Here’s a status report on some long-awaited applications.

Quark’s new page-layout program XPRESS shipped at the end of March, ahead of the new version of Aldus’s PageMaker, which started shipping at the end of April. Another desktop publishing offering, Target Software’s Scoop (a.k.a. Solo, a.k.a. SPUD) is due out this summer. Meanwhile, looking no worse for wear after being rejected by Letraset, Boston Publishing Systems’ MacPublisher III (formerly LetraPage) began shipping in April. The new version of the page makeup program includes support for color on the Mac II and gray-scale text.

The world is still waiting for Ashton-Tate’s high-end database manager, dBase Mac, which now may have to fight for its life if the Actus 4th Dimension challenger beats it to dealers’ shelves.

Remember hearing about Grey Paint long ago? The gray-scale graphics editing software for bit-mapped images, developed by Fractal Software, was picked up by Letraset, revised significantly, and is scheduled for release late this summer as The Realist.

Doug Clapp’s Word Tools grammar- and punctuation-repair program has shipped, according to Aegis Development of Santa Monica, California. On the other hand, Ann Arbor Software’s FullWrite Professional is still under construction, and Word Perfect hasn’t made it to the beta-test version at press time.

Publishers will probably make an effort to present finished programs for sale at the Macworld Expo in Boston next month, but at this late date it looks as if some may be shown in demonstration-only editions.

And Now, in Four Colors

- Adobe Systems’ Illustrator is a great tool, say professional graphic artists, but it won’t be a total solution until there’s some way to automate the drudgery of color separations. In response, the Palo Alto company is preparing a desk accessory that breaks down an Illustrator image into the cyan, magenta, yellow, and black parts comprising a four-color printed image. Code-named Separator, the program can produce printer-ready negative film on the Linotronic 100 or 300 or positive images on any printer. Adobe has come up with settings that produce good results in print, but designers can also pick their own screen angles and percentages, scale and position artwork, and add registration and crop marks.

SE Inside Drives

- According to sources, 85 percent of Macintosh SEs are sold with internal disk drives. But not all of them come from Apple. Rodime, which won’t confirm the word on the street that its Apple’s hard disk supplier, has begun to market a 50MB internal drive for the SE ($1595). The Pepper Pike, Ohio, company bases its 33 1/2-inch drive on voice-coil technology, which makes its speedier (average access time: 28 milliseconds) than electromechanical drives that hunt for data track by track. It’s also more reliable—the drive heads park automatically when it stops.

CMS Enhancements of Tustin, California, also makes a voice-coil internal drive for the SE, the 38.5MB Pro-40 ($1395), with an average access time of 29 milliseconds.
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If you do desktop publishing you'll definitely want a MegaDrive. Like a hard drive, it gives you the capacity you need for digitized images, artwork and whole projects. Unlike a hard drive, it keeps on growing, and growing and growing. Economically. And when it's time to take that 300-page manual to the typesetter or printer, you don't need a series of floppies. Just one MegaFloppy.

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In business environments where operators spend long hours in front of their computer, the Mac's small screen size and the low physical profile can cause physical discomfort and reduced productivity. A common solution to the low profile problem was to place the computer on top of a hard drive. This is no longer a solution for the Mac SE with its internal hard disk or the Mac Plus when used with a vertical hard drive or a file server.

Phone books, shoe boxes, and other creative ideas have been tried to bring the Mac up to eye level, but with little success.

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Apple may still be ahead in desktop publishing technology, while IBM's a Johnny-come-laser. But it could be a close race.

The Apple desktop publishing system still has the lead, the edge, the technological chutzpah, and, oh yes, it still outperforms IBM's desktop publishing system by about 200 Mac-years of product development.

Maybe it's because it's IBM's first time around. But whatever the reason, the turnkey PS/2 Model 30 desktop publishing system, which was announced on the same day Big Blue unveiled its next-generation Personal System/2 line of computers, is clearly a case of last year's technology at tomorrow's prices.

In fact, if you squint at it hard enough, you'll see that IBM's desktop offering is virtually equivalent to that of a Mac-based system from nearly two years ago.

I'm talking about a Mac Plus with a hard disk, Aldus's PageMaker, and a LaserWriter, compared with IBM's Model 30 system (based on an 8086 microprocessor) with a hard disk, the PC version of PageMaker, Microsoft Windows, and a PostScript printer.

Isn't it curious that IBM has announced a genuine "me-too" product after years of dismissing Apple's approach to computer design as being some kind of technological affectation?

The good news for Apple about IBM's entry into the desktop publishing world is that the Mac-based system stands out as a no-contest winner in terms of raw performance.

Here are a few of the most obvious advantages of the Mac system over that of IBM:

Installation of the Mac desktop system is infinitely easier. It takes a full 15 minutes to install the PC PageMaker, copying five disks onto 1.5 megabytes of your hard disk. It takes less than a minute to transfer Mac PageMaker files to a hard disk or backup floppies.

Windows on the IBM system limits file names to eight characters. And you still need to end files with the proper three-letter extension to open them easily from the MS-DOS Executive. Then you have to grapple with labyrinthine subdirectories. The Mac, on the other hand, has folders that you simply open and close.

Screen quality, font selection, and print quality are all superior on the Mac system. Notably, Aldus's PostScript driver for the PC PageMaker lacking the Mac PageMaker's smoothing algorithm that smooths the jagged edges in bit-mapped graphics.

What else? I could go on and on. Perhaps the most glaring weakness of the IBM desktop system is that the controller for the PostScript printer goes into the computer, rather than being contained in the printer.

What does that mean? It means that, if you want to hook up your IBM PS/2 30 to your laser printer, you will need to install the printer controller, which contains a PostScript processor and printer memory, so you can print out the various PostScript fonts that create beautiful text, and so you can use PageMaker.

This is fine until you begin adding more computers to your system: the first computer will then have to become dedicated as a print server.

In marked contrast, the intelligence of the Apple printer and all 1.5 megabytes of its memory are contained inside the LaserWriter itself.

It doesn't matter how many Macs you hook up to one LaserWriter—they can all be configured equally into little workgroup networks. So when you're dealing with a work-group situation—like an editorial or design office or a production office—it becomes a much cheaper proposition to have a dozen Macs linked together to one printer.

(continues)
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Circle 289 on reader service card
Remember the early speculation that IBM would take the desktop market away from Apple? It now appears that IBM is indirectly benefiting Apple, by forcing the desktop publishing market to grow, and by making the desktop concept more widely accepted throughout the corporate world.

I don't think there's much doubt that IBM brought its own desktop package to protect its existing customer base—those Fortune 1000-type companies that have nothing but IBM computers, from mainframes to minis to terminals and PCs. Big Blue should do very well in selling to this segment of the market.

But since Apple has the definite technological advantage over IBM in the desktop field, I believe that some of the more adventurous of even the IBM "lifers" might switch over to the Macintosh.

So long as Apple continues to maintain its edge in "usable-real-world-what-you-can-do-with-it-right-now" technology, it'll be able to penetrate the IBM market. And as it penetrates enough of that market, it will be perceived as the number one alternative to Big Blue.

For that matter, it's not inconceivable that Apple will remain number one in desktop publishing. Apple could easily end up having about 60 percent of the desktop publishing market in contrast to IBM's 20 percent, with the rest going to the clones.

Be assured that Apple will not be content to rest on its desktop laurels. It's no secret that in the near future there will be a new multitasking operating system for the entire Macintosh line that will give Apple an even greater lead over IBM's expanding desktop universe.

And that's all for the best. This competition between the two companies is wonderful. It's going to stimulate the development of better, cheaper, and more powerful products. It will keep pushing desktop publishing technology forward until it truly becomes publishing technology.

So when you think about it, Apple and IBM are really not the dangerous adversaries that they're made out to be. They are actually fellow travelers on the road to enlightened personal computing. □
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Letters
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Shareware Defined
Let me try to clear up some confusion about shareware. Something that is in the public domain may be used, copied, and so on, by anyone, anytime, without restriction. Some of the software posted on electronic bulletin boards (including some of my stuff) is truly public domain. Most of it isn't; most of it is copyrighted. Shareware (sometimes called honorware) is what most of us call copyrighted programs that an author puts up on bulletin boards for others to download (usually with the stipulation that commercial distribution is forbidden), asking for payment from people who keep using the program. In the case of Other and Dakey, for example, I charge a $10 registration fee. Someone who obtains the initial trial copy on a $5 disk from a user group—or from me by sending a self-addressed mailer and a $5 handling fee—still needs to pay the $10 to become a registered owner.

Loftus Becker
via CompuServe

Oasis Revisited
You recently mentioned my Finder replacement, Oasis, calling it public domain software, though it's not. Currently there are two versions of Oasis available—version 1.3, which is shareware ($15) available from most user groups and on-line information services, and version 1.4, which is available from me to registered owners only (send the shareware fee along with a disk and a self-addressed, stamped mailer). Version 1.3 allows you to configure up to 100 buttons on the screen to allow launching that many applications or documents with a single click of the mouse. Version 1.4 supports multiple volumes and adds a built-in disk and folder copier, along with other enhancements.

Jan Eugenides
P.O. Box 151
Maynard, MA 01754

More CAD Comparison
As a professional CAD user of more than a dozen CAD packages on both the IBM and Macintosh computers, I question the conclusions of "The CAD Comparison" in the November 1986 issue of Macworld. Key comparison issues were not mentioned in the article.

Specifically, MacDraft is a very powerful object-oriented graphics program, but it doesn't support the object snap feature typical of most CAD applications, and this severely limits its ability to create accurate layouts. MacDraft's zoom function does not satisfy the needs of power CAD users because it is not truly variable. And while EZ-Draft does have the best implementation of layers, the current version works slowly and suffers from an interface that is not Mac-like.

Errors in the review slight MGMSation. It does have scroll and pan functions, an IGES translator, and it is very easy to learn and use.

Professional design is my career. I use both IBM PCs and Macs and want the best tools at competitive prices. We shopped around and found MGMSation to be the most complete CAD package available at any price for the Mac. I calculate that I can

(continues)

Corrections
After "Insights on Red Ryder" (April 1987) went to press, program author Scott Watson decided not to release the version he had discussed with us. Many of the article's tips are therefore moot, except to the few who downloaded the same version during the brief period Watson had it available on line. In fact, as the July issue went to press, version 10.0 still had not been released. The information phone number for Red Ryder is 314/523-2190.

In "Macintosh II: Opening to the Future" in the April issue, the colors were swapped in the legend of the Mac II processing diagram (page 137): the red section shows NuBus, the blue section represents 32-bit address and data. In the same issue, the Mac SE memory configuration diagram (page 142) contained some errors. A corrected version of the diagram appears in this month's Letters.
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Letters

draft designs 100 to 150 percent faster with MGMStation than with AutoCad. Sure, there are improvements to be made (such as better layers and a zoom-previous command), but the company is very good at providing continuing updates.

Chipp Walters
IDSA
Houston, Texas

A Second Opinion
Ken D. Schuempe's review of McCAD PCB in the February issue claims the program doesn't offer the same level of sophistication as Wintel's package. If by sophistication he means McCAD PCB doesn't have an autorouter, then I agree. But if he means the ability to choose from a wide selection of options such as pad id/od, trace thickness, grids, and so on, then McCAD PCB is by far the more sophisticated and flexible product at less than half the price. I have been using both programs in my work since they were introduced, so I speak with a fair amount of hands-on experience.

Robert Troeller
New York, New York

Dvorak Connections
The October 1986 article “Keys to the Future” mentions the Dvorak International Foundation. How do we reach this organization?

Ralph F. Thompson
Cincinnati, Ohio

Contact the foundation at P.O. Box 128, Brandon, VT 05733. We also list our reference to a useful quarterly periodical, Dvorak Developments, ($12/year) and Randy Cassingham's 96-page book, The Dvorak Keyboard. The book, usually $12.95 postpaid, will be $10 postpaid through October. Both are available from Freelance Communications, P.O. Box 1895, Upland, CA 91785. —Ed.

Lighting in the Round
Here's a tip to add to the collection from "Hands-On Digitizing" in the March 1987 Macworld. I have found in photographic copy and close-up work that setting up two lights at a 45-degree angle may make it hard to balance quantities of light, sometimes resulting in unwanted shadows. I avoid shadows by using a circular fluores-
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Letters

cent tube and modifying the mounting bracket slightly to allow the camera lens to fit through the center of the tube.

Jim Zabieliski
Lakewood, Colorado

Turning Back the Clock

In the April 1987 issue, your response to Don Lund's letter states that dBase Mac is limited to the Apple date scheme, which cannot handle dates earlier than January 1, 1904. In fact, our program is not constrained to Apple's poor choice of internal date representations. Rather, we use a long integer (32 bits) to represent the number of days since a much earlier date: January 1, 4713 B.C. The program can even show the day of the week for that date range, while taking into account the calendar changes that have taken place over the centuries.

Michael D. Rossetti
Ashton-Tate
Glendale, California

At press time Ashton-Tate had still not shipped its long-awaited database manager, but when it does, the software's date handling ought to come in handy. Odesta's Helix also handles dates earlier than 1904.—Ed.

Turning the Tables

The comparison table that accompanied the December 1986 article "Writing Your Own Ticket" sold Microsoft Word version 1.05 a bit short. It does have soft hyphens (as -hyphen), on-line help (select About MS Word on the Apple menu), and global change of fonts and type styles.

The January chart comparing desktop publishing programs ought to say that ReadysSetGo version 3.0 has a maximum text size of 250 points and that the program has soft hyphens.

Robert Art Morgan
Julian, California

You're right about the soft hyphens in Word and RSG 3.0 and Word's on-line help. When we say global font and style change, however, we don't mean that you can select an entire document and change it all to the same new font or style. Rather, we mean the capability found in some new programs to go through a document and pick out, say, all text formatted in New York bold italic and change it to another font or style all at once.—Ed.

(continues)
Until now, there were only 2 ways to buy the new Mac SE. You could get it equipped with two 800K floppies. Or, with a floppy and a 20 meg internal drive. Those were your choices.

We thought that was a little limiting. What about all the storage hungry people out there? People who want to outrun, outsmart and outdo the competition? Well, here's your answer.

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intermail by internet, the oldest Macintosh systems house around.

Expanding Mac SE Memory
This is a corrected version of the memory configuration diagram that appeared on page 142 of the April Macworld. It shows the options for expanding memory—up to 4MB—on the two banks of SIMMs in the SE. No matter how much you add, each bank must contain equal amounts of memory.

Mugging
Steven Levy's column about user groups in the March 1987 issue reported that some people thought that once the Mac's bugs were worked out, the machine's ease of use would obviate the need for user groups.

That's unlikely because the Mac's growing sophistication and versatility will continue to make demands on both novice and veteran users. Some 300 people attended the February meeting of the New York MacUsers Group, and half of them raised their hands to show they were there for the first time.

Don Swain
NYMUG Board
New York, New York

Traditional Values
The January issue's news about desktop publishing advances was exciting. However, as a bookstore owner, an occasional book reviewer, and a freelance editor, I'm concerned lest all this capability convince otherwise astute writer/publishers that they are also book designers and editors. All the talents necessary to produce attractive, professional-looking, saleable books rarely come in one human package.

Books don't leap off bookstore shelves. Poorly packaged material, no matter how important, is not likely to win expensive shelf space. The competition from well-done books is too intense. And book reviewers are usually too busy to waste their time on poorly produced material. My advice for self-publishers: get help; unless you're a triple talent, you'll need it. Jim Estes Deadwood, Oregon

For Want of a Nail
My kingdom for a powerful customizable database management program that works.
Ted F. Yengling
Newburgh, Indiana

Letters should be mailed to Letters, Macworld, 501 Second St., San Francisco, CA 94107, or sent electronically to ComputerServe 70370.702 or The Source B2C440. Include a return address. We reserve the right to edit letters. All published letters become the property of Macworld. □
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Apple and the Software Industry

When should a computer maker get into the software business?

Apple's role as a software developer is a hot topic in Cupertino these days. The very fact of the controversy is remarkable—most computer manufacturers consider internal software development a dead issue. Few of IBM's customers expect Big Blue to produce software for IBM PCs, programs that would rival those developed for the PC by third parties. Even IBM, with a scientific and technical research staff of thousands, doesn't have the knowledge and experience to keep up with all the smaller companies that specialize in the markets supported by IBM computers. This analogy may be odious, because few of us want our computer company to emulate the lumbering, impersonal monolith that IBM has become. But in this case, it's worth considering why Apple should cross the industry's traditional hardware/software line.

Originally, when Apple launched first the Lisa and then the Mac, the company also rolled out exemplary software to counter the obvious objection to a new computer with a new operating system: "But there's no software for it." With the Macintosh, Apple released MacWrite and MacPaint. MacDraw and MacProject followed. These programs were, and continue to be, among the best-selling programs for the Macintosh.

Some people believe that Write and Paint became important only because they were included "in the box" and that if they were unbundled—sold separately, as are Draw and Project—they would not do well against non-Apple products. Well, it's been a year since Apple took Write and Paint out of the Macintosh boxes, and both continue to sell 3000 to 4000 copies each month.

What happened? Do the products sell well because they have Apple's imprimatur and its colorful logo? Or do they sell well because they are excellent products that reflect the original vision of simplicity and utility embodied in the Mac? And why have few third-party products fared as well on the Mac? Even Microsoft Word, by far the best-selling word processor from a third party, has only sold about 150,000 copies for the Macintosh, representing about 15 percent of installed Macs.

These are relevant questions because the debate at Apple arises partly from the company's assumption that it has a responsibility to provide benchmark products that open up new markets for the Macintosh or that demonstrate new technological capabilities. While the 1984 release of a word processor, a project planner, and a paint program was hardly innovative, Paint, Project, and Write were outstanding in their adherence to the Macintosh concept, including its user interface. In addition, they were stable and useful products. MacDraw stands as a true innovation, having brought something approaching minicomputer-type computer-aided design capability to a desktop computer.

Now, having introduced two new machines, does Apple have the responsibility of demonstrating this new technology? And if Apple does so by bringing out its own software, will it chill development by outside publishers? These questions might best be answered in terms of the market and technology. If Apple were to introduce a database product, developers might legitimately question its motives because there are several database managers already on the market and others—notably dBase Mac from Ashton-Tate—still to come. On the other hand, we'd all agree that Apple programmers are the best qualified to modify Mac System software such as the Finder.

Areas of dramatically new technology, such as color, raise the most questions. The case can be made that Apple engineers, having designed the video card that will surely be the most popular graphics card (continues)
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Commentary/Jerry Borrell

Mark Cutler, father of MacDraw, continues to guide graphics software.

for the Mac II, are uniquely qualified to develop a software product that takes full advantage of its capabilities—either an extension of an existing program, say color Draw, or something entirely new.

But in-house design is not the only way to develop excellent programs for new technology. When AT&T's Electronics and Imaging Labs released its line of Targa image-processing cards for the IBM PC family, AT&T contracted Island Graphics of Salinas, California, to develop paint programs for the cards. AT&T, unlike IBM, is known for its ability to innovate. (AT&T's problems lie in marketing.) But comparing AT&T to Apple may not be apt. Apple is young and robust enough to carry off both hardware and software innovation.

As a consequence of the debate, Apple decided to withhold four software products when it announced its new hardware in March. At least one of those programs, a database manager code-named Silver Surfer, has returned to its source. Apple had obtained the rights to market the product, published in France by ACI under the title 4th Dimension. The program's developers have founded Acis stateside to market the database manager. Guy Kawasaki, original head of the evangelist group at Apple, will become the new company's president.

Ashton-Tate and others, such as Omnis 3 publisher Blyth and Helix publisher Odesta, reportedly brought considerable pressure to bear on executives at Apple. They wanted to prevent 4th Dimension's release under the Apple label. Apple, by not releasing the product, seems to have agreed to leave mainstream software products to independent developers. This move will surely encourage developers, who live dangerously enough without competition from Apple. Nor will those who need a new database manager suffer, because the product will soon be available.

Which brings us back to the original question of how far Apple should go to ensure for us, Macintosh buyers and users, that the Mac realizes its potential. Already, Apple does more toward that goal—with its evangelists who enlist and support software and peripheral developers—than most any other hardware manufacturers.

And the expansion of the Apple evangelist group under Kin Seto is encouraging. But some issues—like the thorny question of compatibility—remain unresolved.

Apple is taking on these issues. A clear sign of that is the production of Macintosh hardware that cannot be reached through an upgrade path. Now Apple must tackle backward compatibility of the System software: how much longer does the company intend to produce system software extending across all of the products in the Macintosh line? Those of us who invested in the first generations of Macs applaud the universality of system software. But by demanding this of Apple, we may be obstructing another leap forward in capability like that represented by the original Macintosh.

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Contributors

Robert C. Eckhardt ("Mac Desktop Tools") is a frequent Macworld contributor and the author of the forthcoming books Free (and Almost Free) Software for the Macintosh, to be published by Crown, and The Fully Powered Macintosh, to be published by Brady.

Ric Ford ("Raising the Roof on Storage") worked with a variety of large computers, from IBM mainframes to DEC VAXs, before falling under the spell of the Macintosh. He edits and publishes the MacTouch newsletter, and he's developing a Mac music application when he's not on line in the ICONtact user group at Delphi.

David L. Foster ("Scanning the Horizon") is a biochemist at Genentech, Inc., a biotechnology company in South San Francisco, California.

Adam B. Green ("Into the 4th Dimension") has been teaching, writing about, and evaluating microcomputer database software since the early days of Pf/file on the Apple II. He now travels coast to coast teaching classes on dbase and looks forward to the day when he can begin leading 4th Dimension seminars.


Jim Heid is a contributing editor of Macworld who has been writing about the Macintosh since its introduction. Each month he takes a look at fundamentals in the Getting Started column. He is author of dBase Mac in Business, brought out this year by Ashton-Tate Publishing.

Steven Levy ("Where Are the Heavy Hitters?") whose column appears each month in Macworld, is the New York-based author of Hackers: Heroes of the Computer Revolution, now published in paperback by Dell. His enthusiasm for baseball is all out of proportion (unfortunately, he favors his hometown team, the Philadelphia Phillies) and a welcome diversion from his current book project about a sixties radical accused of murder.

Lon Poole ("Into the 4th Dimension") has been educating Macintosh users since the machine was introduced. Every month he answers readers' questions in his Quick Tips column. His books include Mac Insights, a collection of tips published this year by Microsoft Press.

Charles Seiter ("Insights on Microsoft Works") is a chemistry professor turned computer writer who telecommutes from his woodland home in Willits, California. His published works include The Skeptical Consumer's Guide to Used Computers from Ten Speed Press and books on Pascal and computerized financial planning for Addison-Wesley.

Stuart Silverstone ("The Architect's Apprentice") was trained as an architect and has taught computer graphics and visual communications in the architecture department at MIT. Formerly a graphics designer for the UPI News wire service, he now consults on Macintosh graphics.
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Where Are the Heavy Hitters?

When it comes to games, the Mac lacks bench strength—but some rookies might change things.

When the Macintosh first came out, Apple Computer was extremely sensitive to the charge that the machine was a cute little item not suitable for serious applications. The Apple corporate nightmare seemed to be that people would dismiss the new product as a computer that was nice for playing games and charting biorhythms but not for zipping through spreadsheets or creating business reports. As a result of this fear, Apple held back *Through the Looking Glass*, a nifty chess-like game, months after it could have been released, and Apple's evangelists, responsible for recruiting a base of software developers, did not do much to enlist entertainment software companies in their crusade.

While this may have been a strategic imperative in positioning the Macintosh as a business machine (which could not be successful anyway until Apple empowered the Mac to handle those heavy-duty tasks), it limited the potential of the Macintosh to be in the vanguard of computer gaming. The fact is, despite the cuteness factor, the Macintosh had some built-in handicaps in that field. Its display was black-and-white, and games make good use of color. It used a mouse instead of a joystick, and a mouse makes a clumsy controller in real-time games. It suffered in responsiveness because even the powerful chip inside wasn't often up to the demands of handling the Mac interface along with a game's screen animation, sound, and input from a user. Finally, the complexity of the Macintosh system made software development an arduous and expensive proposition—worth the price for a developer of a high-ticket business program, but questionable for a game.

So although the first wave of Macintosh owners were very hungry for games, it took months before good ones began to appear. Some games, in fact, were very good, taking full advantage of the sharp graphics and the easy-to-grasp interface. But while the quality was high, the quantity has been disappointing. After three years of software, it's clear that the number of great games available on the Macintosh does not approach the number available on even the simplest of computers, the Commodore 64. And now that the Amiga and the Atari ST series are approaching critical marketplace mass, there is a danger that the Macintosh will always be second-rate in the entertainment category.

I suspect that upon reading this less-than-earth-shattering jeremiad some of you are thinking, so what? I will tell you so what. Any student of computer software—and this applies to mainframe computers as well as to personal ones—is aware that no genre of program puts as much demand on a machine as a terrific game. The fascination of a game often rests on its ability to emulate a world entirely different from
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Steven Levy

that of numbers and letters—which go on the computer screen more easily than space shuttles, monsters, and airports. To successfully simulate a wider reality, a game programmer must squeeze every ounce of computer power from a machine. New, sometimes daring techniques must be developed. And once these techniques are discovered, people who program database managers and word processors see how these things are done and improve subsequent iterations of their own programs. Eventually, the entire software base benefits from the innovations of avant-garde gamesters.

It Happens Every Spring

My thoughts on Macintosh gaming were spurred recently by, of all things, the coming of spring. That means, of course, baseball. Since my daydreams of major league competition have gone the way of the 8-bit computer, I participate in the national pastime by vicarious pursuits. Among them are baseball simulations. It seemed reasonable to expect that the Macintosh would have a fine collection of baseball games. After all, baseball fanaticism has attained a yuppie vogue of late, and what computer usership is more attuned to the latest trends than the Mac's? Also, baseball is not such a horridly complex sport that the limitations of the Macintosh would preclude a workable facsimile.

Computer baseball games fall into two categories, with varying degrees of overlap. The first kind, perhaps easier to execute on a computer, takes the statistical-strategy approach. Using the actual names and simulated performances of major league players, these games allow you to manage "real" baseball teams, giving you not only the strategic options but also the same personnel that big-league managers have. The second kind of game, tricky to produce, is more arcade-like; it tests not only baseball strategy, but also your physical abilities—hand-eye coordination in hitting and fielding. The pitcher/hitter conflict usually comes to the fore here.

Literally dozens of baseball games for various computer systems crowd the field. In the "strategy" category, the best software for other machines is APBA Baseball, available on the IBM PC and Apple II; and MicroLeague Baseball, which runs on the Commodore 64, the Atari 800, and the Amiga, as well as the Apple and the PC. A new game that looks good is Earl Weaver

(continues)
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Baseball. Other contenders include Radio Baseball, The World's Greatest Baseball Game, and Pure-Stat Baseball. The arcade category is topped by a game called Hard-ball, the clear choice over several other contenders.

How many games does the Macintosh owner have to choose from? As the 1987 baseball season began, three. And two of them have been released only since last year's World Series ended.

This is typical of the Mac game drought. Why this pathetic selection? Charlotte Taylor of Electronic Arts—a company that prides itself on being on the cutting edge of gaming—puts it succinctly. "We hardly bring anything to the Mac first. The Mac is a machine for the office; there doesn't seem to be an interest among Mac users for games." Taylor insists that, personally, she loves the Mac. "I use it at my desk, and I'd die without it. But I don't play games on it." And, most damning of all: "Mac games don't sell that well. Our most popular Macintosh game, Pinball Construction Set, did extremely well considering the installed user base, but on the C-64 it did four times better."

In other words, don't hold your breath waiting for Electronic Arts to convert Earl Weaver Baseball to the Mac.

Nor should you hold everything until Random House Software writes a version of APBA Baseball—the Rolls Royce of baseball simulations—that will run on a Macintosh. For a variety of reasons, a Mac version is "on the back burner," says a spokesperson.

Even Sublogic, a firm known for developing the brilliant Microsoft Flight Simulator, has no plans to convert its clever Pure-Stat Baseball to the Mac. VP Norm Olsen notes that it's much easier to convert software to other systems, even to the Atari ST or Amiga.

So what do we have?

Batter Up

Leadoff batter is MicroLeague Baseball, published by Gamestar (now a subsidiary of Activision). This is an arcade-style program translated from a colorful Atari 800 version. It is decidedly less compelling on the Macintosh. The graphics are adequate; the single view is that of the entire playing field, as well as some of the packed grandstand—all squeezed onto the Mac screen. The players stand less than an inch high and are rather cruelly represented.

(continues)
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Steven Levy

The fielding team uses the mouse to select a pitch, and the ball wafts to the plate rather unimpressively, at which point the batter hits the space bar to make contact. Fielding the ball with the mouse is awkward, but eventually you get the hang of it. There's not much sophisticated strategy, but this is baseball—and, as games go, the setup is adequate. Play against the computer is tough; so tough that if you beat the computer and send a screen shot to the manufacturer, you get a certificate.

One frequent occurrence, especially when you play against the computer, is a ball hit to right field that results in a force-out at first base. This is an outrage. Next batter up.

Computer Baseball. I had a soft spot for this one because it was the first game I purchased for my old Apple II+, more than five years ago. For that era, the strategy-style game that uses teams from noted World Series matchups performed quite nicely. On the Macintosh it is a disaster. SSI, Computer Baseball's manufacturer, released the game programmed in the antique BASIC language. This not only makes play slow and unforgiving, but this particular version eschews things like menus and dialog boxes when asking for input. At times it freezes up if you do not properly capitalize a word. Even though graphic representation in a strategy game need not be elaborate, the graphics here are akin to cave art. It's a shame, because the strategy options available in this game are comprehensive. If you put up with the faults, you can play a swell nine innings. But the faults are too much to put up with.

Clutch Hitter

That's two out. But as noted hacker Yogi Berra once said, "The game isn't over till it's over." A last-minute pinch hitter is always capable of turning things around. Finally, a hit. Hardball.

The publisher is Accolade, a young firm that has quickly made a name for itself in computer games—all without bothering with the Macintosh. Peter Doctorow, Accolade's VP of design and development, admits to a wariness of the Mac market. "Mac users do not generally have the need or desire or time to play with entertainment software," he says. (Although upon being questioned, he admits that there is no hard research to prove this statement.)

Yet Accolade thought that Hardball might be an exception. The game had done (continues)
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Central Point Software
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Portland, OR 97219
Steven Levy

very well in previous incarnations, and Doctorow opined that Mac users might appreciate how well it simulates baseball. Fortunately, Accolade did not approach the Mac halfheartedly. Much as a baseball team sends out scouts to evaluate the opposition, the firm took a hard look at the Mac and determined how to modify the game to take full advantage of the computer. Accolade also allowed much more time than the usual 4 months it takes to convert a game from one machine to another; the Mac version took 11 months to complete.

As a result, Mac *Hardball* joins the elite class of top-notch games (*Wizardry* is a prime example) that run better on the Macintosh than in previous best-selling versions. And they run very well indeed. *Hardball* is of the arcade genre, best played by two opponents (though it is not impossible to play the computer to a standoff, if you concentrate), and more than any other game it duplicates the mental warfare between pitcher and batter. Heightening the verisimilitude are wonderfully sharp graphics. The pitcher-hitter-catcher view from an imaginary center-field camera shifts to a panoramic press-box view of the field after the ball is hit. The motions required to field the ball are easy to perform with the mouse. The sounds are digitized baseball sounds—the ball snapping off the bat, the base runner sliding home, the umpire howling, "Stee-e-rike three—out-ta there!" Hook up the Mac to your stereo and you're in the ball park.

As a baseball fanatic, I have only a few cavils with the game, but none so serious that it has prevented me from often challenging my friends to a seven-game series with modest funds at stake. The only truly dire problem is that if a visiting team scores during extra innings, the program crashes. Even this is not so bad if you're the home team.

*Hardball* has done great business on the Mac—so much so that it might begin to dispel the negative aura of Macintosh games. "We consciously viewed *Hardball* as a test," says Peter Doctorow. "We wanted to see what the Mac market did." It did well enough to convince Accolade to do more games on the Macintosh.

And hold on, fans—from out of the bullpen comes another hopeful sign. *MicroLeague Baseball*, one of the better baseball strategy games, is finally going to appear in a Macintosh version. "True, [the Mac] is not an entertainment machine," says Paul Kelly, a MicroLeague executive, "but we think that Mac owners will appreciate an intellectual game like ours." Kelly is impressed by the Mac version of *Hardball* and vows that his game—due to ship by late summer—will have equally stunning graphics and sound. In a strategy-based statistical game, that's almost unheard of.

All of this is encouraging. Could it be that the bad rap the Mac has been getting in entertainment software is undeserved? A self-fulfilling prophecy? Will baseball help save the Mac as a gaming computer? Will the million-plus user base convince developers that enough of a market exists to justify the added expense and effort required to convert their games to the high standards of Macintosh?

It's a long shot. But as anyone who watched the sixth game of the 1986 World Series can tell you, sometimes the near-impossible can happen. Let's just say that Mac games are having a late rally. And that the game's not over till it's over. □

See Where to Buy for product details.
Polish Up Your Mac

Stepping Out The Macintosh Screen Extender by Berkeley System Design

Stepping Out is essentially a software big screen that fools the Macintosh into thinking it has a bigger screen than it actually does. The view of that big screen follows the cursor wherever it goes. Wide tables, big spreadsheets and full page layout are no longer limited by small viewing windows and slow scrolling. Users can choose their screen size and key commands are available for 2 and 4 times reductions and 2 to 16 times enlargements of area pointed to by the cursor. Get Stepping Out now, the big screen on a disk!

Stepping Out ... ... 58.00

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MacPublisher II was the first desktop publishing system to offer microjustification, kerning, depth justification, and hyphenation. MacPublisher III now offers built-in hyphenation and a new toolbox that allows users to both edit & create text and graphics directly on the page. MacPublisher III also contains a number of additional unique features including: Gray text (10% increments), Rotated text and graphics, Precise placement and resizing of PostScript items, Color Printing using the ImageWriter II, and Color display with the Macintosh II.

MacPublisher III ........... 199.00

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Picks of the Month with Special Pricing!

Memorandum by Target Software

Memorandum, a desk accessory, lets you attach electronic sticky notes to documents and files. You can use it on spreadsheets, reminding yourself of the details of a specific expenditure. It's also a great aid in word processing documents and database files. Just make a note and attach it. Memorandum is compatible with Excel, Multiplan, Jazz, Word, and loads of others. Order this note-worthy new program by Target Software today!

Memorandum .............. 62.00

MacBottom SCSI Hard Disk Drives By PCPC

The MacBottom arrives completely formatted and ready to use. It comes with easy-to-use software including a print spooler for the ImageWriter and the LaserWriter; HFS Backup, the popular archive and restore program; and Eureka, the desk accessory that locates misplaced files. The cables, terminators, push-button SCSI address selection, and an additional SCSI port are built right into the compact case, as is the quiet fan that helps you keep cool. The MacBottom weighs less than five pounds, and it's just two inches tall but no other hard disk stacks up!

MacBottom 21 MB Hard Drive .......... 869.00
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MacPublisher II by Boston Publishing Systems

MacPublisher II was the first desktop publishing system to offer microjustification, kerning, depth justification, and hyphenation. MacPublisher III now offers built-in hyphenation and a new toolbox that allows users to both edit & create text and graphics directly on the page. MacPublisher III also contains a number of additional unique features including: Gray text (10% increments), Rotated text and graphics, Precise placement and resizing of PostScript items, Color Printing using the ImageWriter II, and Color display with the Macintosh II.

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Programmers, Peripherals
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- Printer Modifier F0
- Printer Modifier 40

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- Hayes Microcomputing
- Smartmodem 1200
- Smartmodem 1800
- Modem 1200
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An interview with David Winer, president of Living Videotext

David Winer founded Living Videotext in June 1981 to develop ThinkTank for the Apple II. His brother Peter Winer joined him to head Mac software development. By a series of coincidences that included almost hiring Guy Kawasaki, who went instead to Apple Computer, Living Videotext became one of the first companies to publish software for the brand new Mac 128K. By now, the company reports having sold more than 100,000 copies of More and ThinkTank for the Mac, which makes it a force to reckon with in the Macintosh market. As head of a software company with both IBM PC and Apple products, and whose fate has followed the Mac's from the beginning, Living Videotext's CEO offers a unique perspective on the Mac at this turning point in its history.

How did Living Videotext enter the Mac Market?

When Guy Kawasaki showed me the Mac, my reaction was, let me at it. I realized it was a different kind of computer; everything about it communicated that, from the interface to the CPU.

It was a good window of opportunity. Sales at Apple were at about $1 billion. Apple was fighting for its life because the IBM PC was drawing customers away from the Apple II. The Mac was a kind of second coming. I knew that Mac applications were building a strong launch, and that we could benefit.

The next step after seeing the Mac was to understand it. It was a new architecture—there was no software. It was not clear what ThinkTank would be on the Mac. At first we thought we could take the software for the Apple II and add windows like an afterthought. That was a naive view. When Peter and I got a machine, we decided to spend a weekend to try and get something up and working—anything. We didn't get a single line of code up. It became Peter's full-time occupation, in a locked room with the blinds drawn because the Mac hadn't been launched. We learned then that the product cycle for a good product is eight months.

Ours was the fourth software product to ship on the Mac—after Mainstreet Filer, Habadex, and Multiplan.

Which are still around?

Only Multiplan, I believe. The 128K was the beginning of a process; so was Multiplan. The 128K led to the 512K Mac, Multiplan led to Excel. Immediately after the 128K, we started the 512K version.

Why so fast?

We had to capture the user's imagination. The users wrote letters telling us they wanted more; they wanted word processing, flexible formats, text editing, slide shows.

So your early acceptance of the Mac paid off?

In 1985, sales were awful, computer companies in the Mac market were dying right and left. Certainly Lotus didn't do well and Telos had a bad year. Databases—MacLine, DB Master, Mainstreet Filer, and Habadex—shrank. OverVue was an excellent product, but 1985 hurt its publisher as well. There were no significant product launches that year.

Apple did lots of things that didn't work, like trying to sell 512K Macs against IBM ATs; a 512K machine was inadequate against an AT. The hard drives were slow; there was no hierarchical file system. And not enough memory; Mac applications are bigger memory users than comparable PC products. The 512K couldn't deliver the promise of its software. AppleTalk was then no more than a sophisticated printer cable. Switcher didn't work on 512K. Then there was the lemmings commercial.

What are the most innovative products out there, besides your own?

Mac Flow from Mainstay. Design from Meta Software. Both are in the same general area of engineering software; that is a fertile ground. Also, the games from ICOM, the people who developed Enchanted Scepters and Déjà Vu, sold by Mindscape. I love those products. I solved Déjà Vu the other day.

(continues)
The Barbecue Brothers would rather bake beans than count them.

It's only the best chili in the whole doggone state. 
But it might not be, if Larry Keenan and Curt Fischer had to spend more time balancing their books and less time balancing their spices.

That's why they bought In-House Accountant,™ from Migent.

With In-House Accountant, the boys spend very little time entering transactions. Or reconciling bank accounts. Or otherwise analyzing their business’s financial situation.

Instead, In-House Accountant does it for them. Automatically, and in a very Macintosh™ kind of way.

That means all the information is right there on the desktop. So the guys can see at a glance things like their checking balance, or the amount they spent on hot peppers last month. They can also call up context-sensitive help windows anytime they need them.

Larry and Curt also like the fact that In-House Accountant, unlike other software designed merely to automate paper-based systems, was developed from scratch to take full advantage of their Macintosh’s power.

The result is that when they enter a transaction, all related items in other lists are updated immediately. So there’s never a need for “posting.” And to handle payables and receivables, the guys simply zip among their various accounts without ever having to change modules, or even close a window.

The program also lets them search for and change any entry in the current fiscal year, so they’re not forced to close the books at the end of the month. It even lets them print balance sheets—or reports, with bar graphs and pie charts—anymore they want.

But mostly, In-House Accountant just lets the guys do what they do best.

Which is make the best chili in the whole doggone state.

In-House Accountant. Only $149. See your nearest Migent dealer, or call 1-800-633-3444 if you’d like to receive a free demo disk.
What are the worst products?

Jazz really hurt the market. Partly the application, partly Lotus's handling of it. It was a formula product, and Lotus's developers got carried away with functionality. They didn't understand the Mac market. Apple promoted Jazz at the expense of others and learned a lesson. Jazz set the market back almost one year.

When did the Mac turn around?

We saw sales double in April of 1986 on the 512K version for no apparent reason. We investigated and quickly determined that the Plus had stimulated the market.

We sold 50,000 copies of ThinkTank for 512K Macs. Figuring that very few software companies had continued to invest in the Mac market in 1985, we decided to take advantage of the lull by combining three planned products in More. The market developed, and the investment paid off.

More is an outliner?

More is a writing tool, a list maker, idea processor, controller of details. I'll live with "outline processor" as a description. Two features define the product: the ability to expand and collapse and reorganize according to structure, and the ability to manipulate headlines according to structure. Scrolling, headlines, cross-references, tree charts, bullet charts are all extra.

Outlining is a technology generic to personal computers. In the next few years you'll see outline processors show up in more than word processors.

What about incorporating more traditional forms of graphing into More?

We don't generate pie charts, but they can be incorporated into More documents through the Clipboard.

We are currently debating whether we should have a separate graphics product or incorporate more capabilities into More. We think that More is a big product in planning and management, not in production departments. It would be a cop-out for us to give managers something like a tweaked MacDraw and still tell them they're going to gain productivity.

What's the worst problem with More?

It doesn't do page breaks. My marketing people are going to kill me for saying that. We'll add it in the next release.

The PostScript page-description language has become more important with its adoption by IBM. Will your products have PostScript drivers?

We have done some development work in that area, but for now, QuickDraw is enough with our output.

Characterize QuickDraw versus PostScript.

QuickDraw has color, lines, patterns, and shadows. PostScript gives control and more flexibility; it's more complex code.

Do the two compete?

Yes, to the extent that QuickDraw can drive a printer and PostScript can drive a screen. On the whole, PostScript is good as a page-description language. There is a standard on both PC and Mac sides now, and IBM will begin to offer PostScript printers. We're better off with fewer standards. In addition, it's flattering to see IBM following Apple's lead. Apple is best when it's leading, and this isn't the first time it has led IBM.

What is it like to develop for the Mac II?

The II is an infinite machine, the first personal computer since the early days that has no limits. It's an amazing feeling. There (continues)
This is why
IBM, NCR, HP,
Compaq and
Apple choli
and
flukp#rs skowt
lijmo ont.

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Outlining is a technology generic to personal computers. You’ll see outline processors show up in more than word processors.

is no way to imagine what the Mac II will ultimately look like. I can see 5- or 125-megabyte programs.

Now that there’s color on the Mac, and a color version of More, how can we produce color output with More?

Even on the Macs without color, we interface to two color cameras, the Matrix film recorder and Presentation Technology’s ImageMaker. They substitute for the LaserWriter, producing color slides instead of paper printouts. But More isn’t just a way to make slides; that you could do with MacDraw. The user’s concern is what to do when you suddenly need to make a project presentation to your board, as happens more often than you’d think. You have to do it well, and you have to do it fast. With Draw you can make up five slides in an hour, and that time goes to formatting the graphics, not to thinking. Draw and other graphic programs don’t help you formulate ideas the way More does.

Any predictions on future Mac products?

I think that the world promised by Apple’s initial, premature 1985 Macintosh office promotion will begin to come to fruition: networked work groups, maturity in production areas like accounting and database management, and presentations over networks that will go out and come back to the sender. We’re moving in that direction—from idea processing to group idea processing. We already have presentations; in the future we’ll add group presentations.

How do you foresee the continuing evolution of the Macintosh?

Apple can give us more power in the hardware, that’s safe to say. It will add technology through ROM enhancements: color, text editing. Apple can direct machines at specific software markets, but if it loses control of the technology, it will lose its strength in the market. Or if it develops products that compete with its developers.
This is why IBM, NCR, HP, Compaq and Apple chose 3M data cartridge tape backup.

The preceding page illustrates why the leading personal computer makers needed a reliable backup system for their computers.

And this page illustrates why they chose the 3M data cartridge tape technology to be that backup system.

For 16 years, 3M has been delivering error-free backup to cover yourself when data freezes up, disappears, or suddenly looks like it was written in Istanbul.

And for 16 years, we've been improving it. Since the day we patented data cartridge tape technology, through every technological breakthrough, we've consistently proven to be the best way to back up data.

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Signature ____________________________________________

Title ________________________________________________

Date ______________________________

1. Industry (check only one)

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☐ 1. Aerospace
☐ 2. Agriculture, mining, construction, oil
☐ 3. Business consulting (non-computer related)
☐ 4. College/university
☐ 5. Elementary/High school
☐ 6. Engineering/architecture
☐ 7. Finance, banking, accounting, insurance, real estate
☐ 8. Government
☐ 9. Health/medical services
☐ 10. Legal services
☐ 11. Manufacturing
☐ 12. Military
☐ 13. Other business services
☐ 14. Publishing/advertising/public relations
☐ 15. Research & development
☐ 16. Retail/wholesale
☐ 17. Transportation, communications, utilities
☐ 99. Other (please specify) ____________________________

Computer-related businesses
☐ 18. Computer consultants
☐ 19. Computer retail
☐ 20. Distributor/wholesalers
☐ 21. Manufacturer (computers, software, peripherals)
☐ 22. Service bureau
☐ 23. VAR/systems house/integrator
☐ 99. Other (please specify) ____________________________

2. Title (check only one)

☐ 1. Chairman/president/owner/partner
☐ 2. Vice president
☐ 3. Controller/treasurer/accountant
☐ 4. Director/supervisor/manager
☐ 5. Project manager/chief/group leader
☐ 6. Art director/writer/creative head/technical writer
☐ 7. Engineer/scientist
☐ 8. Administrator
☐ 9. Consultant/advisor
☐ 10. Microcomputer specialist/manager/analyst
☐ 11. Programmer
☐ 12. Educator
☐ 13. Professional (lawyer, doctor, etc.)
☐ 99. Other (please specify) ____________________________

3. Department or function (check only one)

☐ 1. Accounting/finance
☐ 2. Administration/management/personnel
☐ 3. Consulting
☐ 4. Education/training
☐ 5. Engineering/R&D
☐ 6. Manufacturing/production
☐ 7. Microcomputer center/office automation
☐ 8. MIS/DIP
☐ 9. Purchasing
☐ 10. Sales/marketing/distribution
☐ 99. Other (please specify) ____________________________

4a. Does your company own or lease any mainframe computers at this location?

☐ Yes ☐ No

☐ 1. IBM
☐ 99. Other (specify) ____________________________

4b. Does your company own or lease any minicomputers at this location?

☐ Yes ☐ No

☐ 1. IBM
☐ 2. DEC
☐ 3. Sun/Apollo
☐ 99. Other (specify) ____________________________

5. Does your firm have or plan to buy any of the following types of personal computers or microcomputer systems at your location?

☐ Yes (indicate quantity below) ☐ No

Manufacturer

Currently own (quantity) Plan to buy within
1-12mos 13-24mos

☐ 1. Macintosh 128/512
☐ 2. Macintosh Plus
☐ 3. Macintosh SE
☐ 4. Macintosh II
☐ 5. Apple IIc/IIE/IIc
☐ 6. IBM Compatible
☐ 7. IBM PC/XT/AT/RT
☐ 8. IBM Personal System/2
☐ 9. Sun/Apollo workstation
☐ 99. Other scientific or engineering workstations (min-mid)

6a. Please indicate your involvement with each of the following types of personal computers or microcomputer systems (check all that apply):

☐ 1. Approve purchase
☐ 2. Develop/modify
☐ 3. Evaluate/select vendor
☐ 4. Own (at least one)
☐ 5. Own (two or more)
☐ 6. Purchase or acquire
☐ 7. Recommend to others
☐ 8. Sell
☐ 9. Train people to use
☐ 10. User
☐ 11. User
☐ 12. No involvement
☐ 99. Other (please describe by name and quantity)

If you have no involvement with any of the above, skip to question 8.

6b. For approximately how many total personal computers or microcomputer systems do you have the above involvement? (check only one)

☐ A. 1-3 ☐ B. 4-9 ☐ C. 10-19 ☐ D. 20-49
☐ E. 50-99 ☐ F. 100-499 ☐ G. 500 +

7. For approximately how many Macintosh personal computers do you have involvement described in question 6 above? (check only one)

☐ A. 1-3 ☐ B. 4-9 ☐ C. 10-19 ☐ D. 20-49
☐ E. 50-99 ☐ F. 100-499 ☐ G. 500 +

Please provide your business address below or affix your business card.
8a. How many people work at your location? (check only one)
- A. 1-9
- B. 10-24
- C. 25-99
- D. 100-499
- E. 500-999
- F. 1000-2499
- G. 2500-4999
- H. 5000-9999
- I. 10,000 or more

8b. How many people are employed by your entire company? (check only one)
- A. 1-9
- B. 10-24
- C. 25-99
- D. 100-499
- E. 500-999
- F. 1000-2499
- G. 2500-4999
- H. 5000-9999
- I. 10,000 or more

9. What percentage of people who work at your location actually use a personal computer (check only one)
- A. 1-24%
- B. 25%-49%
- C. 50%-74%
- D. 75%-100%
- E. None

10. The personal computer purchased for this location would be:
- 1. for internal use
- 2. for resale
- 99. Other (please specify)

11. How are personal computers normally obtained for this location? (check all that apply)
- 1. direct from manufacturer
- 2. manufacturer's representative
- 3. distributor or wholesaler
- 4. retail computer store
- 5. mail order
- 6. VAR/systems house
- 7. in-house (company or university store)
- 99. other (please specify)

12. Personal computers or microcomputer systems at your location are or soon will be used for the following communications activities: (check all that apply)
- 1. Communication with internal company mainframe or mini
- 2. Communicate with other micros via modem
- 3. Communicate with outside mainframe or mini through service bureau, database or time-sharing service
- 4. Local area network
- 5. Voice/data
- 6. None of the above
- 99. Other (please specify)

13. Are you involved in any of the areas shown below? (check all that apply)
- Yes
- No
- A. Recommend
- B. Influence
- C. Specify
- D. Buy

Software
- 1. spreadsheets
- 2. word processors/outline processors
- 3. database management
- 4. accounting
- 5. statistics
- 6. communications/networking
- 7. graphics
- 8. presentation
- 9. project management
- 10. desktop publishing
- 11. CAD/CAM
- 12. programming language
- 13. back-up systems
- 14. utilities
- 15. other

Peripherals
- 21. dot matrix printers
- 22. letter quality printers
- 23. dot matrix printers
- 24. laser printer
- 25. local area network
- 26. file server
- 27. optical disk
- 28. monochrome monitor
- 29. hi-res color monitor
- 30. external hard disk
- 31. internal hard disk
- 32. back-up systems
- 33. modems
- 34. other

Computers
- 35. microcomputers
- 36. microcomputers
- 37. minicomputers
- 38. workstations
- 39. mainframe computers
- 40. other

Outside services
- 41. on-line services
- 42. education/training
- 43. maintenance
- 44. custom application
- 45. service bureau
- 46. other

14. Over the course of one year, how would you quantify your level of involvement in total microcomputer systems products?
- A. Recommend
- B. Influence
- C. Specify
- D. Buy

please check all that define your involvement:
- 1. less than $10,000
- 2. $10,000-$24,999
- 3. $25,000-$49,999
- 4. $50,000-$99,999
- 5. $100,000-$249,999
- 6. $250,000-$499,999
- 7. $500,000
- 8. None of the above

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MS-DOS for the Mac? Who cares. It's important to have the option, but who buys a Mac for DOS?

Contrast the evolution of IBM PCs and Apple's personal computers.

Apple puts thought into its machines' architecture organization and supports user options. I've been impressed by Apple's product development: the CPUs, architecture, color, memory expansion; Apple's future; the orderliness of the software's evolution. That means software design on the Mac can move more quickly. On the IBM PC side, there are all kinds of adapters and printers—no standards. Each application needs 5 or 6 screen adapter drivers and 20 or so printer drivers.

That sounds like an impressive difference to me, but what do IBM PC users think?

Apple should promote more to IBM PC users. Apple does nothing to convince them that the Mac II is more than a toy. Living Videotext may take out ads in IBM PC magazines to convince users to take the Mac seriously.

What did you think of the Appleworld show that launched the new Macs in March?

It was sort of an existentialist pep talk.

Overall I think Apple is not making enough of its technology. Today it does have a stronger machine than the others, including the DOS and PC compatibles, with no trade-offs. The Mac II is a milestone product, and there hasn't been enough drum beating about it.

In five years people will look back at the Mac II's announcement as a landmark. Apple calls the Mac II a platform, and that's an accurate description.

What is the reality of running three different operating systems on a Mac II?

Well, the Apple choice for an operating system is clearly the Mac OS. Look at how much work Apple has put into the details of its operating system. Many personal computer developers shot from the hip in adding to the technology base, whereas Apple did a lot of thinking and planning.

MS-DOS for the Mac II? Who cares. It's important to have the option, but who buys a Mac for DOS? With all the compatibles, there are much less expensive alternatives for DOS. UNIX is different, since it takes the Mac into new markets.

How can buyers evaluate today's complex products before purchase?

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(continues)

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user groups for them to copy and try out, and we also put trial copies up on the CompuServe bulletin board. In fact, Living Videotext has its own forum on CompuServe where users go for information on our products.

How does that work?

We support a database and a bulletin board on CompuServe to answer questions. The turnaround is fast, maybe five to ten minutes for questions. Any way to talk to users helps you come down to earth.

What impact do Macintosh user groups have on the market?

They are less software product specific than PC user groups, and they have transformed the Macintosh. They pick up the slack on support that retailers cannot handle, and they help keep companies focused on their products.

I did a demo for the Mac user group in Chicago. A question came up about how to use PageMaker and More together. I really didn’t know the best way, but someone in the audience stood up and explained how he used them together. Then another had a better way. I got a tutorial on my own product.

Does software piracy affect Living Videotext?

Theft can be a product of what users consider an unfair price. People see a manual and a disk and think that can’t possibly be worth the list price; they don’t see the investment in a product that costs $500,000 to develop, promote, and support.

We try to prevent casual theft by having our program ask for the user’s name and organization. That information is encrypted onto the disk and shows up whenever it boots up. That gives the user a reason to withhold it from another person. People tell us that it helps because most want to do the right thing.

What do you think about software from the big companies?

Each company is different, but the big companies have more than just Mac products on the street. That diversification takes the risk out of launching a product. After all, a product that will cost $250,000 to $500,000 to roll out can be killed by a single reviewer who doesn’t understand a product and doesn’t take the time to see its value.

As a result you end up with predictable products—filling narrow niches and competing with other products—instead of diversity.

(continues)
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Take *dBASE* Mac for example. Its feature sets were very carefully selected, and the result is a formula product that doesn't appear to be very interesting.

Are Apple's products as exciting as they might be?

Well, the Mac SE is a necessary product, if not very exciting. It addresses the issues of compatibility on Macs and shows that the compact Mac still has a life. Apple's job is to be stable and predictable and to plan for the 1990s. Apple has to be conservative.

Its products are the ocean liner, and software companies are the crew. Apple directs the ship, but we help maneuver it.

If the system works, Apple hears us. If we're able to keep customers coming back or take Apple to a different place where there's a new group of customers, it'll listen.

Is there more progress on third-party software development now than under Jobs?

I think Jobs's vision of hardware was flawed, but not his vision of software. Look at the H; it has the same user interface we saw in 1984. It will be improved, but the basic philosophy has only evolved, not changed. Jobs misunderstood the needs of personal computer users; he was not attuned to the outside world. He denied that the IBM PC existed, and IBM succeeded when Apple had no leadership in the market. It took Gassée to realize that Apple had to push back the frontiers again. For example, in 1984 a 128K Mac with one 400K floppy drive was just not competitive.

Apple is rumored to be investing in key companies such as Forethought.

Apple needs strong allies. Software doesn't receive large venture investments, especially Mac software companies, so with carefully targeted investments Apple can help new markets get established. Apple doesn't want to be locked in exclusively with several large vendors that aren't loyal to Apple and that have more options than smaller companies.

Would Living Videotext accept an investment from Apple computer?

Sure, if it was the right sort of investment.

Interviewed by Jerry Borrell
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David Snyder of Triad Artists streamlined staff communication with a multiuser Omnis 3 Plus program. Agents now spend their days with phones to their ears and hands on Mac keyboards.

Triad

Although David Snyder didn’t know much about computers a few years ago, he saw the potential of using an Apple II to book concert tours and manage recording and performing artists. First, he designed a worksheet in AppleWorks and used it to set up and monitor a Tina Turner concert tour. Then Snyder and his associates at Triad Artists stepped up to the Mac. The agency—one of the largest in Los Angeles, with artists ranging from Julie Andrews to Ray Charles to Steve Winwood—uses the Macintosh with software that Snyder developed in Omnis 3 Plus to coordinate agents’ work and to improve communication among the music, talent, literary, and packaging departments.

Snyder’s program has over 400 fields, 30 data entry screens, and prints 100 different reports. A local area network—a Corvus Omninet with a 126-megabyte hard disk—enables each agent to work autonomously and to share information with others on the network.

Telecommunications is also part of Triad’s system. Tour proposals are often sent via MCI Mail, and data from the Omnis database can be saved as a text file and used as a mailing list on MCI.

In a current project, an OCR reads in forms and contracts that weren’t previously on disk, as well as glossy photos of clients. Meanwhile, Snyder is constantly modifying his program to provide even more exceptional client support.

Desk Accessory Parade

Desk accessories for the Macintosh range from calendars and sophisticated calculators to scaled-down versions of full-featured applications. Here are just a few that have become available from user groups and electronic bulletin boards in the last half year or so.

Artisto 1.4 (by Tom Taylor, contribution requested) displays any paint document either full size, or reduced to fit the window. μPaint (John Brehm, Roy Leban) is a miniature paint program, complete with a selection of patterns and line widths, a choice of fonts and font sizes, a line box and circle tools, an eraser, and a variety of ways for the pixels of overlapping objects to interact.

New Scrapbook (Tim Wasko, contribution requested) is an enhanced version of Apple’s Scrapbook desk accessory. Unlike Apple’s version, this program lets you retrieve selected lines of text or portions of images, and you can scroll to see text that is too long to fit in the window.

LaserWriter Reset 0.2 (Greg King) acts like a reset button for the LaserWriter. If your LaserWriter crashes because of a PostScript error, you can avoid having to turn the printer off and then on again by resetting it with this desk accessory. And with a PostScript spooler, you (continues)
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can send a PostScript file directly to the LaserWriter for printing.

_Saviour_ saves work in progress automatically at the first mouse click after a specified interval of time or number of keystrokes since the last save. It uses the save command of your choice: Save, Save As, or any special-purpose save commands your application may have.

_LockOut 1.0 (Beyond)_ takes control of your Mac until someone types in the correct password, which you set beforehand. (Of course, it is possible to subvert _LockOut_ simply by restarting the computer.)

**Nuclear Art**

A single aerial photograph of an atom bomb provides the raw material for nine of Neelon Crawford's oil paintings. Crawford, a working artist for 20 years, is exploring the artistic possibilities of photographs taken in 1946 at the Bikini Island site used for atom-bomb experiments. With the Mac, a camera, and a darkroom, Crawford has produced hundreds of abstract variations of the images. He used a digitizer to transfer two-dimensional images of the explosion to the Mac for editing, and he created ImageWriter output that was photographed and then manipulated further in the darkroom. Finally, the developed images were transferred to canvas for the finished rendering.

Crawford finds that the Mac's ability to let him work on several files at once aids the creative process. "The development of images in different dimensions at the same time leads to a cross-fertilization of the ideas involved," says Crawford. "Instead of one thing leading to another, the process becomes many things leading to many other things."

Crawford was introduced to the Mac while working on Hollywood movie production crews. What impresses him about the Mac is how it changes the way people think—it gives the average person license to experiment freely with text and graphics in ways that weren't possible or accessible before.

_Elinor Craig_

---

**Ad Lab**

The University of Missouri School of Journalism recently installed a desktop publishing laboratory with 25 Mac Pluses, 3 LaserWriters, and 5 ImageWriters so that future Madison Avenue magnates can learn desktop publishing on the Mac as part of their advertising curriculum. In addition, five faculty offices are equipped with Macs so instructors can access students' work, grade it, and return it—all electronically.

Desktop publishing equipment was deemed necessary since advertising students are training for a field in which combining text and graphics is a daily requirement.

Instead of stacks of clip art and mat books piled around the classroom, all the material is stored electronically. The students work with the basic Macintosh applications—MacPaint, MacDraw, and MacWrite—as well as page-layout software and clip art to create ads. The entire journalism school, which owns the local paper, the Columbia Missourian, benefits as well because the network is connected to the paper's pagination and typesetting equipment. _—Elinor Craig_
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workstations, and includes both bit-mapped and vector graphics. Gosney feels that the bit-map look is going to have increasing impact on the design world and will never be completely replaced by PostScript high-resolution graphics.

Gosney and his staff use the Macintosh to design Verbum. The charter issue was done with PageMaker and the LaserWriter and includes some Linotronic output; future editions will use other page-layout programs. For more information contact Verbum, P.O. Box 15439, San Diego, CA 92115, 619/463-9977.

Earthquake Sleuths

With the help of the Macintosh, a team of researchers is rewriting the history of the great 1906 earthquake. Using Telos's Business Filevision, the research team is collecting data on a block-by-block, address-by-address basis and storing information about the locations of the worst disasters, characteristics of the damage, and the number of deaths at each location. Digitized street maps of the city are stored on disk by quadrant so that damage patterns can be better visualized.

The researchers have discovered that city officials downplayed the extent of the devastation caused by the temblor, attributing most of the destruction to the subsequent fires. Individuals who were insured against fire but not against earthquake aided in the cover-up, because they were anxious to get all they could out of the insurance companies. Although 498 has long been accepted as the earthquake’s death toll, the research team now estimates that at least 2500 were killed.

Inside Macintosh

Addison-Wesley is adding the final chapter to the Apple Technical Library Inside Macintosh collection with volume 5, scheduled for release this fall. It will cover changes for the Mac SE and the Mac II.

In addition, the Inside Macintosh Library, which will focus on specific topics for developers, will be published over the next year. The first offering will be Technical Introduction to the Macintosh Family, a language-independent discussion covering basic hardware and programming concepts for first-time Macintosh product developers.

The second Inside Macintosh Library title, Macintosh Family Hardware Reference, will cover hardware for all the Macs. The third book, tentatively titled Macintosh II and Macintosh SE Cards and Drives, will focus on the Nubus and the SE expansion port. The fourth in the series, Programmer's Introduction to the Macintosh, will be similar to Technical Introduction to the Macintosh Family but heavier on programming concepts.

Another set of Inside Macintosh Library books is also in the works. These will provide about 2000 pages of documentation in three volumes: one on the Toolbox; one on System software; and one volume of summaries and indexes. The advantage of this recompilation of Inside Macintosh is that it (continues)
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Insight's capabilities have also impressed the world's biggest accounting firm - Peat Marwick who has written a handbook on how to automate a small business. For a free copy of their handbook, as well as a free demonstration of Insight, call 1-800-262-6620 (or in Massachusetts, 617-423-9041) for the dealer nearest you.

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organizes the information better, so readers waste less time thumbing through the volumes for cross-references.

Addison-Wesley will also release Scott Knaster’s new book, which picks up where How to Write Macintosh Software (Hayden Books, 1986) left off. The new book includes information on new machines and should be out in the fall.

Electronic Art Service

Multi-Ad Services produces and distributes advertising art to more than 50 percent of U.S. daily newspapers and over 1500 other publications. The artwork used to be delivered in mammoth books, with each image displayed in several sizes. Now, however, Multi-Ad’s new Inhouse Graphic Services (IGS) is taking advantage of the Macintosh and PostScript to provide a sophisticated electronic art-and-layout service.

Subscribers receive over 900 pieces of generic art each year on CD ROM, plus brand-name product art from manufacturers such as General Foods and Coca Cola. All artwork is in vector form (like MacDraw and Adobe’s Illustrator), which requires less storage space, provides cleaner output than bit-mapped graphics (like MacPaint) on PostScript-driven printers, and has the ability to scale images.

IGS’s page-layout software, a customized version of Quark’s XPress, includes a full-featured word processor with a spelling checker, autohyphenation, kerning, and horizontal text scaling. Layout features include automatic text flow, text run-around, and the ability to superimpose text and graphics.

In addition, a subscription includes software updates and a monthly newsletter. IGS also provides a customized artwork service, which can, for example, create retail logos for customers with Illustrator. An IGS subscription costs $200 a month, plus $25 for each Macintosh workstation.

Multi-Ad is also using the Mac in its Retail Cooperative Advertising Service, currently used by 350 newspapers to stimulate retail advertising. The system at each newspaper consists of a Mac with hard disk, modem, and printer. Also included is a Helix database with product checklists that help determine what eligible products retailers carry, complete advertiser histories, accrual tracking, co-op policies for over 20,000 manufacturers, and several report formats (including billing and manufacturer claims). If someone requests data on a product not on the list, Multi-Ad does the research, and if a plan exists, it goes into the next update of the database.

Besides distributing ad art, Multi-Ad is involved in creating product illustrations—over 90 percent of the food products manufactured and advertised in the United States are now illustrated by Multi-Ad artists with the aid of the Macintosh.

ComputerCade

Michael Sand, who heads a Boston museum-planning and media-development firm, has been incorporating the Macintosh into museum exhibits across the country. At the Museum of Science in Boston, for example, Sand created a coin-operated arcade to make people comfortable with the Mac by allowing visitors to play with several programs. The ComputerCade is controlled by special software; people can design faces using Mac a Mug, play or compose music with Studio Session, play a round of racquetball with Smash Hit Racquetball, or have ArsImagna find all the anagrams for their name.

At Commonwealth Museum at the Massachusetts State Archives Building, the Mac is used as a historical time line—a visual database containing information about presidents, geography, the Constitution, population, and so on. You scroll along the time line and click on a year; buttons appear for the four topics, and clicking one of them displays the appropriate information. As in a hypertext system, clicking again displays another layer of information. To keep the interface simple, people who use the Mac at the exhibit don’t have to deal with the keyboard—the Turbo Touch trackball is the only input device.

Sand has also installed Macs at the National Boy Scout Museum in Murray, Kentucky. A special version of Filemaker Plus enables people to enter comments about their visit to the museum. Sand wants to ultimately see printers coupled to the Macs, so people can take away souvenirs of their museum experience.

Apple Comes to Washington

The Apple Federal Government Operations in Reston, Virginia, with a sales and marketing staff of 50, represents the company’s long-term commitment to penetrating the biggest market of them all in nearby Washington, D.C.

According to Frank Sauer, hired two years ago to evaluate the feasibility of the government market and now head of Apple government sales and marketing, “Prior to 1985, Apple did not concentrate on any portion of government markets because of the phenomenal growth in educational and consumer markets.”

Although there is some dispute over the General Services Administration’s claim that Apple now holds 6 percent of the government microcomputer

(continues)
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market, unquestionably Apple is working toward being a major player in that arena. Right now, the company is focusing on the $4 billion of long-term government microcomputer procurements that will be signed over the next two years.

Although federal bureaucrats use the Mac for every imaginable office application, Apple is focusing on third-party software solutions such as graphic briefing documents, electronic visual presentations, facilities management, logistics modeling, and thought processors. Apple is also confident that the new open-architecture systems can offer the friendly Mac interface as an attractive link to the government's large installed base of mainframe systems.

Company officials allude to large impending government purchases that are expected to open the floodgates for the Macintosh and to challenge the de facto MS-DOS standard in many federal agencies. "We support the formation of standards to serve the end user, not some arbitrary technical specifications," says Ron Oklewicz, head of Apple's Washington sales force. "Design specs can be written into a particular contract, but they should define functional performance, not a specific operating system," he adds.

Toward these ends, Apple has instituted a government third-party consortium to coordinate efforts with developers and system integrators interested in the government market. New products are demonstrated to a growing government constituency at a quarter-million-dollar executive briefing center in Reston that features rear-screen projection displays, light shows, and interactive media exhibits. In the same building, separate company groups are increasing Apple's presence in federal government activities by participating in public-policy debates, gathering intelligence on trade issues, and developing strategies for emerging industry standards.

Oklewicz points out that "the real heroes are the government Mac users who started things rolling by bringing their own machines to work, and who are taking an active role in spreading the word."—Stuart Silverstone

The Mac Teaches Speech

Howard Schlieper is an audio systems engineer in the communications department of the Model Secondary School for the Deaf. The school, on the campus of Gallaudet College in Washington, D.C., was created by Congress as a model school for educating people with impaired hearing. The communications department includes speech pathology, audiology, and music.

The sound lab in Schlieper's office has a raised vibrating floor for feeling the sound and devices that make sound "visual"—an organ that represents frequencies by different colors and a stereo speaker with a mirror that reflects a laser beam in time to the music. In addition, Schlieper uses oscilloscopes and spectrum analyzers to generate scientific pictures of sound.

Most of the students have impaired speech abilities along with hearing impairments. Last year, Schlieper purchased an Emulator sampler, a Macintosh, and Digidesign's Sound Designer software, believing that the fast representation of speech with Sound Designer could be a powerful tool for speech pathology. In fact, it turned out to be so powerful that the students now advance at nearly ten times the rate they were able to achieve before.

The teachers' words are sampled (digitally recorded) and these files are transferred to the Macintosh with Sound Designer. This software provides a visual overview of the amplitude envelope of the sound, as well as a spectrum analysis. Students can analyze a word or syllable with Sound Designer and then sample their own voices pronouncing the same word.

The audiologists in the lab use the system to increase stu-
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Einstein Meets Macintosh

What really happens to time and space when you travel close to the speed of light? Einstein couldn't see time fly, so he described his theory of special relativity in long, complex formulae. Students enrolled in Physics 60 at Stanford University can see time fly by launching their Macintoshes.

With a Macintosh, Professor Blas Cabrera provides computer simulations for his Advanced Introduction to Physics class. The Macintosh is the first affordable computer with sufficient power to render smooth animations for classroom use. Along with James Terman and Sha Xin Wei, two student programmers from Stanford's Faculty Development (FAD) program, Professor Cabrera has written 16 simulations to cover a full year of physics (mechanics, electromagnetism, and modern physics). The visualizations of difficult concepts help the teacher to explain and the student to understand the dynamic systems of the physical universe.

Each week a new simulation is introduced and demonstrated in class on a Macintosh equipped with a large video display. There are simulations that demonstrate Einstein's special relativity, Kepler's planetary motion, the oscillatory motion of electric radiation, Fourier transforms, elementary kinetic theory, and a model superconductor. Students are assigned problem sets that use the simulations to find the answers. The simulations provide a method for checking both analytical and intuitive results. About half of the 20 students in the class have Macintoshes; the remainder have access to Macintosh clusters at the libraries on campus. Students spend about two hours a week with the simulations, getting hands-on experience and developing an intuitive understanding that wasn't possible before.

The programming was started in the fall of 1985, and the manual was finished in time for this academic year. Cabrera wrote all of the computational algorithms in Microsoft BASIC and then turned them over to the FAD programmers for fine tuning and enhancement. They used Lisa Pascal to add speed, graphics, controls, and a consistent user interface.

Two of the project's goals were that computer literacy not be a prerequisite and that the Macintosh's graphic capabilities be used to provide maximum scope with minimum complexity. The simulations are applicable to all of the introductory physics courses, from physics for engineers to physics for poets. Thanks to Professor Cabrera, it no longer takes an Einstein to think in four dimensions. It just takes a Mac.

Apple Uses Cray, Cray Uses Mac

When Seymour Cray, developer of the Cray supercomputer, heard that Apple Computer had bought a Cray to work on new product design, he revealed that he'd just started using a Mac to help design the Cray III. Cray is said to prefer the most simple, easy-to-use tools available so that he can spend time working rather than learning to use the tools.

Cray uses his Mac to commit to words and drawings his concepts and configurations for the new Cray system. Whereas the Cray II is ten times faster than the original model, a design objective of the new system is to be ten times faster than the Cray II. Gallium arsenide circuits are expected to contribute their remarkable electrical conductivity and low heat properties to the new design.

Besides using the Mac, the reclusive Cray improves his creativity by eschewing interviews and by working unpredictable hours in his Chippewa Falls, Wisconsin, research labs and cottage-in-the-woods.

—Stuart Silverstone
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Turbo MacAccountant (GL, APAR, Payroll) ... $262.

Dove Computer ... NCP
RAMSnap (RAM Disk/Disk Cache) ... 36.

Dow Jones ... CP
Market Manager PLUS 1.5 ... 159.

Dreams of the Phoenix ... NCP
Day Keeper Calendar ... 35.
Quick & Dirty Utilities ... each 35.

Electronic Arts ... CP
Deluxe Music Construction Set 2.0 ... 63.

Enabling Technologies ... NCP
Easy3D (create solid 3D objects) ... 69.

1st Byte ... CP
Speller Bee or First Shapes ... 27.
Smoothtalker (speech synthesis) ... 27.

Forethought ... NCP
Factendar (free-form info organizer) ... 49.
FiMeaker (custom forms & reports) ... 79.
FiMeaker Plus (feature-packed database) ... 159.
PowerPoint ... special.

FWB Software ... NCP
Hard Disk RackIt (protect hard disk info) ... 36.
Hard Disk Partition (speeds up hard disk) ... 36.

Great Wave Software ... NCP
KidsTime (educational, ages 3-8) ... 28.
TimeMeister (learn about time, ages 4 & up) ... 28.

Hayden Software ... CP
MusicWorks (songs for your Mac) ... 29.

Ideaform ... NCP
MacLabeler (print disk labels) ... 29.

Informatics ... CP
DiskQuick (catalog floppy & hard drives) ... 29.

Imagine ... NCP
Smart Alarms (DA reminder system) ... 38.

Impulse ... NCP
Comic Strip Factory (create cartoons) ... 65.

Industrial Computations ... NCP
Powermath (equation solving tool) ... 65.

Innovative Data Design ... NCP
MacDraft (new updated version, 512k) ... 159.

Kensington ... NCP
type fonts for Text (16 new fonts) ... 29.

Laserware ... CP
Laserworks (requires 512k, Laserwriter) ... 229.

Layered ... CP
Notes (for...Excel, Microsoft Works, ... 42.

Legisoft/Novo Press ... NCP
WillWrite 2.0 (prepare your own will) ... 31.

Linguist's Software ... NCP
Tech (1000 different symbols) ... $59.

FOREIGN LANGUAGE FONTS
MacCyrillic ... 39.
SuperFrench/German/Spanish ... 39.
MacHieroglyphics, MacKana/Basic Kanji ... 39.

MacSeemite/Coptico/Devanagari, MacKorean ... 39.
MacGreek, MacHebrew ... each 59.

SuperGreek New or Old Testament ... 79.
MacGreek/Hebrew/Phonetics ... 89.

LaserGreek or LaserHebrew ... 79.

LaserCyrillic ... 115.

Living Videotext ... NCP
ThinkTank 512k (output processor) ... 99.

Lundeen & Associates ... NCP
WorksPlus Spell ... 39.

MacMemory ... NCP
MaxRam & MaxPrint (Ramdisk, spooler) ... 33.

Magnum ... NCP
Natural Sound Effects ... 27.
Natural Sound Cable & Editor Disk ... 89.

McPic or Volume 1 or Volume 2 ... 29.

Microsoft Flight Simulator (the Mac takes flight, CP) ... 32.

Miles Computing ... NCP
Mac the Ripper (req. Paint program) ... 27.
Orchestra of Fonts Vol. 4 (30 different fonts) ... 27.

Mindscape ... CP
The Luscher Profile (personality profile) ... 24.

Monogram ... NCP
Dollars & Sense (home, small business) ... 81.

New Canna MicroCode ... NCP
MOCFinder (requires 512k) ... 20.

Mac Disk Catalog II (requires 512k) ... 31.

Odesta ... NCP
Double Helix (relational, custom menus) ... 275.

OWL International ... NCP
Guide (hypertext, free-form info) ... 79.

Palantir ... CP
MathFlash, WordPlayer or MacType ... 26.

General Ledger or Accounts Receivable ... 49.

PBI Software ... NCP
Icon Switcher (customized icons) ... 14.

HFS Locator (DA organizer for HFS) ... 26.

HD Backup (Back up, NPS, HFS) ... 29.

Personal Computer Peripherals ... NCP
HFS Backup ... 34.

ProVUE Development ... NCP
OverVue 2.0 (power-packed database) ... 149.

Mail Manager Template ... 29.

Personal Finance Template ... 29.

Rubicon Publishing ... CP
Silver Palace Collection (NY's finest!) ... 28.
Macintosh solution for

Dinner At Eight (recipes to wines) ........... $32.
Dinner At Eight Silver Plate Bundle ....... 54.
Satori ... NCP
BulkMailer (mailing lists) .................... 74.
BulkMailer Plus (up to 90,000 names) .... 225.
Legal Billing (attorneys to accountants) .. 385.
Legal Billing II (full trust accounting) .... 375.
Project Billing (architects to engineers) ... 445.
Silicon Beach Software ... NCP
Silicon Press (printer utility, 512k) ....... 41.
SuperPaint (advanced graphics program) .. 54.
Simon & Schuster ... NCP
Mac Art Department (req. Paint program) .. 24.
Typing Tutor III (learn to type!) .......... 35.
SoftStyle ... NCP
ColorArt (Colormate images) ............ 27.
ColorArt (color printing utility) ........... 48.
Printworks (print faster & in color) ......... 49.
Lasertart ( Hewlett-Packard Laserjet) ... 58.
Decision Map (make better decisions, CP) 75.
Softview ... NCP
MacName (time-use manager) ............ 35.
Software Discoveries ... NCP
Record Holder (data manager) ............ 41.
Software Ventures ... NCP
Microphone (communications) ............. 58.
Solutions, Inc. ... NCP
SmartScrap & The Clipper ............... 35.
Glue (create disk "capability") ............ 35.
Springboard ... CP
Art a la Mac Vol. 1-People & Places (CP) .. 23.
Art a la Mac Vol. 2 - Variety Pack (CP) .... 23.
Easy as ABC (ages 3-6, letters, CP) ........ 28.
Early Games (ages 2-6, counting, CP) ..... 28.
Certificate Maker (CP) .................. 35.
State of the Art ... CP
Electric Checkbook (print checks) ......... 26.
SuperMac Technology ... NCP
SuperSool .................. 39.
Diskit (backup & restore utility) ........... 49.
Multi-User Super Laser Sool ............. 259.
Survivor Software ... NCP
MacMoney (financial planner) .......... 42.
Symmetry ... NCP
AcTa 1.2 (outline/writing desk accessory) . 38.
PictureBase 1.2 (clip art manager, 512k) . 44.
TM/Maker ... NCP
ClickArt Personal Graphics .............. 28.
ClickArt Effects ........................ 28.
Click Art Publications .................... 28.
ClickArt Letters Vol. 1 or Vol. 2 ........ 28.
ClickArt Holidays (Easter) ............... 28.
ClickArt Business Image .................. 28.
Bombay, Plymouth, or Seville Laser font .. 46.

MacConnection
Special of the Month
through July 31, 1987

FORETHOUGHT
PowerPoint
PowerPoint is for people who need to plan, compose, and manage complete presentations including overhead transparencies, flip charts, speaker's notes or audience handouts. With its built-in graphics editor, word processor and layout tools, Powerpoint makes it easy to create the kind of presentations you've always wanted.

- Integrates smoothly with other programs
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PowerPoint (reqs. 512k Mac) ........ $249.

Write Now (word processor) .............. 104.
Target Software ... NCP
Voila! (desk accessory outliner) .......... call
Telos Software ... NCP
Business Fileversion (512k, external drive) 199.
Think Educational ... CP
MacEdge II or Mind Over Mac ............ 28.
Think Technologies ... NCP
Laserspeed (Laserwriter utility) ....... 67.
Lightspeed Pascal (includes debugger) ... 87.
Lightspeed C (top-rated C Compiler) ... 127.
TML Systems ... NCP
TML Source Code Library ............. 58.
TML Database Toolkit ............... 64.
TML Pascal (compiler, req. 512k) ...... 68.
True Basic ... NCP
True BASIC (fast, flexible & portable) ... 59.
TrueSTAT (statistics) ............... 58.
Runtime (create stand-alone applications) 59.
Unicorn ... CP
Animal Kingdom (ages 6-12) ............ 27.
Decimol Dungeon (math, ages 9 and up) . 27.
Fraction Action (arcade style math game) 27.
Math Wizard (math games, ages 6-10) . 27.
Read-A-Rama (reading, ages 6-12) ...... 32.
William & Macias ... NCP
myDiskLabeler (design & print labels) ... 24.
myDiskLabeler w/Color (req. ImageWriter II) 33.

myDiskLabeler w/Laserwriter option .... $35.
Working Software ... CP
Spellswell (spelling checker) .......... 45.
Spellswell Medical Dictionary ........... 59.

GAMES
Accolade ... CP
Activision ... CP
Championship Star League Baseball .... 22.
Shanghai (Mah Jongg strategy) .......... 27.
Tass Times in Tonetown .................. 27.
Hacker (you're on your own!) .......... 27.
Hacker II (break Russian computer) .... 30.
Adicon - Wesley ... CP
Pupoy Love (your dog will love it!) .... 15.
Ann Arbor Softworks ... CP
Grid Wars (3D graphic arcade) .......... 22.
Artwork ... CP
Bridge 4.0 (sharpen your skills) ......... 20.
Avalon Hill ... CP
Crack Football (req. 512k) ............. 39.
Blue Chip ... CP
Millionaire (stock market) ............ 35.
Tycoon (commodities) .................. 35.
Baron (real estate) .................... 35.
Square (personal finance, req. 512k) ...... 35.
Broderbund Software ... CP
Lode Runner (over 120 levels) ......... 29.
CannonArt War (military strategy) ....... 27.
Toy Shop (create working models) ....... 39.
Bullseye ... CP
Ferrari Grand Prix (Formula One racing) 34.
Fokker TriPlane Flight Simulator ......... 34.
Electronic Arts ... CP
Archon (arcade strategy, req. 512k) ...... 27.
Skyfox (3D graphics) .................. 27.
Seven Cities of Gold .................... 27.
One on One (Dr. J vs Larry Bird) (req. 512k) ... 27.
Patton vs Rommel (req. 512k) ............ 27.
Pinball Construction Set ............... 27.
Chessmaster 2000 ........................ 30.
Epyx ... CP
Sub Battle Simulato ....... 24.
Winter Games (Olympic events) ......... 24.
Rogue (strategy dungeon classic!) ....... 24.
Hayden Software ... CP
Parplex (arcade-type game) ............ 24.
Sargon Ill (9 levels of chess) ............ 29.
Infinity Software ... CP
Grand Slam (tennis, req. 512k) .......... 27.
Infocom ... CP
Leather Goddesses of Phobos ........... 24.
Zork Trilogy .......................... 45.

1-800/Mac&Lisa 720C

MacConnection, 14 Mill Street, Marlboro, NH 03405 800/622-5472 603/446-7711

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you.

Macromind  ...  NCP
MacWars + (play via modem or network)  ...  $32.5
Miles Computing  ...  CP
Hammer Strike Mission (3D flight simulation)  ...  27
MacWars (3D space simulation)  ...  27
MindScape  ...  CP
Racter (converse with your Mac)  ...  27
Balance of Power (world politics)  ...  30
King of Chicago (reg. minimum $125)  ...  30
Bratatticus (great graphics, req. 512k)  ...  30
Unraveled (mystery adventure)  ...  30
Deja Vu (murder mystery)  ...  30
PBI Software  ...  CP
Strategic Conquest (multi-user)  ...  35
Psion  ...  CP
Psion Chess (2D and multi-lingual)  ...  31
Qware  ...  CP
Orb Quest (graphic fantasy adventure)  ...  29
Rainbird  ...  CP
Psion (fantasy adventure)  ...  27
Sierra On-Line  ...  CP
Championship Boxing (knock 'em out)  ...  25
Sunset Sound Beach Software
Airborne! (CP the classic!)  ...  20
Enchanted Scepters (CP over 200 scenes)  ...  21
Dark Castle (NCP arcade action)  ...  21
Walt Disney (NCP, program creator)  ...  41
Simon & Schuster  ...  CP
Star Trek—The Kobayashi Adventure  ...  24
SirTech  ...  CP
Mac Wizardry (high-rated fantasy)  ...  35
SPHERE, INC.  ...  NCP
GATO (submarine simulation)  ...  26
Orbit (space shuttle simulation)  ...  27
Tellus (for 800+ hemispheres, req. 512k)  ...  32
XOR  ...  NCP
NFL Challenge (be the coach)  ...  79

HARDWARE

Manufacturer's minimum limited warranty period is listed after each company name. Some products in their line may have longer warranty periods.

Apricorn  ...  1 year
Apricord Mac (for your Mac 512k)  ...  75
Apricord Mac (Mac Plus parallel interface)  ...  75
AST Research  ...  2 years
AST 2000 (20MB, 20MB tape)  ...  1695
Curtis Manufacturing  ...  lifetime
Diamond (6 outlets)  ...  29
Emerald (6 outlets, 6 ft cord)  ...  36
Sapphire (3 outlets, EMI/RFI filtered)  ...  47
Ruby (6 outlets, EMI/RFI filtered, 6 ft cord)  ...  55
Dove Computer  ...  90 days
SCSI Interface Port  ...  125
MacSnap Memory Upgrades
Mac Snap 524 (512k to 1 Meg)  ...  139
Mac Snap 524S (inc. SCSI interface)  ...  239
Mac Snap Plus 2 (Mac Plus to 2 Meg)  ...  249
Mac Snap 548 (512k to 2 Meg)  ...  369
Mac Snap 548S (inc. SCSI interface)  ...  499
Ergotron  ...  1 year
Mouse Cleaner 360°  ...  15
MacTilt (includes external drive bracket)  ...  74
MacBuffer 512k  ...  329
MacBuffer 1024k  ...  429
Hayes  ...  2 years
Smartcomm II (communications software)  ...  88
Smartmodem  ...  $369
Smartmodem 1200 Package  ...  425
Smartmodem 2400  ...  569
InterBridge (connect AppleTalk networks)  ...  599
Bemoulli Box (dual 10MB w/SCSI)  ...  1579
Bemoulli Box (dual 20MB w/SCSI)  ...  1879
Bemoulli Box (dual 10MB, AppleTalk)  ...  1995
Kensington  ...  1 year
AppleTalk Cable Clips or Connectors  ...  each 1
Mouseway (mouse tracking pad)  ...  8
Mouse Pocket (for your idle mouse)  ...  8
Mouse Plus/Mac SE System Saver Cover  ...  9
Imagewriter (II) Dust Cover  ...  9
Mouse Cleaning Kit w/Mouse Pocket  ...  17
Disk Case (holds 30 Mac disks)  ...  19
Disk Drive Cleaning Kit  ...  20
Swift/Silit
Universal Copy Stand  ...  24
Polarizing Filter (Mac Plus or Mac SE)  ...  34
Surge Suppressor  ...  34
Printer Muffler (80 column)  ...  64
Control Center  ...  64
System Saver Mac (platinum or beige)  ...  64
A-B Box (for the Mac Plus)  ...  65
Turbo Mouse  ...  85
Koa Technologies  ...  90 days
Kraft  ...  1 year
3 Button QuickStick  ...  49
Mirror Technologies  ...  1 year
Magnum 800 External Drive  ...  229
MagNet 20x (w/cable & backup utilities)  ...  779
Magnum 20 tape Backup  ...  899
Magnum 25 tape Backup  ...  949
MagNet 40x (w/cable & print spoolers)  ...  1299
MagNet 40/40 (40MB, 40MB tape)  ...  2395
MagNet 85x (w/40MB tape)  ...  3995
Personal Computer Peripherals  ...  1 year
MacBottom Hard Drive (20MB) ( filament)  ...  865
MacBottom Hard Drive 20MB (SCSI)  ...  865
MacBottom Hard Drive 45MB (SCSI)  ...  1295
SoftStyle  ...  90 days
MacEnhancer (for plotters to printers)  ...  179
Summagraphics  ...  90 days
MacTablet 6" x 9" (stylus driven)  ...  289
MacTablet 12" x 12" (sketching)  ...  379
Systems Control  ...  2 years
MacCard (bubble protection)  ...  55
Thunderware  ...  90 days
ThunderCard (high-resolution digitizer)  ...  954
Powerport  ...  29
Western Automation  ...  1 year
DASCH RAMdisk 2000k  ...  459

DISKS

Single-sided Diskettes
Sony 3½" Disks (box of 10)  ...  14
MAXELL 3½" Disks (box of 10)  ...  14
Fuji 3½" Disks (box of 10)  ...  14
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3M 3½" Disks (box of 10)  ...  16

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Sony 3½" Disks (box of 10)  ...  21
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Fuji 3½" Disks (box of 10)  ...  21
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INFORMATION SERVICES

Compuserve
Compuserve Information Service  ...  $24
Dow Jones
Dow Jones NewsRetrieval Membership Kit  ...  24

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Clean Image Ribbon Co.
Clean Image Ribbon Kit  ...  12

Computer Coverup
Imagewriter (II) Cover  ...  8
Mac (Plus) & Keyboard (two covers)  ...  10

Divisions
Underwire Ribbon (iron-on black transfer)  ...  9
Multi-color Transfer Ribbon  ...  19

I/O Design
Imagewriter II (Imagewriter II carry case)  ...  49
Macinware Plus (Mac Plus carry case)  ...  69
Macinware SE (Mac SE carry case)  ...  89

Innovative Concepts
Flip & File Micro (holds 25 disks)  ...  9
Flip & File (holds 40 disks)  ...  18

Innovative Technologies
The Pocket Pak (holds 6 disks)  ...  9
The Easel (holds 20 disks)  ...  13
The Disk Directory (holds 32 disks)  ...  15
The Library (carousel, holds 80 disks)  ...  29

Kalmar Designs
Teakwood Roll-top Case (holds 45 disks)  ...  14
Teakwood Roll-top Case (holds 90 disks)  ...  21
Teakwood Roll-top Case (holds 135 disks)  ...  29

Magnum
Mouse Mover (let your mouse ride)  ...  14
Moustrak
Moustrak Pad (standard 7" x 9")  ...  8
Moustrak Pad (large 9" x 11")  ...  9

Smith & Bellows
Manography Disk Case (holds 90 disks)  ...  28

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Dear MacPeople,

My name is Martha Finch and I am 25. Three years ago, I was in a serious running accident. I was jogging in Aspen, Colorado up a mountain road and a motorcycle was coming down the same road and hit me badly. I was in the hospital for an entire year with head injuries and broken bones in both of my arms and both legs. My progress is very slow. Today I can’t even walk and can barely talk.

Before my accident I was very athletic. I was a national swimmer in college. I also qualified for the Boston Marathon in 3 hours and 17 minutes. Now I have to switch from all my physical capabilities to only mental activities, and the Mac really helps me. The Mac has enabled me to express myself in letters to my friends. I write all my letters with "MacWrite" and make my own cards with "Print Shop". I am also in the process of writing a book about my experiences.

Mac is a saving grace for me. It is a very good friend.

Sincerely,
Martha Finch
Chasing Rainbows

In which I tire of waiting and go in search of Mac II displays

by David Ushijima

It was the antithesis of a childhood Christmas, when counting days was almost as exciting as tearing open packages. As this article went to press, the SE's big brother was reportedly about two months away from being delivered to retail stores. While waiting for a machine, I paid a visit to the designers of the first display products, hoping to learn more about the Mac II and discuss what they felt were the issues in video cards and displays. I started at Apple. Its video card and 12-inch monochrome and 13-inch color monitors would, by virtue of the Apple label, be the standard against which all other display add-ons would be compared. Toby Farrand, Dave Fung, Ernie Beernink, and Art Cabral of Apple
quickly raised my video consciousness with an invigorating tutorial on the Apple video card and color software. Steve Edelman of SuperMac and David Le and Don Pannell of Sigma Designs were equally enthusiastic, showing me monitors that displayed as dazzling an array of dots on the screen as any you'd find on a Sun or Apollo workstation.

The Chunkiness of Color
The first step in clearing up video confusion is to realize that the on-screen image is controlled by the video card and is also heavily influenced by the characteristics of the monitor. Because the monitors and video cards will likely be offered together, the differences in each component’s capabilities may become blurred in the manufacturer’s ads. However, if you’re willing to persevere, I’ll attempt to unravel what happens at each end of the video cable.

The model of screen graphics, as exemplified by Apple’s current video card, is based on what’s called a chunky or packed-pixel architecture. Basically, the image you see on the Mac II’s screen is stored in an area of very fast memory, called the frame buffer, on the Mac II’s video card. Each picture element (pixel) on the screen is represented by a series of bits, 1 if the image is black-and-white, 2, 4, or 8 bits if the image is displayed in color or shades of gray. Each pixel’s color information is packed together in chunks in the video memory and stored sequentially, beginning with the top-left and ending with the bottom-right pixel. Currently the Apple video card, SuperMac’s Grafix and Spectrum cards, Sigma Designs’ LaserView, E-Machines’ Big Picture for the Mac II, and Micrographic Images’ MegaScreen follow Apple’s chunky color model. Even the current crop of video cards for the PC (CGA, EGA, PGA, and the new MCGA and VGA) use the packed model.

The alternative to chunky architecture is planar architecture (see “Chunky versus Planar”), in which the screen image is physically organized into a number of bit planes, each stored in a separate area of memory (see “The Graphic Mac,” Macworld, November 1986). While the packed-pixel architecture is suited for displaying a single color image, boards designed around the planar architecture are often better suited for image-processing applications, such as those requiring the manipulation of multiple image layers on screen. At present, National Semiconductor is the only vendor to have announced a video card for the Mac II that uses the planar architecture. National’s board, based on its recently released Advanced Graphics Chip Set (AGCS), will reportedly be able to display up to 32 bit planes.

Pixel Wars
With the exception of National Semiconductor’s board, all current Mac II video systems (here video system will refer to both the card and the monitor) implement the frame buffer in much the same way differing primarily in the number of dots displayed horizontally and vertically, and in the number of colors that can be displayed on the screen simultaneously.

As you search for a display system, the term resolution will pop up frequently. Resolution is used in two ways; the first is a measure of the number of pixels displayed on a screen. For example, Apple’s video card and monitor can display up to 640 pixels horizontally and 480 pixels vertically, whereas SuperMac’s Spectrum can display up to 1024 by 768. In the black-and-white arena, Sigma Designs’ LaserView displays 1664 by 1200, SuperMac’s Graphix up to 1365 by 1024, E-Machines’ Big Picture 1024 by 808, and Micrographic Images’ MegaScreen up to 1024 by 900. Jasmine has also announced a black-and-white card that will display 1024 by 1024 pixels. Resolution in this context depends on the frame buffer size (determined by the amount of video RAM on the card) and on how many dots the monitor can display on screen.

The second use of the term resolution refers to pixel density, the number of dots per inch displayed by the monitor. This figure is dependent upon the monitor’s size and the number of dots displayed (more on this later).

Since a black-and-white display only requires 1 bit per pixel—the pixel is either on or it is off (1 or 0)—a 640-by-480-pixel monochrome card contains slightly more than 38K of video RAM (640 × 480 bits). On the other hand, a black-and-white monitor with high resolution, like Sigma Designs’ LaserView, contains about 250K (1664 × 1200 bits).
Spheres of a Different Color

The best way to compare monitors—to determine how they differ in resolution, size, and color—is to run them side by side.

For my comparisons, I set up Apple's 13-inch color monitor next to SuperMac's 19-inch screen. The monitors were driven by their respective video cards. Using the Monitor settings in the Control Panel, I configured both cards to display 256 colors—8 bits of color information per pixel.

Differences in screens were immediately apparent, as the accompanying photos show. (Keep in mind that the screens shown here reflect film characteristics and the color printing process used to print the magazine.)

SuperMac's color monitor gives you a dazzling display of color if you're working with applications that can create images in the full 1024-by-768-dot display. For example, the ray-cast image on the top right, processed on a Mac II by Mike Potel of Apple's Advanced Development Group, consists of over 786,000 dots and fills the entire SuperMac screen.

On the other hand, the equivalent full-screen image displayed on the Apple color monitor (shown on the bottom right) consists of fewer than half that number of dots.

In general, the images on Apple's monitors were sharper, the edges of objects were much more clearly defined, and the colors were brighter and truer. Much of this superiority may be credited to the Sony-manufactured monitor—Sony's Trinitron uses vertical red, green, and blue bands and a finer shadow mask than SuperMac's monitor.
Frame Buffer

Monitor screen

Chunky vs Planar

Current video cards store pixels using the packed-pixel approach. The planar approach allows the color information to span multiple planes. It also allows multiple images to be stored and manipulated separately. The chunky-planar model allocates separate planes for red, green, and blue information. Image-processing applications tend to favor the planar or chunky-planar model.

Rainbows Compared

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Resolution</th>
<th>Color/Mono</th>
<th>Bits per Pixel</th>
<th>Monitor Size (in inches)</th>
<th>Dots per Inch (dpi)</th>
<th>Horizontal Scan Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>640 by 480</td>
<td>mono</td>
<td>up to 8</td>
<td>12</td>
<td>76</td>
<td>35 kHz</td>
</tr>
<tr>
<td>SuperMac</td>
<td>1365 by 1024</td>
<td>mono</td>
<td>1</td>
<td>19</td>
<td>72</td>
<td>64 kHz</td>
</tr>
<tr>
<td>Sigma Designs</td>
<td>1600 by 1200</td>
<td>mono</td>
<td>1</td>
<td>15/19</td>
<td>150/110</td>
<td>75 kHz</td>
</tr>
<tr>
<td>E-Machines</td>
<td>1024 by 808</td>
<td>mono</td>
<td>1</td>
<td>17</td>
<td>82</td>
<td>50.5 kHz</td>
</tr>
<tr>
<td>Micrographic Images</td>
<td>1024 by 900</td>
<td>mono</td>
<td>1</td>
<td>19.5</td>
<td>72</td>
<td>54 kHz</td>
</tr>
<tr>
<td>Apple</td>
<td>640 by 480</td>
<td>color</td>
<td>up to 8</td>
<td>13</td>
<td>69</td>
<td>35 kHz</td>
</tr>
<tr>
<td>SuperMac</td>
<td>1024 by 768</td>
<td>color</td>
<td>up to 8</td>
<td>19</td>
<td>72</td>
<td>64 kHz</td>
</tr>
</tbody>
</table>

1280 by 1024 (66.67-Hz refresh rate).
2E-Machines will be unbundling board and monitor.
360 Hz at 1024 by 850.
468881 available for an additional $549.
5User can also display 640.

July 1987
On a color video board, the size of the frame buffer affects how many colors or shades of gray are displayed on screen at a time: for simultaneous display of 256 colors or gray shades, 8 bits are required for each pixel. Therefore, to display 640 by 480 pixels in 256 colors, as Apple’s card does, the video card must contain slightly over 307K of video RAM (640 × 480 × 8 bits).

Color video cards usually come with a minimum amount of video RAM; you can add chips later to display more pixels and/or more colors on the screen at once. Apple offers its card with one bank of video RAM, so you can display 640 by 480 pixels in 16 on-screen colors. Adding another bank lets you display the same number of pixels in 256 on-screen colors. SuperMac, on the other hand, offers its Spectrum board in three configurations. The minimal Spectrum displays 1024 by 768 pixels in black and white. Adding a second bank lets the Spectrum display 640 by 480 or 800 by 600 pixels in up to 256 on-screen colors, or 1024 by 768 pixels in up to 16 on-screen colors. Adding the final bank of video RAM lets you display 1024 by 768-pixel images in up to 256 colors.

More dots on the screen generally means you see more—either a larger page or several pages of text or graphics at once. It doesn’t mean that images are displayed in any more detail or with any more dots than on a lower-resolution screen. For example, if you display a circle on a 640-by-480 screen and compare it to the same circle on a higher-resolution display, the circle would be drawn with the same number of dots on both screens. What would affect the image sharpness or the smoothness of the circle would be the size and other characteristics of the monitor.

Increasing the number of colors on the screen can do more for realism than can simply adding more dots. For example, a color television has fairly low resolution, but because it isn’t limited to displaying a fixed set of colors—the red, green, and blue guns are controlled by an analog signal—the resulting picture looks realistic.

From Numbers to Colors
To transform the color information stored in the video RAM into a colored dot on the screen, designers currently employ a mechanism called a color lookup table. The color information stored in the video RAM for each pixel is an 8-bit binary number, specifying one of up to 256 colors. Both the Apple color video card and SuperMac’s Spectrum use the 8-bit number to index a table of colors called the color lookup table. The table contains 256 entries; each entry is a 24-bit number that can represent one of 2^24, or over 16 million colors. The output of the color table feeds three 8-bit digital-to-analog converters, which translate the 24-bit number into three analog signals that control the monitor’s red, green, and blue electron guns, resulting in a colored dot on the screen (see “The Graphic Mac,” Macworld, November 1986).

Because both the Apple and the SuperMac color cards contain color tables with only 256 entries, neither card can display more than 256 colors on screen at a time. However, the color table entries can be changed during the blanking interval that occurs between successive screen displays. In fact, it is the Palette Manager, a recent addition to the Mac II’s system software, that is responsible for allowing application programs to modify the color table entries in order to create color animations and other image sequences that require more than 256 colors on screen (see “Changing Palettes”).

Dots that Glow in the Night
While the video card controls the screen image, it is the monitor you actually see. The right monitor can mean the difference between a sharp, crisp, very realistic image and a blurred or fuzzy one. So when choosing a monitor, you should consider a number of properties.

A black-and-white monitor’s screen is coated with minuscule dots of phosphor, which are spaced evenly over the screen’s surface and emit light when hit with a stream of electrons. An image is created by turning a beam on and off while scanning it across the face of the screen, much as you would read a page of text from left to right and from top to bottom.

The rate at which the electron beam scans lines is called the horizontal scan rate. A monitor’s scan rate is usually specified in kilohertz (kHz). For example, Apple’s 13-inch color monitor has a horizontal scan rate of 35 kHz—it can scan 35,000 lines per second. The higher the scan rate, the more lines can be displayed on the screen.

Vital Statistics
Comparing monitor specifications won’t tell you the whole story. For the complete picture you need to compare the appearance of both text and graphics on the screens.
Having more dots doesn’t mean you can see objects on the screen more easily.

The Mac repaints the screen using noninterlaced refreshing: the entire screen is refreshed at once. The alternative, the interlaced method, refreshes a portion of the screen, every other line, on the first pass, then goes back and repaints the alternate set of lines on the second pass. If it’s done quickly enough, you don’t notice the flicker.

As a rule, refresh rates of 60 Hz and above on a noninterlaced screen (repainting the entire screen about 60 times a second) result in a flicker-free display. Apple’s color monitor and SuperMac’s Spectrum in its 640-by-480 color mode have a refresh rate of 66.67 Hz, so the screen appears rock solid.

A third measure of a monitor’s performance is dot clock rate, often referred to as the monitor’s bandwidth. The dot clock rate specifies the rate at which the monitor can accept the pixel data from the video card, and ultimately how quickly the pixels can be turned on and off.

One of the most basic monitor specifications is the size of the screen viewing area. Monitors are usually measured diagonally across the face of the screen. The number of pixels spread across the viewing area yields a pixel density given in dots per inch. Given the same number of dots, a smaller screen would result in a higher number of dots displayed per inch, so the image would appear much denser on the smaller screen. For example, Sigma offers two sizes of monitors, 19-inch and 15-inch, with a video card. The 19-inch monitor displays 110 dots per inch; the 15-inch monitor displays 190 dots per inch. Both display the same total number of dots on the screen.

Having more dots on the screen doesn’t necessarily mean you can see objects on the screen more easily. A lot of dots on a small screen results in tiny images. On Sigma’s 15-inch monitor, the cursor and the Trash Can are not easily discernible on screen—you really have to look to see them. Sigma recognizes the problem and is working on a desk accessory that will let you increase the size of objects on the screen. This is similar to what Radius does with its Full Page Display for the Mac Plus and the SE, although the Radius FPD changes only the proportions of the cursor and menu bar items.

Coloring Images

To display an image in color, a color monitor replaces the single pixels of a black-and-white screen with a pixel triad—one red, green, and blue element per triad. Each element in the triad responds to the coinciding gun—red, green, or blue—of the color monitor. By varying the intensities of red, green, and blue, the monitor can display a particular color.

Color monitors use what is called a shadow mask, or aperture grill, a metal mask placed between the electron guns and the screen with openings for each screen pixel. The spacing between openings in the shadow mask is called its pitch. The finer the pitch, the sharper the image. Apple’s 13-inch color monitor, manufactured by Sony, uses an aperture grill with a pitch of .26mm, resulting in an extremely sharp image. The dot pitch for most color monitors in the same class averages about .31mm.

One key to obtaining a distortion-free image is the match between a monitor’s dot clock rate and the spacing between pixels. The closer the pixels are spaced, the more dots can fit horizontally across the screen, and therefore the faster the dot clock rate must be in order to turn on each pixel in synchrony. Attempting to feed a fast video signal into a monitor with inadequate dot pitch results in distortions such as moiré patterns.

A test of a color monitor’s quality is its ability to display both black-and-white and color images with the same sharpness. For example, the desktop displayed on Apple’s color monitor looks almost identical to the desktop on Apple’s black-and-white monitor—a sign of a high-quality color display.

The criteria for selecting a color monitor are largely subjective because of the differences in the ways people perceive color. Some additional factors that influence the quality of a color monitor are the brightness or luminance level of the individual pixels, the shape of the pixels, and the color characteristics of the phosphors used.

To Mix and Match?

One last issue. Most of the display manufacturers bundle their video cards with their own color monitors. Many have worked with the monitor manufacturers to come up with a design tailored to a particular video card. You can’t just go out and buy any color monitor and plug it into the card you have. The interface between the monitor and video card will determine whether you can physically connect the two.

Many of the black-and-white video cards send digital signals to the monitor conforming to particular voltage levels, referred to as TTL levels. Sigma’s LaserView and E-Machines’ Big Picture, however, are exceptions, sending their signals in the form of ECL signals, a much faster interface method that uses much lower voltage levels.

Color video cards normally send their signals to the monitor in the form of analog voltages to each of
Changing Palettes

While 256 colors may seem like a lot to display simultaneously on screen, when you look out a window, whatever you see most certainly contains many times that number. Depending on your screen image, 256 may be excessive or may not even be enough. For example, writers and spreadsheet users would rarely need more than a few colors—perhaps some shades of color or gray for color fonts—but graphic artists working with digitized color photos could require far more colors than the Mac II's palette provides. A gray scale of 256 shades can provide a smooth gradient from white to black. But when you consider the display of a computer-generated image containing hundreds or even thousands of shades, or try to represent an object as realistically as possible, a palette of 256 colors falls short of the mark.

Apple's engineers realized that applications relying heavily on color would require a standard way to change the colors in the palette, so they created the Palette Manager. Applications specify a color using a 48-bit number, actually composed of three 16-bit values, for shades of red, green, and blue. An application calls the Color Manager to get the closest approximation to the actual 48-bit color specified in the program. The Color Manager knows how to use the color lookup table on any video card you plug into the Mac II.

The Mac II's system software treats a video card's color table as a shared resource, falling under the control of the Palette Manager. Two running applications could share the same color palette, for example, or two windows on the desktop might require two separate sets of colors. An even more complex case occurs when you have two screens—each with its own palette definition—and a single window spanning the two screens. The Palette Manager handles all three cases by keeping track of many different palettes and screens.

To create animations requiring more than 256 colors, the Palette Manager lets an application change a subset of colors on the fly. Colors can be classified in three groups: those requiring only a satisfactory match, those requiring a match within certain tolerances, and those requiring an exact match. For colors that must be represented exactly, the Palette Manager can write an RGB color number directly into the color table. In this way, an animation could actually simulate many times the 256-color limit imposed by the current offering of color cards.

the three guns (red, green, and blue). Monitors that accept these signals are referred to as analog RGB monitors. Gray-scale monitors like Apple's 12-inch monochrome monitors also require an analog input.

Apple worked with Sony to come up with its 13-inch color monitor. By attaching an off-the-shelf RGB monitor with a wider dot pitch than that of Apple's, you can end up with an intelligible but somewhat distorted image. However, Sony does offer its own 13-inch Multiscan CPD-1390, which a few developers report works well with the Apple color card. Likewise, SuperMac's 19-inch monitor is manufactured by Hitachi, and it's used on workstations like the Iris from Silicon Graphics. You can't buy that monitor off the shelf yet, but as the Mac II gains popularity, and as the prices of high-resolution color monitors drop, it won't be long before it's available.

### Shopping for Rainbows

While this all may have sounded a bit technical, really the only way to pick a monitor is to go out and compare them side-by-side, something I plan to do as soon as I get my Mac II.

Let your eye be the final judge. After all, you're the one who's going to be staring at the screen for hours on end. Just as you can characterize the sound of a stereo system as warm, tinny, brittle, brilliant, full, and so forth, so can you characterize your video as sharp, fuzzy, warm, bright, or hot. Choosing a monitor is really a subjective call.

And don't forget that the marketplace is changing rapidly. As I was finishing this piece, several manufacturers, including Radius, E-Machines, and Jasmine, were about to announce new color cards for the Mac II, making window-shopping even more exciting, but all the more confusing.

Armed with the knowledge of how color works on the Mac II, you're at least prepared to go out and ask some intelligent questions. And after that, let your eyes do the rest.

See Where to Buy for product details.
In order (counter-clockwise): Abaton's C-Scan 300, New Image Technologies' Mac-Scan, the Dens PC Scan Plus, and the AST TurboScan.
Scanning the Horizon

by David Foster

A survey of the current scene in high-resolution image digitizers

Digitizing scanners that work at the LaserWriter's 300-dot-per-inch resolution may be a desktop publisher's or computer artist's dream, but at the moment they're also a shopper's nightmare. In the last year, approximately a dozen high-resolution scanners have been released or announced. While the hardware for many of these units is fairly straightforward, the controlling software packages present a tangled web of choices for the prospective scanner owner. Not only do they offer very different features and pursue different basic approaches to the problem of making digital halftones, but most of these programs are still undergoing development, with features being added or revised on a regular basis. Further complicating matters is the manufacturers' inability to settle on a standard format for high-resolution graphics (see "The Tiff over TIFF").

The six scanners reviewed here are the ones that were actually shipping when we prepared this article. All the control programs except ThunderScan's (which was a beta copy, yet the most polished in some ways) were release versions. On the other hand, almost all the manufacturers said they were expecting upgrades. So if you're worried about a particular shortcoming, compare the version number of the program reviewed here with the one you see in stores; the program may have improved.

Before You Buy

A good grasp of the current state of affairs in the digitizing world will help you evaluate specific models. One of the first issues you should consider is memory. Since most scanners save data to RAM rather than to disk, the maximum area you can scan is limited by the amount of memory remaining after your operating system and scanning application have been loaded. All the scanners reviewed here need at least one megabyte to capture a half-page graphic effectively at 300 dots per inch (dpi). A 512K Mac can handle only about 25 square inches.

High-resolution images also eat up a lot of storage space. You'll need at least one 800K floppy disk drive to save your digitized images. Since a double-sided disk may hold only one or two scan files, a fast SCSI hard disk drive is highly recommended.

Once you're sure you've got enough memory, it's time to consider the kind of scanner you want. Scanners come in two flavors: sheet-fed and flatbed. The optical reader in sheet-fed scanners remains stationary as the artwork moves past it. Flatbed scanners work more like photocopiers, with the optical reader moving across the artwork. All the scanners reviewed here are of the sheet-fed variety.

The major consideration in deciding whether a flatbed configuration merits the extra cost is whether you plan on using artwork, such as prints bound into a book, which can't easily be fed between rollers. Of course, you can always make photocopies of your originals and then scan those. Doing so enables you to size before you digitize, which yields better results than sizing in software. And while you're considering paper-handling mechanisms, be sure to look for basic quality. The Microtek unit (used also by AST and Abaton) is the sturdiest of the assemblies I looked at, while the MacScan struck me as the flimsiest. If you plan on using a scanner in a professional environment, you'll want to consider the superior speed of units that attach to the Mac through the SCSI port versus those that attach through the serial port. As expected, SCSI-based scanners are twice as fast.

One final consideration is that some scanners have the ability to work with both images and text. Optical Character Recognition (OCR) software enables a digitizer to translate printed text into an ASCII file accessible from any word processor,outfile, or database program. When this article was prepared, only the Dest scanner offered OCR. Abaton says it has an optional OCR program ready for distribution. Known as ACR (Abaton Character Recognition), the software will cost $700 to new
No Hereford Jokes, Please
Due to the limited brightness and contrast controls offered by the software for PC Scan Plus

purchasers of the C-Scan 300 and will sell for $995 as an upgrade. Be aware that most OCR programs are limited in their ability to recognize different typefaces and complex formatting.

PC Scan Plus
The Dest PC Scan Plus is a sleek, single-piece unit that fits underneath the Macintosh. Despite this scanner's high price, it doesn't come ready to be attached to the Mac's SCSI connector; you have to buy SCSI cables. Although Dest's installation guide shows how to connect the PC Scan once you have the right cables, two relatively experienced colleagues of mine had difficulty connecting the PC Scan to their Macintoshes. If you're confused about SCSI ID conflicts and when and where SCSI terminators are required, I recommend that you have a competent technician or consultant set up this system for you the first time.

In addition to scanning photographs, shaded drawings, and line art, the PC Scan Plus works as an optical character reader. Making a scan is as simple as inserting originals or photocopies into a slot located in the front of the unit. You must insert pages carefully, since the paper guide is a bit too short to ensure that pages go in perfectly straight. The PC Scan accepts paper sizes from 3½ by 3½ inches to 8½ by 14 inches, and it handles an amazingly wide range of thicknesses and color shades.

Dest's Publish Pac program (version 1.0) is easy to use. You needn't spend any time learning to adjust parameters for controlling halftone patterns or brightness, because these features aren't adjustable; only the contrast of an image can be altered. Publish Pac offers scanning resolutions of 200, 240, or 300 dpi, but the program saves only 300-dpi scans in an easily edited form. Images can be converted into high-contrast bit maps or into halftones.

Publish Pac provides no way to edit a scanned image; your only option is to save it in one of three formats: TIF (Tag Image File Format), a format pioneered by Aldus, which is likely to become a desktop publishing standard; PageMaker format, for loading images into versions of PageMaker preceding version 2.0; and SuperPaint's LaserBits format.

If you want to edit your Dest scan, you must save the image in LaserBits and make your changes in SuperPaint, which comes with the PC Scan. I discovered several severe limitations to this approach. First, an 8-by-10-inch image is the largest you can import into SuperPaint. Second, when you save a large image, it gets broken up. An 8-by-10-inch picture, for example, multiplies into 16 separate documents. Going into so many separate documents to edit a graphic can be extremely frustrating, particularly if your change spans several blocks. Third, if you use HFS you must keep all the documents in the folder in which they were created, or SuperPaint can't find them when you open the master graphic document. Finally, whenever I printed large graphics saved in this format, thin white lines separated each 2-by-2½-inch block, forming an unappealing grid pattern on the LaserWriter output. To make matters worse, the printer was very slow. Some of these problems may be resolved by the time you read this, but until then, I cannot recommend the Dest scanner.

Using Publish Pac to create MacWrite documents from scanned text is surprisingly fast and error-free—when it works. I found that the PC Scan read most text documents created with a typewriter, a letter-quality daisy wheel printer, or even a dot matrix printer quite well. Surprisingly, the software does not recognize most LaserWriter fonts—with the exception of Courier. Text from magazines, books, and newspapers almost always proved unacceptable for scanning. If you need to transform typewritten text into MacWrite documents, however, Publish Pac's OCR capability could be a godsend. The program does a creditable job of preserving paragraphs, columns, tabs, centers, indents, and underlines. You'll need to make a few changes every now and then, but on the whole, this scanner performs capable and reasonably fast optical character recognition.

MacScan
MacScan from New Image Technologies includes a Princeton Graphics LS 300 Page Scanner, a hardware-based SCSI interface, and New Image's MacScan software. Despite some flaws, this package was my favorite of the group. Connected to the Mac via a special SCSI interface box (powered by a ColecoVision power supply), the LS 300 scanner consistently provided high-quality images. This scanner's only major problem is that it feeds images through the machine via small rollers that are located in the center of the paper path, which makes scanning small paper sizes difficult. MacScan digitizes line art and continuous-tone images at resolutions of 75, 150, 200, or 300 dpi. The software gives you only three brightness settings. These are usually sufficient, but a little more control over brightness, as well as some halftone options, would provide a lot more flexibility. MacScan offers seven magnification lev-
The Tiff over TIFF

Once an image has been scanned, the next step is often to either put it into a graphics program for editing or other purposes or to move it directly to a place where it will be useful, such as a page-layout program. Two standard formats have been created to allow high-resolution graphics to be moved back and forth between applications: EPS (Encapsulated PostScript) and TIFF (Tag Image File Format). The market has yet to decide which standard will prevail.

At present, most scanner packages can output TIFF, and some would argue that TIFF may ultimately emerge as the standard, due to acceptance by Microsoft, Aldus, and others. As of this writing, PageMaker 2.0 will definitely support TIFF, and Scoop will probably end up working with TIFF. PageMaker, however, will also support EPS, as does Quark’s XPress. ReadySetGo currently supports only standard PostScript and can accept files only as large as 32K (whereas scanned images can easily run to 1 megabyte).

In the graphics software arena, EPS seems to be the favorite. Cricket Draw outputs EPS, but won't open EPS files created by another program (it will display the EPS code in an editing window.) Adobe’s Illustrator outputs EPS (for Macintosh and for Microsoft's Windows environments), but it also won't open an EPS file created by another program. Neither program will open TIFF files. GraphicWorks 1.1 enables you to open TIFF files and edit them; given this, it might just surpass SuperPaint as the standard low-end scanned-image editor.

Sound confusing? It will probably be a while before the Mac market stabilizes in terms of PostScript/scanned image standards. Predictably, as the Mac grows into more advanced capabilities, Mac owners are beginning to get a taste of what the average IBM PC owner long ago learned to live with: non-standard standards. — David Biedney

C-Scan 300

The hardware for the C-Scan 300 from Abaton was originally produced by Microtek. The unit is solid and heavy, with a large footprint. The excellent sheet-fed roller mechanism accepts a wide variety of page sizes and thicknesses.

The C-Scan 300 connects to the Mac's serial port (usually the modem port) rather than the SCSI port, so the scan rate is noticeably slower than that of SCSI-interfaced scanners. Scanning a full page typically requires three to four minutes. Since the cable that's provided has a DB-9 connector, you'll need a serial port adapter cable to connect the scanner to a Mac Plus or an SE.

Abaton's C-Scan software for the C-Scan 300 is quite distinct from the programs provided by Microtek and AST, which are virtually identical to each other. You work on-screen slider switches to select the number of gray levels and the halftone resolution, as well as to alter the contrast and brightness. You can accomplish mixed-mode scanning by defining areas to be scanned as either line art or continuous tone.

Once you've scanned an image, you can view it in a reduced-to-fit mode, in an expanded representation that simulates a 300-dpi view, in a 72-dpi actual-size view, or in FatBits. The software provides a pencil and paintbrush for editing. You can select and save sections of images to the Clipboard at either 72 or 300 dpi (although there's a size limit on the 300-dpi option), and you can print directly from within the C-Scan software. An option automatically prints a caption describing the settings used to create an image. This is a feature I'd like to see all scanner makers copy.

The quality of the images captured by the Abaton C-Scan 300 scanner are roughly equivalent to those produced by the Princeton LS 300 scanner used by MacScan, but I found that the C-Scan 300 often required several scans and setting changes to achieve the same quality that I got with only one, or at most two, scans on MacScan. Since the serially interfaced Abaton C-Scan 300 scanner is ten times slower than MacScan, its throughput is far less. On
includes a program that allows three installations on a hard drive, I found that properly installed copies could easily become invalidated. Furthermore, the presence of copy-protected programs on a hard disk drive can prohibit the use of utilities that eliminate file fragmentation. This is a major failing about which I'd say more, except that Abaton says it will take the protection off in the immediate future. Abaton says it is also planning to support TIFF in a soon-to-be-released upgrade.

**Microtek MS-300A**

Although Microtek developed the scanner sold by both Abaton and AST, it has lagged behind both companies in developing an adequate image-manipulating program to drive the hardware. Microtek's VersaScan software (version 2.07) was relatively unstable, crashing more than a few times during testing. The program is a classic example of how not to implement a Macintosh interface. For example, you must have different settings for image scanning from different pull-down menus, meaning you cannot check all current settings simultaneously. Scans interrupted by a jam in the roller mechanism cannot be canceled; instead you must reboot the Macintosh.

VersaScan does, however, give you considerable flexibility. You can scan images at resolutions ranging from 75 to 300 dpi in increments of 15 dpi. The program gives you 14 positions for setting contrast and brightness with a range of +28 percent to −24 percent. And you can choose to trade off levels of gray against resolution.

VersaScan 2.07 saves images in VersaScan format (compressed and noncompressed), PostScript format, **MacPaint** format, or TIFF (compressed and noncompressed).

You can edit images in either normal or FatBits view using a pencil tool. More extensive editing requires saving a version of the image as a **MacPaint** file, editing that file with **MacPaint**, and then pasting the result back into the VersaScan image. This process does not, as one might think, degrade the resolution of a 300-dpi image. However, to call it tedious is an understatement. Furthermore, the Microtek system doesn't include **MacPaint**.

Images scanned with VersaScan cannot be printed directly from the program; you must save them as PostScript files, then download them to the LaserWriter or some other PostScript printer with a separate program. This means that to fine-tune a printed image, you must save the scan twice (first as a file that can be reloaded into the VersaScan, and then again as a PostScript file), exit VersaScan, launch a PostScript downloading program, send the PostScript file to the LaserWriter, exit again, and then relaunch VersaScan. If you need to change the settings and scan again, you must repeat this entire process.

Microtek is working on a new version of VersaScan that's much more sophisticated. It will be closer in style to Abaton's C-Scan, and many, if not all, of the serious limitations exhibited by the current version will be corrected. The new version may be shipping by the time you read this.

**AST TurboScan**

Like the Abaton 300, AST's TurboScan hardware is based on Microtek's scanner. The TurboScan software is very similar to Microtek's VersaScan software, but it's more stable. Changing scan parameters is also a bit less tedious, since most settings can be found in a single dialog box. As with the Microtek software, images scanned into TurboScan cannot be printed directly from the program; they must be saved as PostScript files and downloaded to a PostScript printer using a separate program.
TurboScan saves images in several formats, including TurboScan (compressed or noncompressed), PostScript, and MacPaint. The version I evaluated (version 1.2) doesn't work with TIFF. You can place noncompressed TurboScan documents into PageMaker, but the noncompressed file must reside in the System Folder whenever you print the PageMaker document that contains the image.

**ThunderScanner**
The ThunderScanner from Thunderware is a unique offering. It essentially turns an ImageWriter printer into a scanner by replacing the ribbon cartridge with an optical reader, and it's one-tenth the cost of the other scanners. On the other hand, it's much slower than any of them—taking a hundred times longer at high resolution. For example, scanning an 8-inch by 10-inch halftone image with the MacScan took 17.7 seconds, whereas it took 34 minutes using ThunderScanner.

ThunderScanner's sophisticated software, ThunderScan, helps to compensate for its slow scanning speed. The latest version of ThunderScan (4.0) not only provides halftone capabilities equal or superior to those of other packages, it also offers several features no other package can match. For example, ThunderScan's lasso tool lets you select irregularly shaped areas for halftoning, cutting, and copying. With other scanners you often need to scan an image several times with different settings to get the image you want. With ThunderScan you can usually alter a scanned image to your satisfaction without rescanning. ThunderScan images can be rotated by increments of single degrees or surrounded by circular, triangular, or diamond-shaped frames. You can also change the image's standard dots to lines, providing a line-screen effect.

While I can't recommend ThunderScan for professional desktop publishing or for anyone who needs more than one or two scans a day, it's perfectly suited for scanning images on an irregular basis. It's an excellent way to break into the world of image digitizing at low cost.

**And the Winner Is...**

No one, really. If you possess a pioneer spirit and patience to match, most of these scanners can give you the ability to put high resolution digitized graphics into your documents. But without a critical need, I wouldn't purchase any of them at their current state of development. If your scanning demands are light and you don't mind waiting, consider the slow but inexpensive ThunderScanner. If you need to scan several high-resolution images on a daily basis, MacScan is probably your best bet. It scans entire pages in seconds, and it's the least expensive model (next to the ThunderScanner, of course).

Abaton's scanner and software are more capable and flexible than MacScan's, but the copy-protection scheme in the software is inappropriate for professional use. If Abaton has removed protection and added TIFF support as promised, this scanner will definitely be worth consideration. Both AST and MicroTek are also working on improved software that should make them contenders sometime this summer.

**A Realistic Solution**

After reading this review, some of you will come to the conclusion that the scanner software scene could be in better shape. Fear not: an as-yet unreleased program by Letraset, code-named Realist, promises to resolve the scanner software muddle in a single stroke.

**Realist** is an extremely sophisticated PostScript grayscale editor that emulates the capabilities of expensive digital retouching computers. The program will support various scanners directly, circumventing the limitations of individual scanning packages.

Once you've scanned an image with Realist, the fun begins. A full range of editing abilities enables you to modify the scan in just about any fashion imaginable: full interactive control is provided for brightness, contrast, gray-scale remapping and quantization. The zoom feature allows multiple levels of editing, from full page to a 300-dpi FatBits mode. You can scale any area of an image in any way while retaining correct shading, a feature found only in larger dedicated graphics systems.

Using the various editing tools, you can soften hard edges (with the equivalent of an electronic water droplet), smear tones into each other (electronic finger painting), shade areas with a "charcoal" tool, or fill them with a pattern or gradient. You can even restrict fills to the area occupied by a specific shade of gray. Each tool has a myriad of modes and settings, far beyond what could be described in this space.

**Realist** outputs graphics in a number of formats, including EPS, TIFF, and MacPaint. It was promised for release by early this summer, so it may even be out by the time you read this.

—David Biedney

And that's probably the bottom line: while this technology is still immature, there is little doubt in my mind that better hardware and software are not very far in the future (see "A Realistic Solution"). If you're looking for an optical digitizer right now, shop carefully. Make sure promised features are actually in the software that comes in the carton rather than in the developer's mind. Determine whether the programs you currently use can handle the files generated by a scanner. And don't forget that no matter what scanner you buy, lots of memory and storage are crucial for handling large, high-resolution images.

See Where to Buy for product details.
Mystery surrounds the 4th Dimension. Born in France, then nurtured secretly in California under Apple's wing for more than a year, the powerful new database management program has now returned to the care of its original developers. During its tenure at Apple, the program was code-named "Silver Surfer" after 23-year-old programmer Laurent Ribardière's favorite comic book character (see Macworld News, June 1987).

Like the comic character who explores the universe in search of new worlds, 4th Dimension promises to create a small cosmos of applications, since it is actually two potent programs in one: a powerful relational database manager and a complete application-development environment.

4th Dimension has been available in France for two years, where it has been used to develop a range of custom applications that encompasses accounting, document-retrieval systems linked to videodisk players, interactive pictorial medical education, and even adventure and action games.

Database Structure
As a database manager, 4th Dimension lets you visually define a file structure with up to 99 files. Each file may contain up to 511 fields per record, and field types run the gamut: alphanumeric, text, real, integer, long integer, date, and picture. Text fields can vary in length up to 32,767 characters per field. Any field type other than text or picture can be indexed for faster searching and sorting. You decide whether or not indexed fields must have unique values. Fields may also be marked for mandatory entry, and may be designated display-only or unmodifiable. In addition, you can create a scrollable list of standard choices for all but picture fields. Later, when you enter or change records, you enter a value for the field by clicking a choice on the list—no typing is required.

Once you've created your files, you can draw lines to link them together. For example, rather than waste space repeating a customer's address in every invoice, you can link the invoice file to a customer file. One field in an invoice record identifies the customer, and 4th Dimension automatically finds the customer record and makes all its information available, as if it were part of the invoice record.

Very few database managers offer an elegant solution for defining a file whose records have varying numbers of fields. 4th Dimension solves this problem with a special type of field, called a subfile, that makes a dependent file the "value" of the field. For example, a subfile that contains line items for an order file allows an individual order record to have any number of items from none to 16 million (disk space permitting, of course).

Input and Output Form Design
Through layouts, you enter, view, print, and otherwise input and output information from the files in your database (see Figure 1). 4th Dimension can create eight layout designs automatically. You may
Launching a first exploration of a powerful new database manager
Analysis

I've been a fan of 4th Dimension from the first time I saw it in November 1986, when it was known by the code name Silver Surfer. Since then it has gone through a custody battle that makes the struggle for Ewing Oil on TV's "Dallas" seem tame.

First it was to be published by Apple, next an unnamed software publisher was set to buy it, then Apple was going to kill it off to please the other database publishers, and finally it was resurrected under its original French name of 4th Dimension. All this confirms a basic rule of software: great programs never die, they just get acquired.

Database Programming Language
The key to 4th Dimension is a command language specifically designed for database programming. Serious database applications require extensive control over the data-entry process, with strict rules for verifying additions and changes. Repetitive transactions and reports must also be processed. The only way a developer can have complete control over such an application is with a programming language.

Some Mac users claim that a visual interface eliminates the need for a programming language, but this is just wishful thinking. In real life, pictures by themselves are rarely enough to fully describe a multistep procedure or a set of interrelated details. Imagine giving someone directions to your house with just a map, using no additional words to describe the important turns and landmarks. Even comic books have a text narrative.

Database application developers want to control what a program does and when it is done, but they don't want to know the dirty details of how the operation was carried out. To program on the Macintosh with a traditional language like Pascal or C, you have to study hundreds of pages of arcane Toolbox calls listed in Apple's programmers' bible, Inside Macintosh. A 4th Dimension programmer can use commands (such as Save Record to write a record to disk) without knowing any of the system-level details.

Database Publishing
Instead of having to concentrate entirely on the content of database output, 4th Dimension programmers can also assume a great deal of control over the quality of presentation. Just as Mac word processing inevitably led to the current desktop publishing craze, the combination of 4th Dimension and the LaserWriter will open up the equally important area of database publishing. For many print applications, such as price catalogs and financial reports, you'll need more database management and programming control than page-layout programs like PageMaker can provide.

4th Dimension has caused a lot of excitement in the Mac community, even though only a handful of people have seen it. After logging over 200 hours with a prerelease copy, I'm convinced that many users of other Mac databases and even PC databases will want to switch over to 4th Dimension.

– Adam B. Green

Figure 1
In separate windows, you work on database structure, design input and output layouts, and program procedures. In other windows (not shown here), you set up custom menus and establish a password hierarchy.

change them or design your own from scratch using a graphics editor that works like MacDraw. With the layout editor, you draw lines and shapes, type text in any font or style, position objects, paste graphics from MacPaint or MacDraw, and so on. A layout can include fields from the field with which it's associated or from any other file linked to that file. In addition, a layout can include standard buttons, radio buttons, check boxes, graphs, scrollable lists, and variables, although you must program 4th Dimension procedures to make much use of them. Layouts can even include other layouts. You can create as many different layouts as will fit on your disk, and each layout can have a different selection, format, font, style, and arrangement of objects. You also control the foreground and background color of every layout object.
Programming

4th Dimension's structured programming language, with 200 standard commands and functions, is similar to Pascal without the strict control of variable types. You can create your own procedures and functions and then use them just like the standard ones. It's also possible to use external procedures written in Pascal, C, assembler, or some other language.

You can control record selection, set manipulation, data manipulation, links, data input and output, telecommunications, buttons, fonts, dialog boxes, windows, and menus. As a high-level language, 4th Dimension requires relatively little programming effort. For example, managing a standard window requires over 300 lines of Pascal versus 3 lines of 4th Dimension code.

You write a procedure using either of two procedure editors. A listing editor creates conventional text-only programs. A flowchart editor shows program structure graphically with boxes that depict program steps and tests, plus interconnecting lines that map program flow. With either editor, entering program statements requires little typing. You can type keywords, file and field names, and procedure and function names or you can select them from scrollable lists.

User Environment

4th Dimension's user environment handles many standard database management tasks such as adding, modifying, and deleting records. It also lets you perform multiple-criteria searches and sorts with up to 30 sorting levels (see Figure 2). You can define and print columnar reports with subtotals and totals, print mailing labels according to your predesigned layout, or print up to eight types of graphs (see Figure 3). Additionally, you can import or export data in SYLK, DIF, or ASCII format through a configurable character-substitution table. All this requires little or no programming, depending on the complexity of the database. Since most of your programming is effective in the user environment, you can customize the environment for testing stand-alone applications you're developing.

Custom Environment

By adding custom menus and the necessary programming, you can turn any database into a custom application (see Figure 4). 4th Dimension gives you complete control over the menu bar (with the exception of the Apple and Edit menus, which cannot be deleted). You create menus using a menu editor that provides simple commands for changing menu bars, checking and unchecking individual items, disabling and enabling individual items, and so forth. If you design it carefully, your 4th Dimension application will be indistinguishable from one written in Pascal or another conventional development system.

Developing an application in 4th Dimension is a very fluid experience. You can redefine the file structure at any time, adding and deleting files, changing field types and attributes, moving links, and so on, even if the database already contains data; 4th Dimension automatically makes the necessary adjustments. If you want to change the way you enter or view the information in your database, just change a layout or draw a new one.

Since 4th Dimension is a mutiuser application, each user must have a copy of the program, but the database files can reside on a file server. Hierarchical password security is available to restrict access to any menu item or layout. The password system also tracks how many times each password is used and when it was last used.

Overall, 4th Dimension offers tremendous promise for developing exciting new applications with a truly Macintosh flavor. I suppose it's suitable to say that with 4th Dimension, only time will tell.

See Where to Buy for product details.
Whether you're a musician working with sound samples, a visual artist manipulating digitized images, or an analyst working with a large corporate database, you can benefit from the new high-capacity hard disk drives available for the Macintosh. Whereas drives capable of storing hundreds of megabytes were previously available only for minicomputers or mainframes, now you can buy them for the Macintosh at half the former cost. And the Mac versions are just as fast.

The drives I compared represent the state of the art; all offer high performance in compact packages at reasonable prices. Because they've been available for a relatively short time, though, I wasn't able to uncover every little bug and incompatibility. And like most new products, these drives have their share of rough edges. I'll point out a few things to look for and explain how the products differ, but because designs change at a rapid pace, it's best to check with the manufacturer on a drive's status before you buy.

More Storage for the Dollar
Although the hard drives available for the Mac have been criticized for being too expensive, the cost per megabyte shrinks when you move up to larger drives (see Table 1). Apple's latest System 4.0 and Finder 5.4 releases correct many previous problems with high-capacity disks; however, some manufacturers still require System 3.2. Check with the manufacturer for the correct System and Finder versions to use. Right now the only serious limitation in the Macintosh architecture is the Finder's performance when large numbers of files (more than one hundred) are on the desktop. You can work around this limitation by partitioning the disk into multiple logical volumes, using the partitioning software supplied with some of the disks. In Moreover, MacServe also provides for volume partitioning in addition to its networking functions. Alternatively, the number of files on the desktop can be reduced by properly setting up hierarchies of folders. For UNIX users, Apple's A/UX on the Mac II promises to alleviate the problem of dealing with thousands of files on one disk.

Performance
With such a wide range of sizes and prices to choose from, the next factor to consider is performance. Fortunately, the higher-capacity hard disks offer more speed to accompany their increased storage capacities and prices. If you're processing large databases, or graphics or sound files, the speed differences can be quite noticeable. And if the disk is going to be shared on a network, the higher-performance drives will let more users share data without sacrificing too much speed.

One thing to remember is that in disk performance, the Mac SE substantially outpaces the standard Mac Plus. And the Mac II, with its true direct-memory-access (DMA) SCSI interface, has the potential to perform much faster than even the SE.

All the drives I tested worked well with AppleShare, TOPS, MacServe, and HyperNet should also work with these drives; however, I wasn't able to test the drives with these packages.

To measure drive performance I ran a series of tests using Steve Brecher's public domain DiskTimer II program and a few other tests that are more representative of the performance you'll get when using the drive (see Table 2).

DiskTimer II tests the raw performance of the drive. Proponents of the test argue that it isolates a drive's performance from other random variables that could invalidate a performance test. Detractors say it overlooks operating system factors that...
Three to Grow On
Peripheral Land, LoDown, and AST were among the first to establish a solid reputation in the hard drive market. Shown here (clockwise from left): the Peripheral Land PL172, the LoDown LD-155, and the AST-4000.

Table 1
If you compare the cost per megabyte, two of the drives tested are less than half the cost per megabyte of a typical 20MB drive.

<table>
<thead>
<tr>
<th>Drive</th>
<th>Price</th>
<th>Disk Capacity (MB)</th>
<th>Cost/MB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Drive 80</td>
<td>$1380</td>
<td>77</td>
<td>$17.92</td>
</tr>
<tr>
<td>CMS S240</td>
<td>$4195</td>
<td>225</td>
<td>$18.64</td>
</tr>
<tr>
<td>SunStreak SCSI-245</td>
<td>$7495</td>
<td>235</td>
<td>$31.89</td>
</tr>
<tr>
<td>PL172</td>
<td>$4995</td>
<td>150</td>
<td>$39.97</td>
</tr>
<tr>
<td>Typical 20MB disk</td>
<td>$900</td>
<td>20</td>
<td>$45.00</td>
</tr>
<tr>
<td>Disk/tape combo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MagNet 172x</td>
<td>$6995</td>
<td>140</td>
<td>$49.96</td>
</tr>
<tr>
<td>SS400/Mac261</td>
<td>$11,800</td>
<td>253</td>
<td>$46.64</td>
</tr>
</tbody>
</table>

affect the drive’s performance in the real world. The write test measures the time it takes the drive to write a 24K data block. The read test measures the time required to read the same data block. The access test measures the time it takes to read 512 bytes and then read a second 512-byte block located 1 megabyte away.

Sizing up the Competition
You’ll find a wide range of sizes and shapes among these large-capacity hard disks. The Jasmine Direct Drive 80 is small enough to fit into a briefcase, while the Northern Telecom unit requires two people just to lift it out of the box. All are reasonably quiet; even the relatively loud Peripheral Land PL172 would probably fade into office background noise, and the others are generally quiet enough for home use. All drives tested have fans.

One drive comes with 25-pin SCSI connectors, and all the others have 50-pin connectors. The drives with 25-pin connectors require less-expensive cables, but both types of connectors work fine. A much more serious concern is how you set the SCSI address. If you have a Mac SE with an internal hard disk, all external drives must be set to an address other than 0, or the system won’t start up properly.

Some drives come with the address preset at the factory, while others provide a push button on the outside of the cabinet for changing the address. Three drives have jumpers that you change. The push-button method is by far the easiest—the only potential problems are accidentally changing the address by bumping the switch, and attempting to use addresses 7, 8, and 9, which are off-limits on the Mac. These minor concerns are more than made up for by the ease with which you can readdress the drive.

Drives with Utility
Back up disks is a necessity. Take it from someone who has had more than one hard disk fail suddenly and completely, without any warning. Some of the drives include built-in tape backup units and flexible backup and restore software—a real advantage. Others don’t, and you’ll have to buy a separate tape drive or a removable cartridge drive for backing up the data. Even the smallest-capacity drive tested, the Jasmine 80, is much too large to have its contents backed up onto floppy disks—it takes one hundred 800K floppies, or more than fifty 1.6MB disks, to back up 80 megabytes.

A utility program that rewrites the hard disk’s driver without reformattting the disk can be crucial; it may allow you to recover lost data when the disk is malfunctioning. The driver is a critical piece of the hard disk puzzle, and manufacturers are constantly modifying it to accommodate new Macs and improve performance. Some of these disks come with a driver-update utility—named “manager” or “mount”—and you’ll find a wide range of sizes and shapes among these large-capacity hard disks.

July 1987
some require you to reformat the disk before updating. All the hard disks reviewed offer a program for reformatting the disk, but this should rarely be done, because it destroys whatever data is on the disk. The Jasmine drive employs a unique method of hard sectoring that preserves the data after a reformatting operation.

A few manufacturers offer print spoolers along with their drives. Jasmine and Mirror use Think Technologies' LaserSpeed (see "Speaking of Spoolers," Macworld, June 1987). Since print spooling software is available separately, you should consider it a bonus rather than a necessity.

A Look at the Drives

CMS S240

This workhorse offers a huge capacity in a small, shoebox-sized package that can sit quietly on your desktop. Its performance is speedy; especially when compared to smaller drives, and CMS bundles in Hard Disk Partition, so you can store thousands of files on the drive by separating them into logical volumes. Hard Disk Partition also offers some security by letting you choose an optional password for each volume. You create, delete, mount, and unmount volumes from a desktop accessory. The volume size is limited to 32MB each.

You can change the SCSI address from the outside of the S240's case, although you must use jumpers. The manual and the utility programs are good, and CMS offers a one-year warranty. Although the price per megabyte is one of the lowest, you'll have to shop elsewhere for backup and spooling capabilities.

Jasmine Direct Drive 80

You can easily fall in love with the quiet Jasmine drive. First, it's amazingly compact, fitting easily under the Mac or into a briefcase. And despite the bargain-basement price, it comes with extras like a push-button SCSI address selector, an air filter, surge protection, and two extra AC outlets in back; Jasmine also offers a one-year warranty. The drive ran flawlessly during the review period, with very good performance and no compatibility problems of any kind. The utility software is good, and the LaserSpeed spooler is included. The manual wasn't finished at the time of this review, but if the Direct Drive 20 manual is any indication, this one should be fine.

MagNet 172x

This drive from Mirror Technologies comes complete with built-in tape backup and two flexible backup/restore programs: one for AppleShare and the other for normal backup. The utility programs are complete and well-designed, and LaserSpeed is included. The only features missing are volume partitioning and an external SCSI address button. The MagNet is quiet, and it's compact enough for a desktop (about the same size as the CMS S240). Though you pay a little more to get the tape backup, the MagNet is less expensive than some of the other drives on the market. All in all, it's an attractive package for network or business applications.

<table>
<thead>
<tr>
<th>DiskTimer II Results</th>
<th>Real-World Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in tenths of a second)</td>
<td>(in seconds)</td>
</tr>
<tr>
<td>Read</td>
<td>Write</td>
</tr>
<tr>
<td>RAM disk</td>
<td>17</td>
</tr>
<tr>
<td>PL172</td>
<td>53</td>
</tr>
<tr>
<td>SS400/Mac261</td>
<td>65</td>
</tr>
<tr>
<td>CMS S240</td>
<td>101</td>
</tr>
<tr>
<td>Jasmine 80</td>
<td>129</td>
</tr>
<tr>
<td>MagNet 172x</td>
<td>157</td>
</tr>
<tr>
<td>SunStreak SCSI-245</td>
<td>138</td>
</tr>
<tr>
<td>PL172</td>
<td>238</td>
</tr>
</tbody>
</table>

Table 2
DiskTimer II provides only raw measurement statistics, while the two real-world tests are better indicators of the actual performance you can expect from the drives.

Storage Trio
Shown clockwise from left: Mirror's MagNet 172x, CMS's S240, and Storyst Systms' Sun-Streak SCSI-245.
### High-Capacity Hard Disks Compared

<table>
<thead>
<tr>
<th>Company</th>
<th>Reviewed</th>
<th>Formatted Capacity (MB)</th>
<th>Price</th>
<th>Warranty</th>
<th>Fan</th>
<th>SCSI Connectors</th>
<th>SCSI Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMS</td>
<td>•</td>
<td>225</td>
<td>$4195</td>
<td>1 year</td>
<td>•</td>
<td>two 25-pin</td>
<td>0-6; external jumpers</td>
</tr>
<tr>
<td>Jasmine Computer Systems</td>
<td>•</td>
<td>77</td>
<td>$1380</td>
<td>1 year</td>
<td>•</td>
<td>two 50-pin</td>
<td>0-6; push button</td>
</tr>
<tr>
<td>Mirror Technologies</td>
<td>•</td>
<td>140</td>
<td>$6995</td>
<td>1 year</td>
<td>•</td>
<td>two 50-pin</td>
<td>5; internal jumpers</td>
</tr>
<tr>
<td>Northern Telecom, Memory Systems Division</td>
<td>•</td>
<td>253</td>
<td>$11,800</td>
<td>2 years/1 year²</td>
<td>•</td>
<td>two 50-pin</td>
<td>0-6; push button</td>
</tr>
<tr>
<td>Peripheral Land</td>
<td>•</td>
<td>150</td>
<td>$4995</td>
<td>1 year</td>
<td>•</td>
<td>two 50-pin</td>
<td>2; internal jumpers</td>
</tr>
<tr>
<td>Sanol Systems</td>
<td>•</td>
<td>235</td>
<td>$7495</td>
<td>6 months</td>
<td>•</td>
<td>two 50-pin</td>
<td>0; factory set</td>
</tr>
<tr>
<td>Bering Industries</td>
<td>100</td>
<td>$3995</td>
<td>90 days³</td>
<td></td>
<td>•</td>
<td>two 50-pin</td>
<td>external switches</td>
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<tr>
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<td>$3895</td>
<td>90 days³</td>
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<td>two 50-pin</td>
<td>external switches</td>
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<tr>
<td>Century Data Systems</td>
<td>83</td>
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<td></td>
<td>•</td>
<td>two 50-pin</td>
<td>external DIP switches</td>
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<tr>
<td>Softworks Limited</td>
<td>105</td>
<td>$2499</td>
<td>6 months (ext.)</td>
<td></td>
<td>•</td>
<td>two 50-pin</td>
<td>internal jumpers</td>
</tr>
<tr>
<td>Softworks Limited</td>
<td>140</td>
<td>$3495</td>
<td>6 months (ext.)</td>
<td></td>
<td>•</td>
<td>two 50-pin</td>
<td>internal jumpers</td>
</tr>
<tr>
<td>Softworks Limited</td>
<td>170</td>
<td>$3995</td>
<td>6 months (ext.)</td>
<td></td>
<td>•</td>
<td>two 50-pin</td>
<td>internal jumpers</td>
</tr>
<tr>
<td>Softworks Limited</td>
<td>270</td>
<td>$6495</td>
<td>6 months (ext.)</td>
<td></td>
<td>•</td>
<td>two 50-pin</td>
<td>internal jumpers</td>
</tr>
</tbody>
</table>

1 Standard backup free; full-featured backup available for $25.
2 Drive: two years/other components, one year.
3 Automatic bad-block remapping.
4 There are two formatting programs; one is much faster.
5 Extended warranty available.

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### Breaking the Gigabyte Barrier

Mitra's ProStation 1024, the first expandable drive to offer up to a gigabyte (1024MB) of storage, is ideal as a large network server. The ProStation comes with either a 40-, 120-, or 240MB tape drive for backups. The cabinet is designed to sit under the Mac II and includes SafetyNet network backup software.

### Northern Telecom SS400/Mac261

This disk drive looks like a minicomputer from Digital Equipment or IBM, and it's priced accordingly at $11,000. It's also big: a hefty 85 pounds. That's a lot to carry around, so it has casters on the bottom to make it more transportable. The drive is fairly quiet, although it does make some loud noises at start-up time. Northern Telecom uses its own 8-inch hard disk inside, which is guaranteed for two years. A pop-out tape drive in the front is used for backups, and a push-button SCSI address selector is provided on the back. It has first-class hardware and software and good disk performance. Volume partitioning is built-in, and the backup and utility programs are both very good. Even the manual is superior. Performance was brisk, and I encountered no problems or incompatibilities at all during the test period. The SS400 makes a very good network file server with its speed, backup, and robust design.

### Peripheral Land PL172

This drive is like a sports car in character—fast, expensive, and a little noisy and temperamental. It's an attractive, vertical drive, about twice the width of a DataFrame, and can sit conveniently beside a Mac.
The PL172 is like a sports car in character—fast, expensive, and temperamental.

I did encounter some difficulty, though, which I finally traced to the start-up sequence. Unless you start the PL172 and wait for it to come up to speed before powering on the Mac, it may get confused and not start at all. It also took me a while to realize that the two ports on the back are not the same—one is intended for connecting to the Mac, and the other is for additional disk drives. If you don’t use the correct one, the drive may not work.

Once it’s running, the PL172 is the fastest of the bunch, if it has been formatted using the special Turbo Format 4.1 utility. Using the regular Format 4.0 resulted in performance that was just average for the group of drives tested. The tests I ran clearly demonstrated the importance of the driver software. Unfortunately, the PL172 has no provision for rewriting the driver software without destroying all the other data on the drive. SCSI addressing is also cumbersome—you must open the cabinet to set the jumper switches.

Peripheral Land does provide backup software and its own volume-partitioning utility, but the manual isn’t too impressive. I also encountered some crashes using the volume mount program, although no data was lost.

Sunol SunStreak SCSI-245

The Sunol SunStreak presents an interesting contrast to the CMS drive. At the heart of each is a Maxtor drive, but the Sunol is three or four times the size of the CMS. Sunol doesn’t provide any easy way of changing SCSI addresses and presets the address to 0, which conflicts with the internal hard disk of a Macintosh SE. It has a meager manual and provides no programs for backing up the hard disk or installing a driver without destroying the data on the drive. The warranty lasts only six months.

High-Capacity Shopping

The products reviewed had a surprising number of unique characteristics, considering that SCSI disks have become a Mac commodity. You can choose from a wide range of prices and capacities, and any one of the drives should prove satisfactory for Mac Plus, SE, and II owners.

The Jasmine 80 is a very nice unit at an extremely good price. In fact, you could buy two—one to back up the other. The CMS S240 outclasses the Sunol SunStreak, but you’ll need to shop for a backup system unless the disk is shared in a way that allows many users to handle their own backups individually (usually not a good idea). The Peripheral Land drive is the hot rod of the group, a good choice if you need top performance right away—but other manufacturers will undoubtedly catch up with similar high-speed driver software. The Mirror MagNet 172x is a sort of half-sized version of the Northern Telecom S261, and these two provide the advantage of built-in tape backup at a higher cost per megabyte.
The Architect's Apprentice

In large and small practices, the Mac is changing the way architects think about design.

by Stuart Silverstone

Hard at work on a renovation project at the California firm of Neil Stanton Palmer, architect Barry Isakson found he could produce an elegant construction document in a fraction of the time it would have taken him with the traditional methods of manual tracing and drafting. Using MacDraw and a ThunderScanner, Isakson was able to combine text labels for construction procedures with a digitized image of the building facade.

Such an innovation, while not the most important or most typical Mac architectural application, shows how architects around the country are integrating Mac technology into their practices.

The eager architects who responded on an emotional level to the Lisa, or who adopted the Mac early on, haven't always found the machines easy to use in their practice. They doggedly plowed ahead with the versatile but limited MacPaint and MacDraw software, until more serious drafting tools emerged.

But even with the arrival of today's special-purpose CAD packages and sophisticated peripherals (such as the LaserWriter), architects still choose the Mac for the same reasons they originally did. "The Mac overcomes the two main objections to CAD, especially for small offices," says Florida architect Chuck Carroll. "The start-up cost is one third of other computer systems, and the learning curve is a fraction of the time." San Diego landscape architect Niles Nordquist adds, "Hardware and software are relatively inexpensive. The real cost of CAD is in training, and the Mac is the simplest and fastest machine to learn."

Drafting Plans

Large architectural firms working on major projects still require the special abilities of minicomputers and graphics workstations for drafting purposes (for example, the Mac Plus can't drive electrostatic plotters, nor can it manipulate the hundreds of layers sometimes required for a single set of plans). Small and medium-size practices, however, increasingly turn to the Macintosh to produce plans for everything from houses to shopping centers, hospitals, and commercial buildings.

Of the many software packages available for producing traditional architectural drawings—floor plans, elevations, cross-sections, and large-scale details—no clear winners have yet emerged as the best overall or the best for a particular task. Architects may choose EZ-Draw, MacDraw, MacDraft, MGMStation, or MinicAD to do the same type of job, based on their own preferences or product familiarity. The choice does not seem to be based on software costs—price differences are easily justified for a tool used daily in a professional practice. Far more important considerations are speed and ease of operation, the way features fit individual working styles, and training costs.

Some architects use MacDraw, for example, to perform functions that other architects accomplish with one of the many special-purpose, high-powered CAD software packages. MacDraw's ease of use and versatility are its drawing cards. For complex floor plans, elevations, cross-sections, and construction details, however, the Mac’s generic drawing tool is quite limited. This is why Tim Johnson, MIT architecture professor and a computer graphics pioneer, came up with his own solution. Creator of the first 3-D graphics...
system, Sketchpad III, in 1963, Johnson developed the Sizer and Adjacency desk accessory to provide MacDraw with inexpensive CAD capabilities (see Reviews, Macworld, March 1987).

With this enhanced form of MacDraw, New Hampshire architectural designer Ed Cundy produces everything from preliminary schematic drawings to complete sets of final working drawings. Cundy works by himself, primarily on residential and light commercial projects. Sizer and Adjacency enables Cundy to lay out entire drawings accurately in MacDraw without taking the time to zoom in from Reduce-to-Fit mode. The desk accessory lets you use a dialog box to size MacDraw shapes precisely according to a pre-selected scale, and the adjacency features snap sized elements into place automatically.

Although Cundy wishes Sizer could measure diagonal lines and would like to see a zoom feature in MacDraw, he says his projects don't really require the precision and features of advanced CAD programs. "I can create any architectural drawing at any scale, extract its dimensions, and label them with great accuracy, while retaining MacDraw's screen-refresh speed and efficiency," Cundy explains.

The Victoria, British Columbia, firm of Douglas A. Campbell is, according to principal Tom Moore, "100 percent Mac—we don't use pencils." The company's most recent project is a $7.5 million 150-room hotel located in Victoria.
The 12-person firm has four 512K Macs and two Pluses running with a 20-megabyte hard disk over a MacServe network. Moore says staff members formerly used MacDraw for many purposes but have now switched almost entirely to MiniCAD, because it combines a natural drawing style and the ability to work with up to 40 layers. While the 512K Macs diminish MiniCAD's performance, they are tolerable for the present (see Figure 1).

Of course, with more complex software, training time becomes a more important consideration. General Manager Owen Moore figures the learning curve for MiniCAD is one week for working at a residential level and another two months to become familiar with the more complex routines and shortcuts—although you can start drawing within hours. He adds that "within a month people should be working at two to three times manual drawing speed."

While Owen's brother Tom Moore says that he originally expected computerized drafting to save time only in the revision process, he has been pleasantly surprised to find that Macs are actually faster for initial drawing than are manual methods. Another unexpected benefit of the all-Mac practice, according to Moore, is that it enables the firm to lower its overhead by saving on office space, since a Mac workstation takes up about half the room of a traditional layout area.

Architect Joseph Bayer, of Hermitage, Pennsylvania, says the Mac is crucial to his one-man practice: "It enables me to remain small yet productive." Of Mac drafting Bayer observes that the more repetition involved in a project, the more time he saves. Regarding a recently designed 60-bed motel, Bayer comments, "Once I'd laid out one room, I'd virtually laid out the whole project."

After trying many CAD packages, Bayer now uses a combination of MiniCAD for presentations and design drawings and MGMStation for final working drawings. In addition to its "more natural" drawing style, Bayer finds MiniCAD appropriate for presentations because of its ability to cut and paste bit-mapped clip art and digitized graphics. While he feels that MGMStation is not "architect intuitive," he uses the package for construction drawings mainly because it offers superior dimensioning features.

Bayer's advice to anyone considering CAD on the Mac: get a large-screen monitor. His choice was the Stretch Screen, from Network Specialties.

**Output**

One of the main concerns for architects considering the Macintosh is whether it can produce the large drawings—up to 30 by 42 inches—that are the traditional format for construction plans. While some architects have developed techniques for working around the size limitations of the standard Mac output devices, others opt for drafting fine-plotters. Both approaches involve trade-offs.

Pen plotters are probably the output devices with which architects are most familiar. Plotter drivers such as MacPlot or MacPlots II enable the Mac to work with a wide variety of pen plotters. Plotters have the advantages of being able to produce very fine (up to 1/100-inch) color lines and large-format, single-sheet drawings. On the other hand, they lack the quality typography, fill patterns, speed, and convenience of Mac printers.

A wide-carriage (15-inch) ImageWriter is the solution for Boston architect Bill Bunting. Two 15-inch printouts spliced together form standard sheet sizes up to 30 inches wide by 40 inches long. Bunting then uses standard photocopying techniques to transfer his design to a single reproducible transparency that can be revised as needed and reproduced for multiple drawing sets. Although the ImageWriter provides a simple method of producing adequate-quality output at a low cost, it lacks the high-resolution typography and fill patterns available from laser printers and professional typesetters. In addition, because the Image-writer...

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**Figure 1**
The plans and elevation for this Victoria, B.C., home were created in MiniCAD and plotted on a Houston DMP52. Drawings by Douglas A. Campbell, Ltd.

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Writer doesn’t print with 100 percent accuracy, lines that are supposed to match on spliced pages often vary by up to 1/8 inch.

The LaserWriter, on the other hand, gives architect Barry Isaksen the ability to produce polished output quickly and easily. Since the LaserWriter has a paper-size limit of 8½ by 14 inches, however, Isaksen must piece together multiple printouts to produce large drawings. He usually tapes together up to six small drawings of standard plans, details, and information schedules to produce a 25½- by 22-inch drawing sheet, which he then enlarges onto reproducible vellum using a high-quality Shach or Xerox 2080 copier (see Figure 2).

Architect Tim Johnson of Boston uses an Allied Linotronic 100 as an output tool. He accesses that expensive equipment by taking disk copies of Mac-drawn building plans to a local service bureau. Johnson then uses a Shach copier to enlarge the 8½- by 11-inch, high-resolution output 200 to 400 percent to create reproducible drawings of up to 34 by 44 inches. The results are professional-looking drawings that hold fine hairlines and have typeset-quality typography and a variety of excellent fill patterns.

One solution to the output problem is simply to avoid the large-size plans that are traditional in the building industry. For some simpler buildings, plans and elevations remain readable when printed on small drawing sheets of 11 by 17 inches or even 8½ by 11 inches. Some portions of a traditional set of building plans, such as large-scale joint details, are typically composed of small drawings grouped together on a large drawing sheet. When these drawings are produced on a LaserWriter on 8½- by 11-inch sheets, or 11- by 17-inch foldouts, they take full advantage of the quality and versatility of computer technology and yet remain convenient for the people who ultimately work with them. “I can use the Mac to create a set of working drawings at 11 by 17 inches with complete specs,” says landscape architect Nordquist. “It’s a great benefit for the contractor, who doesn’t need to carry around a big, heavy set of drawings.”

Massing Studies

Some new Mac software, developed by and for architects, attempts to go beyond merely automating procedures traditionally performed by hand. Since building environments exist in three dimensions, architects realize a great advantage in being able to study the massing of proposed design solutions in 3-D before drafting their plan and elevation views. Two new Mac software tools—Schema, developed by architects at Harvard’s Graduate School of Design, and New-Studio, developed by graduates of UCLA’s school of architecture—enable architects to construct complex, three-dimensional masses that can be viewed from any vantage point and manipulated for quick exploration of alternative designs (see Figure 3).

In Schema you create building masses by selecting solid objects from a palette of three-dimensional shapes. You can then freely manipulate edges and corners to produce curves and irregular shapes. New-Studio provides a palette from which you choose rectangular, elliptical, polygonal, straight-line, and other design primitives. These two-dimensional building blocks can then either be revolted or extruded to create solid shapes. Additionally, the program enables you to generate perspective, axonometric, or isometric projections (either as wireframes or with hidden lines removed) from designs in plan, front, and side views.

New Mexico architect Richard Nordhouse used Schema to explore ideas in the schematic-design phase of a proposed housing subdivision. “We studied relationships between the housing and the street by designing a few units in Schema, cloning the units and placing them along both sides of the street, and viewing alternative designs from many vantage points,” explains Nordhouse. He then printed the best view of the best arrangement, traced overlays, and produced a rendering with colored pencils, pastels, and felt-tip pens.
Perspective Renderings

Beyond a rotatable view on the Mac screen, the next-best method for visualizing a building's shape is a perspective view. Production of hand-drawn perspectives is time-consuming and is traditionally undertaken only when a design is complete and ready for presentation. With the Mac, creating perspective views can be part of the design process. "I can generate one-, two-, or even three-point perspectives so quickly that I find myself using them to test out ideas from the very beginning," says Dennis Dornan of Field/Paoli Architects in San Francisco. "With MacPerspective I can model even quite complex designs in one or two hours and print out as many different viewpoints as I choose. This is valuable for keeping the client informed during the design phase of a job and getting feedback at the earliest time."

Architect Bob Senonson uses SpaceEdit to take this process one step further. Once he has settled on a design and perspective he likes, Senonson transfers the perspectives to ComicWorks for enhancements such as shading and shadows. "ComicWorks has an airbrushlike feature with incredible control over pixel density," he explains. Clip-art views of different tree varieties, available from MacGraphics, make it easy to add realism to Mac-generated perspectives. Senonson then uses MacPlot to output the resulting graphic on a line plotter. From the plotter output he makes a standard architectural blueprint and renders a high-quality presentation of the project design with colored pencils and felt-tip pens.

Albert C. Martin and Associates, a 200-person, 40-Mac architectural and engineering firm in Los Angeles, uses a digitizer to create quick renderings for presentations. Firm members create building studies in cardboard, photograph them, and then digitize the photographs with a scanner. When the architects present the models to clients, they pass out desktop-published descriptions that include the digitized images.

Baltimore architect and illustrator Isao Oishi uses Mac-drawn perspectives to produce elegant painted renderings of proposed building projects for internationally acclaimed architectural firms (see Figure 4). Oishi drafts as much detail as possible in MacPerspective (see Reviews, Macworld, November 1986), but he prefers to draw trees, people, and shadows by hand. He traces the hard-copy plotter output onto mylar tracing film using ink, colored pencil, felt-tip pen, and watercolor or airbrush. Oishi finds the fill patterns and line resolution of plotters generally unacceptable, but overcomes that problem by plotting large and then photographically reducing the drawing 25 percent. His artistic results command high prices from clients, who feature them in leasing brochures and display advertisements.

Even construction details and assembly procedures can be rendered on the Mac, with shade and shadow for improved informational clarity. Niles Nordquist finds that his high-resolution rendered perspectives of details are clear enough to replace several normal views (see Figure 5).

Design Concepts

Many design decisions—such as the relative location, adjacencies, and grouping of activities or spaces—can be made before an architect draws specific sizes and shapes of rooms. While the Macintosh can't automate these conceptual design decisions, it can facilitate them.
At the simplest level, one can define a design problem based on client preferences, square-footage needs, building-site resources and limitations, available materials, and other program factors—with the help of standard word processing, idea outlining, and spreadsheet and database software. Architects at the internationally acclaimed firm of Cambridge Seven use Microsoft's Multiplan to massage a project's square-footage requirements until they conform to budget restrictions. Architects actually take a Mac into client meetings and run calculations until the clients' diverse and often conflicting interests are sorted out. At the meeting's end, the resolution is printed on an ImageWriter and distributed.

More sophisticated analyses of a building project—for example, the examination of pedestrian circulation patterns or the relationship of energy consumption to a building's orientation to the sun—can be performed on a Mac using simple bubble diagrams, diagram languages, or modeling software.

Specialty Applications

In addition to design and drafting software, architects use all the common Mac office tools. They plan projects with MacProject and Microplan; they create brochures and environmental impact reports with desktop publishing software; they mock up signs; and they telecommunicate drawings to consultants, clients, contractors, reproduction services, and building sites. But alongside generic office tools, specialized support software designed for architects' needs is beginning to appear on the market.

ArchAccount, for example, is a customized package that handles tasks such as architectural project billing; job costing; and tracking of time-sheet data, expenses, project status, client payments, and project earnings.

Architects need more than MacWrite to prepare the detailed written specifications that must accompany a set of working drawings. MacSpec, from LM software, is a technical word processor that's designed to manage hundreds of sections and subsections on topics like joint sealants, material performance requirements, and interior finishes. The program lets you number sections hierarchically for sorting and accessing.

As a nice adjunct to MacSpec, the American Institute of Architects now publishes its MasterSpec documentation on disk. You simply call up standard technical specifications and incorporate them into your documents wherever needed.

Structural analysis programs like MacFrame, Simple Span, and FrameMac provide tremendous conceptual aid for architects. Such programs perform common beam- and column-structure analyses to determine sizes of structural elements—in wood, steel, or concrete, for example—for various fixed- and changing-load conditions. While these programs don't eliminate the need for a consulting engineer, they allow an architect to conceptualize efficient structural systems in the early design phases without waiting for an engineer's analysis.

The Future

As the Mac's early fans knew they would—and its hesitant enthusiasts hoped—the Mac's inherent strengths are now fulfilling their potential for architectural applications. The next step in the development of truly efficient CAD tools for microcomputers will be integrated programs that combine all the varied and interrelated activities of the design process in a single package.

Such products have been demonstrated in academia (principally in architecture schools at MIT, Harvard, Carnegie-Mellon, and UCLA), and companies like ComputerVision and McDonnell Douglas have offered some products for minicomputers and supermicros. Similar products for the Mac could be on the desktop within a year. The principal obstacle to all these efforts has been the lack of a common descriptive language that could represent design elements at all stages of a building's development, translating information from relational abstractions to spatial descriptions.

Developing an integrated package of this magnitude is an ambitious undertaking that extends beyond the automation of manual techniques into the realm of artificial intelligence. This path is an obvious one, however, for an industry that has already revolutionized the way we write, communicate, illustrate, publish, and even think. ☐

See Where to Buy for product details.
Speed seems to be the calling card for modem manufacturers these days: 300 bits per second (bps) is hopelessly old-fashioned. While 1200 bps is the current standard, available in reasonably priced modems, 2400 is hot on its heels—twice as fast and almost as cheap. The next logical step, 4800 bps, seems to have been skipped altogether; already 9600-bps modems are available for under $2000, and a modem costing less than $1500 that can communicate at nearly 19,200 bps over standard telephone lines has recently been introduced.

Files that would take several hours to send at 300 bps can be transferred in minutes at 9600. If you regularly send large files to distant places, you'll realize an immediate gain in productivity—accompanied by shrinking phone bills. But paying the price for high speed may not be the best choice. In this article, we'll present the features that set modems apart from one another, and see how nine modems on the market fit in.
The Speed Trade-off

If exchanging files is only a small part of the way you use a modem, speeds in excess of 1200 bps might be overkill. You can only type or read so fast, so standard 300/1200-bps modems are generally adequate for applications like calling a bulletin board system, reading electronic mail, or entering information into a remote database. Few, if any, information services or packet-switching networks currently support connections above 2400 bps.

Moreover, with faster modems the price you pay for speed could be more than the one on the price tag. Lacking the standards set for less adventurous speeds, you'll often have to send files without the error-checking safety nets set up for more sedate data transmission.

Three on a Match

Another consideration in picking a modem is its compatibility with other modems. For communication to take place between two modems, both must support the same data transmission rate and agree on communication protocols.

In data communications, the term protocol is applied to at least three different but related aspects of the process: the data transmission speed and properties (confirmed in the initial signals the modems send, called the handshake), the signals used to control the flow of information, and the method of checking for errors in the transmitted information.

Until the 1984 divestiture of AT&T, most modems followed the Bell standards for communication protocols; the Bell 103 and 212A protocols remain dominant for 300 and 1200 bps, respectively. After divestiture, when the 2400-bps modem came on the scene, manufacturers more or less universally adopted the only standard available: CCITT V.22 bis, from the Consultative Committee on International Telegraph and Telephone, an international telecommunications advisory organization.

At higher transmission rates, no single protocol rules. There are three technologically distinct types of 9600-bps modems: CCITT V.32-compatible, modified CCITT V.29, and proprietary nonstandard devices. Only the V.32 protocol is implemented in the same way across manufacturer lines. The V.29 scheme has been adapted in different ways by different modem makers, putting a wrench in compatibility. Modems that use V.29 and modems that incorporate proprietary technologies for high-speed communication can be used only with modems from the same manufacturer. So if you want a high-speed modem, it's important to find one that can fall back gracefully to 2400, 1200, or even 300 bps—speeds at which compatibility between different manufacturers' modems can be counted on.

Overhead Transmission

The terms bits per second and baud are often used interchangeably. They have distinct meanings, however. Bits per second (bps) refers to the number of data bits received from the terminal and transmitted; baud is the measure of the number of modulations per second performed by the modem. When one modulation equals one bit, bits per second and baud are equal. To achieve high transmission speeds, however, a single modulation can convey several bits of information, and often the number of bits per second will be some multiple of the baud rate.

The more complex the modulation scheme, however, the more susceptible the signal becomes to distortion during transmission. To take account of the inevitable noise on telephone lines, error-correction features must be built into the communication process, either in software or in hardware. High-speed modems usually incorporate error-correction facilities within the modem itself, since hardware-based code can respond faster than independent software.

To check transmitted data for glitches acquired in transit, error-correction facilities at both ends of the line generate a number based on the data bits in each block of data sent. If the results of the independent calculations don't match, the system assumes that an error occurred in transmission, and the offending block is resent again.

A noisy line can slow even the fastest modem to a plodding pace as the device is kept busy retransmitting error-plagued blocks. A well-designed error-correction scheme can keep a modem at or near peak speeds even over noisy lines by filtering out extraneous noise and detecting and counteracting signal distortions. Throughput—how much data gets through in a given time—is a better measure of modem speed than an advertised bps rate (see "Beyond Baud").

(continues)

### Manufacturer | Effective bps | Transfer Time (in minutes)
--- | --- | ---
Migent | 960 | 46.65
Novation | 1840 | 23.82
Hayes | 1866 | 23.48
Racal | 6831 | 6.42
Fastcomm | 7300 | 6.08
Telcor | 7306 | 6.00
Codex | 7666 | 5.72
Microcom | 14,454 | 3.05
Telebit | 17,265 | 2.53

Beyond Baud
The actual speed of a modem depends on more than its advertised rate of bits per second. The error-checking protocol and extra like data compression determine the actual throughput—the amount of original data that actually gets sent in a given amount of time.
Modems for Many

A high-speed, intelligent modem is an expensive proposition. For a stand-alone computer that communicates less than 10 percent of its working hours, $3000 for a peripheral may be a prohibitive cost. But if a modem—or several modems—could be shared by several computers, sophisticated communication becomes practical.

A modem server is software or hardware that allows several computers on a network to share a single modem. The server acts as a traffic coordinator; it accepts requests for the modem and either passes them to the modem or, if the modem is already on line, reports back to the user that the device is busy.

InfoShare's ComServe, scheduled for release in May 1987, is one such software package. Once the system is installed, users can access modems on the AppleTalk network much as they choose LaserWriters, using the new icon-oriented Chooser 3.0. After you select the modem you wish to access from the Chooser window, the system functions as if the modem were connected directly to your computer.

To receive files, you run communications software on your own Macintosh. If the modem selected is already in use, a "device busy" message appears. ComServe does not queue or spool requests, primarily because the Mac must be running telecommunications software in the foreground in order to command the modem properly.

The major technical issue in modem servers is the problem of passing characters, as opposed to passing blocks of data, across AppleTalk. Modem control is often dependent on recognizing one or two characters within the data stream (such as an XOFF character). Apple has announced its intention to define such a protocol, called a stream protocol, for AppleTalk. Until Apple's protocol arrives, ComServe implements a stream protocol developed and tested at Dartmouth College.

ComServe has been tested with most popular communications software and is not copy protected. There is no limit to the number of copies that can be made for network users, although the software requires that each server have a different serial number. The number of users and servers allowed per network is virtually unlimited.

ModemShare, a product of Mirror Technologies, is functionally similar to ComServe. The main difference between this product and InfoSphere's is the stream protocol used; ModemShare uses a proprietary protocol. ModemShare has been tested and found compatible with common network applications such as MacServe, Microphone, AppleLink, and laser spoolers. Scheduled for release in June, the program will be bundled with a communications software package suitable for 1200- and 2400-bps communications.

While the software approach to modem serving requires that the shared modem be attached to an individual Mac, Solana Electronics and Abaton Technology offer hardware servers that let you attach multiple serial devices like modems, printers, and plotters directly to the AppleTalk cable. Solana's $595 C-Server attaches to the AppleTalk cable and has three serial ports through which you can connect three modems operating at 19,200 bps or less. Abaton's $699 MultiTalk also lets AppleTalk users access up to three 9600-baud modems.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Migent Pocket Modem</th>
<th>Hayes Smartmodem 2400</th>
<th>Novation Professional</th>
<th>Telcor Accelerator</th>
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<tbody>
<tr>
<td>BPS</td>
<td>1200</td>
<td>2400</td>
<td>2400</td>
<td>9600</td>
</tr>
<tr>
<td>Data compression</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compatibility</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Bell 103</td>
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<td>●</td>
</tr>
<tr>
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<td>●</td>
<td>●</td>
<td>●</td>
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<td>V.22bis</td>
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<td></td>
<td></td>
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<td></td>
</tr>
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<td>Half and Full</td>
<td>Full</td>
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<td>Leased-line connection</td>
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<td>Hayes AT</td>
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<td>Intelligent dialing</td>
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<td>Password</td>
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<tr>
<td>Dimensions</td>
<td>5&quot; x 2.5&quot; x 1.3&quot;</td>
<td>1.5&quot; x 5.5&quot; x 9.6&quot;</td>
<td>10.5&quot; x 5.5&quot; x 1.0&quot;</td>
<td>1.9&quot; x 8.2&quot; x 10.0&quot;</td>
</tr>
<tr>
<td>Cables included</td>
<td>Mac 512K</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Software included</td>
<td>●</td>
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<td>Price</td>
<td>$259</td>
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<td>$795</td>
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The Expected and the Extra
The nine modems reviewed differ in more than data-transmission rates. In addition to finding the speed you need, check the protocols each modem uses for compatibility with other modems, and look for extra features included in the price.
<table>
<thead>
<tr>
<th>Fastcomm 2496</th>
<th>Microcom AX-9624c</th>
<th>Racal 9600VP</th>
<th>Codex 2260</th>
<th>Teletech Trailblazer</th>
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<tr>
<td>9600</td>
<td>9600</td>
<td>9600</td>
<td>9600</td>
<td>19,200</td>
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<td></td>
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<td>Modified V29</td>
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<td>MNP class 6</td>
<td>MNP superset</td>
<td>TCM (forward error correction)</td>
<td>CRC-16</td>
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<td>1.5&quot; x 8.0&quot; x 13.3&quot;</td>
<td>3&quot; x 8.5&quot; x 16&quot;</td>
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Novation Professional
Although its top speed is 2400 bps, the Novation modem offers extra security and error-correction options. The LCD panel provides more information than the blinking lights common to most modems. It also communicates musically with its user during self-testing.

The efficiency of error-checking protocols depends on many factors. One is the size of the block in which data is sent. The smaller the block size, the less efficient, since proportionately more bits are sent for error detection and correction rather than for data transfer.

Modems can also lower overhead and increase throughput by using selective retransmission—resending only those blocks of data that included an error. This is far more efficient than nonselective (called go-back-n) retransmission, in which all data blocks beginning with the offending block are re-sent.

Whether a modem sends data asynchronously or synchronously also affects speed. In asynchronous transmission, start bits and stop bits are sent with each character to synchronize the transmitter and the receiver. In synchronous transmission, the receiver and the transmitter receive characters only at specified intervals. Start and stop bits are not necessary, which eliminates two bits of overhead for each character sent.

Xmodem and Kermit are the error-checking protocols used on most 300- to 1200-bps modems. Generally implemented in software, they use fairly large block sizes and half-duplex data transmission. (In half-duplex operation only one modem at a time can send information. Full-duplex operation allows a modem to receive confirmation of data received as it continues to transmit.) CRC-16, an error-detection algorithm, is an alternative protocol. It is implemented by individual manufacturers in many different ways, but the standard calls for larger data blocks to cut down overhead.

At high transmission rates, a confusion of incompatible protocols persists, but MNP, the Microcom Network Protocol, is making a place for itself. MNP varies data block sizes according to the conditions of the line and improves throughput with data compression. Microcom has defined six MNP error-correction classes, but only three are licensed to other vendors.

Extras
In addition to the many permutations of the basic factors discussed above, you should pay attention to extra features that may be important to you.

Security facilities, designed to prevent unauthorized access to a system, are important if sensitive or valuable data are stored on the computer. Password protection limits access to those who know the password. Callback is a system that ensures that access is granted only to systems located at authorized phone numbers. When a call is received, the modem asks for the caller's identification, then disconnects. The modem then looks up the phone number associated with that user and calls back. To defeat a callback system, potential intruders would need valid identification and would have to be located at the authorized phone number.

Communications software can automate your connection and transmission. To use such software, your modem must have a command set that the software supports. Most communications software is capable of issuing Hayes AT (Attention) commands and so can control any Hayes-compatible modem.

The more sophisticated the modem, however, the more likely specialized software will be required to use the advanced features effectively. Hayes's Smartcom II can only select rates of 300, 1200, and 2400
bps; it cannot support 9600-bps communication. *MacTerminal* is more flexible, allowing rates up to 19,200 bps, and *inTalk* from Palantir is designed especially for high-speed modem control.

Features like autodialing, autoanswer, self-testing on start-up, and LEDs to tell you how communications are proceeding have become standard on microprocessor-controlled modems. Check the variations on these features. If any are missing, it's an oversight to be noted.

Each of the nine modems compared here has unique strengths. The modems *Macworld* tested range from a $259 1200-bps model for those whose speed requirements are not extreme to a $3495 9600-bps number with all the extras. Within the field there's probably a modem that suits your needs.

**Migent Pocket Modem**

The Migent 1200-bps modem is bright red and about the size and weight of a TV remote control. Either battery- or AC-powered, what it lacks in transmission speed it makes up for in convenience. It comes complete with cables for either the Mac 512K Enhanced or the Macintosh Plus (no other modem tested did). It's also Hayes compatible, and will be bundled with Macintosh communications software. (At press time the package was being selected.)

The Pocket Modem has no hardware switches to set or configuration routines to run: just plug in the phone lines and the battery or the AC cord and it's ready to go. Configuration settings and one phone number and access code can be stored in nonvolatile memory. Error correction is accomplished via the communications software. At $259, the Migent Pocket Modem is an exceptionally inexpensive and convenient way to get on line. If you don't anticipate making large-volume data transfers and so can live with 1200 bps, this modem is an excellent choice.

**Hayes Smartmodem 2400**

The Smartmodem series from Hayes sets the standard among intelligent modems. The Smartmodem 2400 looks and acts very much like its 300- and 1200-bps predecessors, and supports those speeds. The 2400-bps modem has not substantially changed any of the commands in Hayes's AT command set, but has added several commands specific to the modem, including commands for controlling the speaker volume and the selection of synchronous and asynchronous modes.

In the future, Hayes will use a version of the CCITT X.25 packet-switching protocol to provide error correction at 2400 bps. Unfortunately, the X.25 specification leaves the implementation of some capabilities up to the ingenuity of individual manufacturers. Therefore, only transmissions between Hayes modems could be checked using that protocol.

**Novation Professional 2400**

The Novation 2400 is a 2400-bps Hayes-compatible modem. Like the Hayes, it is a solid and dependable 2400-, 1200-, or 300-bps modem. Advantages over Hayes and other plain-vanilla 2400-bps modems are mainly in the area of options: Novation offers versions that include MNP error correction and password and callback security features.

Novation's LCD display separates it from the other modems surveyed. The display, while more intelligible than the usual array of blinking lights, requires you to look downward at the modem to read it easily. When it is turned on, the modem automatically performs a six-step self-test with audible musical feedback (though this can be silenced by entering a command).

**Telcor Accelerator**

The Telcor (formerly Telebyte) Accelerator is a full-duplex 2400-baud modem that achieves 9600 bps using a data-compression technique. Throughput is dependent on the efficiency of the compression and varies from 6500 to 9600 bps. (The more random the data, the less efficient the compression. ASCII text, for example, compresses much more efficiently than nearly random binary data.) At press time, Telcor's error-correction scheme was a proprietary implementation of a CRC-16 protocol, but Telcor planned to release a version that incorporates MNP class 3 in June.

Telcor's acceleration can be turned off so that the modem operates at 2400 bps. The modem also supports communication at 300 and 1200 bps.

**Fastcomm 2496**

The Fastcomm 2496 is an asynchronous half-duplex 9600-bps modem capable of communicating at 300, 1200, or 2400 bps as well as using a proprietary adaptation of V.29. Fastcomm's error-correction technique is basically a hardware-based CRC-16 implementation that uses selective retransmission. The modem uses a superset of the Hayes AT command set.

The Fastcomm modem can switch a remote modem to the highest mutually acceptable data rate. If a 9600-bps modem calls a 9600-bps modem at 2400 baud, for
example, the answering modem can up-shift the dialer to 9600 bps during the initial handshake. The answering modem's bps rate cannot be changed by the dialer.

The FastComm's half-duplex operation results in choppy communications when sender and receiver are communicating via keyboard. Much of the time you type without being able to see what you have entered, and then suddenly the characters appear. Received data also appears in short bursts of characters.

The FastComm modem was the only one tested that did not have a jack for attaching the telephone to the modem so that voice calls could be received when the modem was not in operation.

**Microcom AX/9624c**

Darth Vader-like in appearance, the Microcom AX/9624c is a sleek, black, 9600-bps modified-V.29 modem that can also operate at 2400, 1200, and 300 bps. The AX/9624c incorporates MNP class 5, a data compression algorithm currently available only on Microcom modems. As with the Telcor compression scheme, the amount of compression achieved is influenced by the type of data being sent. The effective throughput can be dramatically increased, to an average of 14,000 bps.

Like Fastcomm's, Microcom's modems negotiate a mutually acceptable bps rate during the initial handshake. Also like the Fastcomm, the Microcom modem is limited to half-duplex operation at high speed.

There is no on/off switch on this modem; the power must be disconnected when the modem will be idle for long periods. The manual does not explain the hookup procedure very clearly, and the danger of frying the modem with an incorrect hookup is worrisome.

The Microcom modem uses a proprietary SX command set as well as the Hayes AT complement. Microcom's was the only modem tested that required access to hardware switches in order to configure it for operation with the Mac.

**Racal-Vadic 9600VP**

Racal's 9600-bps modem uses a proprietary technique to adapt V.29 technology. The dynamic duplex protocol allows full-duplex operation when interactive asynchronous data is being transmitted, and switches to a half-duplex link for high-speed transfers. This eliminates the jerky bursts of characters you must put up with during interactive communication using half-duplex-only modems such as Fastcomm's and Microcom's.

The front panel of the 9600VP is more elaborate than that of the other 9600-bps modems tested. It features a nine-LED status-indicator panel along with a ten-key keypad from which commands (such as phone numbers for dialing) can be entered. Modem commands can be issued using either the Vadic or Hayes AT command set. You can interrupt data communication and switch to voice (when arranging the details of a file transfer, for example) by pressing a key. As with the Microcom modem, there is no on/off switch: the modem must be unplugged to be turned off.

Error correction is provided using a superset of MNP class 3. In addition, the modem automatically adjusts transmission speed to balance error rates and data throughput. When errors occur the modem falls back from 9600 bps to 4800, 2400, or 1200, until the lowest error rate is achieved. When the error rate improves, the modem then increases speed in the same increments.
Racal's documentation, while not the most attractively presented, was by far the most complete of any of the modems tested. It clearly and lucidly describes the modem's features and how to use them effectively.

**Codex 2260**
The Codex 2260 was the only V32 modem in the batch. In accordance with V32, it supports full-duplex 9600-bps operation and falls back to 4800 bps. The modem has several features consistent with its orientation toward large-scale data communications applications: a leased-line phone-connection jack (in addition to the standard-line and handset jacks); an internal phone book that stores up to nine telephone numbers; password protection to prevent unauthorized changes to the modem settings; and line-quality monitoring capabilities via an externally connected oscilloscope.

Though many high-speed transactions are primarily asynchronous and so can be performed acceptably using half-duplex high-speed modems, the full-duplex capabilities of the Codex modem make it extremely attractive for interactive applications such as CAD.

Like the Racal modem, the Codex 2260 has a drop-down front panel that conceals a five-key keypad with which you can access an internal modem-control menu or switch the line to voice.

The Codex modem supports the Hayes AT command set as well as its own Codex Verbose command set.

**Telebit Trailblazer**
The Telebit Trailblazer can transmit and receive data asynchronously at speeds up to 18,000 bps (for an overall throughput rate of 14,000 bps) using a proprietary transmission and error-correcting protocol appropriately named PEP (Packetized Ensemble Protocol). How fast is this? In our test, we were able to send a 300K file in less than four minutes using the Telebit. The same amount of information would take nearly an hour to exchange at 1200 bps.

The Trailblazer is also compatible with 300-, 1200-, and 2400-bps modems and will automatically shift to match the transmission speed of the remote modem during the initial handshake. At 1200 and 2400 bps, the Trailblazer can transfer data using Microcom's MNP protocol. Telebit has also added the Kermit and Xmodem protocols.

When in PEP mode, the modem continually monitors the line to determine if errors have been introduced into the data; if errors exist, the modem adjusts the data-transmission rate to compensate. Data transmission speed is adjusted downward in small increments (less than 100 bps) if errors are detected. These increments allow throughput to be maintained at the highest level possible, given the quality of the connection. Using the Trailblazer's setup program, you can even see a graph representing the quality of the phone line.

Like the Racal modem, Telebit uses an adaptive duplex technique. The modem operates in full duplex for interactive communication and switches to half duplex when communication is asynchronous.

The Telebit modem is easy to configure and operate as well as blazingly fast. It is Hayes compatible, and its proprietary command set is supported by inTalk, Palantir's communications software. A CRC-16 protocol with selective retransmission is used to ensure that data is received error-free.

**Making a Choice**
Because it is fast and easy to use (it's supported by inTalk and offers adaptive duplexing), the Telebit Trailblazer is probably the best value among the high-speed modems. The Microcom modem, which offers the closest approximation of Telebit's speed, is slightly more expensive, and its interactive operations at half duplex are less attractive. Racal's 9600VP has advantages, like good documentation and the ability to switch easily between voice and data, but it is comparatively pricey. Fastcomm's modem offers a weak selection of features at 9600 bps. The full-duplex capabilities of Codex make it the modem of choice for interactive graphics applications, despite its high price. Unfortunately, none of these modems can talk to any others at high speed.

At lower speeds, the Hayes and Novation devices are both excellent, well-supported modems compatible with all other standard 2400-baud modems. Novation offers a greater range of options, particularly in access control, and a lower price. It's the better buy unless you want the psychological security of owning the industry standard.

The Migem Pocket Modem is not powerful, but it is portable, convenient, and quite inexpensive. It fits easily inside a Mac's carrying case and does not require an external power supply. At 1200 bps it's a worthy entry, suitable for those with modest communications needs.

In making a selection, decide first what speed you need. Then weigh compatibility and price issues among the contenders. Whether you treat yourself to 19,200 bps and blinking lights or opt for a pocket-sized economy model, you're bound to find something just your speed.

See Where to Buy for product details.
Reviews

Scrap the Scrapbook?

**SmartScrap 1.02 and The Clipper 1.01**

Cut-and-paste desk accessories. **Pros:** Allow manipulation of Clipboard and Scrapbook contents. **Cons:** Take up a good deal of disk space (50K). List price: $59.95. Requires: 512K. Copy protection: None.

As the popular aphorism states, "If it ain't broke, don't fix it." Solid advice. But if it ain't broke but ain't state of the art either, you might want to enhance it. The latter statement, much too wordy to become a popular aphorism, applies to Apple's Scrapbook. The Scrapbook, a serviceable desk accessory that stores a series of graphics or text "clippings," has finally been improved by **SmartScrap** from Solutions, Inc.

**The Scrap Is Lacking**

The standard Scrapbook has a number of limitations that most Mac owners have learned to live with. For example, a single Scrapbook is tied to a given System file; if you boot up with Microsoft Word and later need to paste in an illustration from the Scrapbook on your FullPaint disk, you'll have to quit Word and either boot up with FullPaint or transfer the FullPaint Scrapbook file to the Word disk. The situation is similar with a hard disk; you must replace the Scrapbook in the hard disk's System with the one you want to use. A public domain desk accessory called **Multi-Scrap** alleviates this problem by allowing users to create multiple scrapbooks on the same disk and choose among them. However, **Multi-Scrap** fails to address some of the Scrapbook's other limitations.

Another drawback is the Scrapbook's fixed size—a window approximately 2½ inches high by 4½ inches wide. Although you can fit an item larger than this window into the Scrapbook, you can't view it as a whole, nor can you select a portion of the contents to paste. Finally, Apple's Scrapbook forces you to flip through its contents one entry at a time until you find the clipping you need.

**SmartScrap** solves the problems of locating, viewing, and selecting contents. It lets you create multiple scrapbooks, name them, and choose the one you need from a list. When you open a **SmartScrap** scrapbook, a scrollable, expandable window appears, allowing you to view a screenful of information at once, as well as move about a clipping that is larger than the screen area. Not only can you scroll to different sections of a text or graphics selection, but you can copy and paste selected portions as well (see "Souped-up Scrapbook"). For graphics items, a selection rectangle lets you choose part of a drawing, while a cursor lets you highlight and copy any portion of a text passage. (Note that when you select a portion of an object-oriented drawing, any object even partially within the bounds of the selection rectangle is copied in its entirety; this is not a **SmartScrap** flaw, but rather an inherent characteristic of object-oriented graphics.)

You view the contents of a **SmartScrap** scrapbook by clicking a dog-eared corner to flip from page to page. This method doesn't improve on the Apple Scrapbook's scroll arrow, but **SmartScrap**'s Table of Contents option does. When you...
open a *SmartScrap* scrapbook, a menu title appears in the current application's menu bar. Show Table of Contents lets you see miniature, 1-inch-square versions of the scrapbook's contents in a scrollable window. You can then click on a picture to open that entry, instead of wasting time clicking from clipping to clipping until you find the one you need. This feature is no help with text clippings, but can prove very useful when a scrapbook contains numerous illustrations. To be fair, I should mention that *New Scrapbook*, a shareware desk accessory by Tim Wasko, (see *Macworld News*, in this issue) is similar to *SmartScrap*; but Solutions provides another handy desk accessory along with *SmartScrap*.

**A Clipboard Companion**

Solutions has also enhanced another essential Macintosh utility, the Clipboard. Apple's Clipboard serves as a temporary holding area for items that are being transferred from one application to another or from an application to the Scrapbook for permanent storage. Unlike the Scrapbook, the Clipboard can hold only one clipping at a time. A companion desk accessory called *The Clipper* enables you to trim or scale a drawing in the Clipboard before sending it to its destination.

*The Clipper* displays a transparent window that can be resized and moved about the screen. The window's dimensions can be displayed in pixels, millimeters, picas, or inches—whichever you prefer. In a typical scenario, you might overlay *The Clipper* on a column of text where you wish to paste an illustration, dragging *The Clipper*'s window to the proper width and height. You would then place *The Clipper*'s window over the illustration in the Clipboard and use the appropriate command—Trim or Scale—to make the drawing fit in the designated area while retaining its proportions.

Both *SmartScrap* and *The Clipper* streamline the cut-and-paste process. Anyone who needs to organize a large collection of clip art by category will find *SmartScrap* valuable. And many desktop publishers will appreciate *The Clipper*'s ability to crop and scale drawings before they're pasted into a document. Together these desk accessories take up about 50K of memory, but they improve upon the original Clipboard/Scrapbook duo. Amid the rush to produce *The Most Amazing Desk Accessory*, it's good to see someone improving those ordinary but indispensable utilities.—*Erfert Nielsen*

See *Where to Buy* for product details.
Data In, Data Out

MacADIOS System I

Four-channel, 20-kHz analog/digital conversion and signal analysis hardware and software. **Pros:** Versatility, advanced built-in analysis capabilities, user interface template for high-level function calls. **Cons:** Erratic performance; Mac user interface not followed strictly. **List price:** $2500; includes MacADIOS unit and sample programs. **Requires:** 512K. **Copy protection:** None.

The processing power and input/output speed of the Macintosh should make it a wonderful laboratory tool. But the Mac has the same problem as any computer: getting digital information from an analog world. MacADIOS, a hardware and software package from GW Instruments, helps bridge the gap between nature and the Mac.

Waveforms to Digits

MacADIOS stands for Macintosh Analog/Digital Input/Output System, which sums up the functions of this science and engineering tool. MacADIOS rapidly and frequently checks the voltage of an analog waveform, such as sounds picked up by a microphone, and stores a series of numbers representing the voltage at each sampling time. You can use this information to recreate the waveform and display it on the Macintosh screen. You can also perform mathematical signal analysis on the numbers, either within MacADIOS or in another analysis application.

The unit has 8 differential analog inputs, 4 single-ended analog outputs, and 16 digital inputs and outputs; the analog lines all provide 12-bit resolution. Synchronization signals and power supply output are alongside the I/O channels on the front panel. According to GW Instruments, MacADIOS on a Mac Plus performed 17 seconds of sampling at 20,000 samples per second. While such numbers won't elbow an oscilloscope aside, MacADIOS has some special tricks of its own.

The MacADIOS package performs a sophisticated function—mathematical spectral analysis—based on the Fast Fourier Transform (FFT). By performing an FFT, MacADIOS can determine how much of a signal's power is at any given frequency, thus characterizing the signal. This function has a variety of applications. Security officers could use MacADIOS as the core of a voiceprint checker in a security system; speech pathologists could use it as a voice analysis tool. (GW Instruments has exploited the latter capability in a separate, $300 software package called MacSpeechLab.)

MacADIOS can also ask the Macintosh for data, then turn that data into corresponding high and low voltages on 16 digital outputs, or into analog waveforms. With this feature you can specify waveforms on the Macintosh and turn them into actual signals.

**My Code or Yours?**

Part of the appeal of MacADIOS is that sophisticated functions are available on the board and don't have to be constructed in software. Simple function calls made by your programs tell MacADIOS how to manipulate signals and data.

Chances are you won't need to write your own programs, thanks to a program called the MacADIOS Manager. A template for the function calls, the Manager lets you design automated experiments in MacADIOS's native language without having to program the Macintosh. Other ready-made programs emulate an oscilloscope, a voltmeter, a spectrum analyzer, and a chart recorder, as well as other instruments.

MacADIOS is not the only "virtual instrument" for the Macintosh. National Instruments sells a comparable $1995 software product called LabVIEW, which works with standard IEEE-488 instrumentation. LabVIEW requires an interface box (National's $595 GPIB-Mac) to connect the IEEE-488 bus to the Macintosh, and the instruments that send data on the bus must be purchased from other firms. These instruments often cost $1000 or more.

But while MacADIOS is less expensive than LabVIEW, it doesn't solve the same problems. The IEEE-488 is a high-performance, general-purpose bus for digital instruments; MacADIOS is itself a kind of instrument (albeit a limited one). MacADIOS and LabVIEW have analogous functions but are not head-to-head competitors (see Reviews, Macworld, May 1987).

**Sweating the Details**

MacADIOS includes ready-to-go software, a commendable feature. However, the familiar Macintosh user interface is not always strictly followed. For example, File menu functions, such as Quit, are grouped under a Special menu in some of the programs. Occasionally messages appear in a corner of the screen when alert boxes are called for. In addition, MacADIOS fumbles

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**Harmonics and Harmony**

An FFT from MacADIOS analyzes a piano note. Each line represents one sample; time progresses from front to back. The leftmost peak in each line is the fundamental frequency; successive peaks indicate overtones. Other musical instruments would show different patterns for the same note.
some of the finer points of Mac software craftsmanship. When alert boxes go away, for instance, they sometimes leave a white rectangle on the screen. You then have to issue a command to redraw the screen, something the software should take care of automatically.

Minor glitches aside, the common theme behind the user interface problems in MacADIOS is ambition, not deficiency. GW Instruments has put a great deal of functionality into a limited space, so the screens are sometimes confusing.

The MacADIOS hardware also exhibits some design deficiencies. The front-panel binding posts have no lock washers; several of them could be turned by hand, which could break wires inside. More technically significant was the fact that chassis ground was not predictably and conveniently available on the front panel.

The MacADIOS manual, though thorough, often lapsed into “computerese,” and clear overview sections are few and far between. A few oversights, like having a screen shot considerably different from the actual display, are also apparent.

The shortcomings of MacADIOS are fairly minor, however. The functions are there, ready to be put to work collecting and analyzing data with your computer, even if the polish one expects for $2500 is missing.—Curt Ingraham and Joe Chew

See Where to Buy for product details.

Losing the Newsletter Blues

PageMaker Portfolio: Designs for Newsletters

Aldus Corporation's PageMaker Portfolio: Designs for Newsletters is a collection of 21 templates for PageMaker 1.2 that's designed as a complete learning tool. So even if you haven't had any design experience, you're likely to find this package an invaluable aid. Created for Aldus by experienced publication designers, Designs for Newsletters is filled with guidelines, tips, and suggestions on a variety of layout fundamentals.

Learning Design Concepts
In this package the extensive manual is as important a component as the templates themselves. It covers everything from what you should consider when creating a masthead to such elements as the font, style, and spacing of the text; whether to include artwork, lines, boxes, or shading; and how to properly balance the size and placement of the newsletter's various components. The manual reviews the best combinations of typestyles for headlines and body text and recommends good font combinations.

You are shown how to create spacing guides, for controlling the space between design elements; how to make more room or take up excess space for articles that are too long or too short; and how to create drop caps, large initial capital letters that start a story or an important paragraph.

Ready, Set, Newsletter
The templates themselves range in complexity from simple two-column layouts to sophisticated five-column and varying column-width designs. Each one has a primary model and two alternative layouts at varying levels of difficulty. The manual describes each layout and provides helpful commentary on specific issues related to its use. For example, it notes where formats can be modified to fit individual needs and points out potential problem areas and how to address them.

The templates consist of ruler guides, to help you align the various objects in your newsletter; placeholders, to identify the placement, font, style, and size of text elements on the page; and ruled lines, to help visually separate sections (see “Three-Column Template”). The manual shows examples of how the newsletter appears when completed, what you might create in a short half-hour period (see “Finished Newsletter”).
In Gangland Chicago

The King of Chicago 1.0

Cinematic interactive fiction game. Pros:
- Innovative graphics, clever plot implementation.
Cons: Inability to save game, eventual repetitiveness.

Interactive fiction has been in a rut. The text-based, Infocom-style adventures vary in theme, but retain the same tired technology. Mindscape's The King of Chicago delivers a game that comes one step closer to the computer entertainment dream: a real-time movie controlled by the user. In this movie/adventure game you see the characters move around, talk, and take action. (Actually, the actors here are animated cartoon drawings based on clay sculptures, the way they move their lips and blink their eyes is reminiscent of the vintage "Clutch Cargo" cartoons.) As in an adventure game, you control the protagonist, and choices you make at various decision points determine the outcome of the story. Different decisions result in different plots, and the program randomly changes characters' actions, so the same decision in one game may produce a different series of events in subsequent games.

This hybrid movie/game would not work at all if the dialogue sagged, or the graphics were handled poorly, or the limited multiple-choice questions you answer had no clear effect on the plot. But it does work, mainly because The King of Chicago is consistently entertaining. Game designer Doug Sharp has saturated The King with plot and characters that might have come straight from the great gangster flicks of the 1930s—protagonist Pinky Callahan tries to gain control of gangland Chicago while dealing with The Crafty Old Advisor, The Dumb Goon, The Flashy Moll, The Deadly Southside Rival, The Weepy Momma, The Crooked Alderman, and the Uncorruptible Cop Who Was Pinky's Boyhood Friend. Everything is handled with self-parodying wit and interchanges between characters are terrifically funny. I've never had so much fun playing a computer game.

Another surprise comes in your reaction to the game. The amount of cynicism required is prodigious. To do well as the would-be King of Chicago, you must put yourself in a mind-set that is as much Machiavelli as Frank Nitti. You must regard everyone as your enemy. For instance, if you try a little tenderness with your sweetheart Lola, your gang members might sense you are soft and plot against you. But if you're too mean to her, she'll betray you to your Southside rival. The unflinching ruthlessness of this game makes it unsuitable for small children and John Denver fans.

In other areas The King has some serious flaws. For instance, I find it appalling that a game that takes hours to complete won't let you save moves for later play. And although characters behave differently each time you play, eventually you find yourself watching some scenes again and again.

All in all The King of Chicago is an exceedingly amusing, if not overly cerebral, attempt at integrating the worlds of computer games and motion pictures.—Steven Levy

See Where to Buy for product details.

Reviews

You can also modify the format of the templates for your own purposes. For example, you may prefer to work with a different selection of fonts. This would affect line and character spacing, so you might need to adjust the positions of the placeholders. Since the templates are made up of normal PageMaker text blocks and ruler guides, adjusting the template is no more difficult than modifying one of your own documents.

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See Where to Buy for product details.

Computer News

WordPerfect: Number 1

Macintosh Comparison Survey

Macworld Magazine

Finished Newsletter

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The Good and the Ugly

Maxwell 1200VP Modem with Communikit 1.0

Modem and communications software.

Pros: Compact 1200-bps modem with front-panel lights and mode switches. Cons: Buggy, poorly designed communications program, doesn't work well under Hierarchical File System. List price: Modem $295; Communikit $79. Requires: 512K. Copy protection: None.

Every great comedy duo has a straight man and a buffoon. A similar trend is surfacing in modem- and communications software packages; however, the result isn't funny. Of the telecom combos I've used, the mods work well but (with the exception of those from Hayes and Microcom) the communications programs aren't worth the disks they're written on.

The Maxwell 1200VP and Communikit combo from Racal-Vadic is a case in point. The Maxwell 1200VP is a well-built, compact, Hayes-compatible modem. Communikit comprises a cable for the Mac and a disk containing MacGeorge, a cantankerous communicator.

The Modem

The Maxwell 1200VP is the better half of this duo. Since it's Hayes compatible, it works with all popular telecommunications programs. I used it with Software Ventures' MicroPhone without incident. Like the Hayes Smartmodem and Prometheus Products' Promodem—but unlike Apple's modems—the Maxwell 1200VP has front-panel indicator lights that keep you informed during a communications session. Moreover, the 1200VP has more lights than most, including some that indicate 1200- or 300-bps operation, and tell you whether the modem is in originate or answer mode.

Unlike its competition, the Maxwell modem has front-panel switches that offer manual control. You can toggle between settings in several modes: 1200 and 300 bps, voice and data, originate and answer. The Loop switch puts the modem through a self-test routine. In most applications, your communications program controls the modem for you. Still, the front panel switches are a nice touch, and they come in handy if you're using the rare communications program that doesn't support the Hayes command set (see the April and May Getting Started columns for communications basics).

The 1200VP's other assets include a sleek, low profile (it's a mere 1/4 inches high), and a power switch, which some modems actually lack. And at a list price of $295, the 1200VP is more affordable than the premium-priced Hayes Smartmodem 1200.

MacGeorge

Anyone who wonders why MacGeorge's icon looks like a dog hasn't used the program. A version of Aegis Development's MacMail that's licensed by Racal-Vadic, MacGeorge is an awkward hybrid of mailing-list manager and telecommunications program. It performs both tasks poorly.

The programmers based MacGeorge's design on an electronic address book, perhaps on the assumption that telecommunications have dozens of friends and associates with modems. (In reality, most people use one or two major information services.) MacGeorge allows you to enter names, titles (of less than ten characters), company names, addresses, and up to three phone numbers, one of which is a modem number. You can create a log-on card for each entry that includes simple macros for automatic sign-ons, but MacGeorge lacks a sophisticated autopilot facility like the ones in Smartcom II, MicroPhone, Red Ryder, and InTalk. It can print mailing labels for your address book entries, but you can't sort the entries before printing. MacGeorge does support the MacBinary file-transfer protocol, and it can emulate VT-52 and VT-100 terminals, although it doesn't display their function keys on the screen.

MacGeorge has a built-in text editor that lets you write messages for later transmission, but it limits you to messages of less than 500 characters. Type more, and you won't be able to see the extra text (there is no scroll bar). What's worse, when you try to save the message, the program crashes. MacGeorge's other catastrophic flaw is its inability to work under the Hierarchical File System. Indeed, a Racal-Vadic representative admitted the firm doesn't even recommend its use on a hard disk.

MacGeorge is the worst telecommunications program I've ever used, but don't let that bias you against the Maxwell 1200VP modem. It's first rate. If you buy one, get a Hayes-compatible cable, and use MicroPhone, Smartcom II, or Red Ryder. —Jim Heid

See Where to Buy for product details.

Save That Disk!

1st Aid Kit 1.0


Disk repair software is like health insurance—you hope you'll never need it, but if you do, it's a real lifesaver. Until recently, there wasn't much you could do about those intimidating alert boxes that gravely announced, "This is not a Macintosh disk: Do you want to initialize it?" You were limited to cryptic tools like Fedit Plus, which gives you the power to change the information encoded on a disk byte by byte, a process that can do more harm than good if you don't know exactly what you're doing. It's a little like being handed a scalpel with license to perform open-heart surgery—unless you're a surgeon, the patient hasn't much chance of surviving. But now 1st Aid Kit from 1st Aid Software is certain to
change all that. Designed to accommodate even the most inexperienced Macintosh user, *1st Aid Kit* is a disk doctor that diagnoses problems, offers suggestions, and then performs the surgery for you.

Version 1.0 is designed to work on single-sided (400K) MFS disks. Although some of the file-recovery features (such as the ability to extract text from a damaged file) will work on HFS disks, none of the disk-level repair procedures (like rebuilding the volume directory) are HFS compatible. But don't be discouraged if you're a Mac Plus user: *1st Aid Software* has promised an HFS-compatible upgrade.

Even in its present version, however, *1st Aid Kit* is much more than a utility—it's really a reference manual accompanied by software, rather than the other way around. Comprising almost 300 pages, the documentation is accessible and comprehensive enough to appeal to any Mac user, for both avoiding problems and solving them when they occur. In addition to its problem-solving sections, *1st Aid Kit* offers three chapters of reference information describing how the Mac functions; how system, file, and disk errors are caused and resolved; and what precautions you can take to minimize operating glitches and data loss.

**For Emergencies Only**

Realizing that you probably won't be recovering disks and files every day, *1st Aid Software* has made its manual and software very easy to follow—complete with much on-screen help (see "Help on Tap"). Also included are three disks of tutorial files for practicing diagnosis and recovery. The manual's eight-page introduction is all you need to start using *1st Aid Kit*; it explains how to use the lists of error messages, troubleshooting techniques, and recovery procedures that follow.

Covering every error condition imaginable, the error-message list is divided into two categories: Abnormal Behaviors (such as system crashes and printing problems), for which no written message is displayed, and Written Error Messages, errors for which the Mac does offer explanations. The Written Error Message List is divided into two groups—errors that require cross-references and those that don't. If your error message is in the cross-referenced group, you're led to the appropriate troubleshooting procedure. For example, the alert "Some files couldn't be read and were skipped" points to a section called "Some Files Were Skipped." There you find a list of six possible courses of action, logically ordered from simple suggestions (such as copying one file at a time or copying to a different disk) to more complex operations (like rebuilding the volume directory, an operation roughly equivalent to rewriting a book's table of contents, since the disk's volume directory tells the Mac where to find each file on the disk). The simple-to-complex order of procedures helps you quickly track down a solution and avoid unnecessary disk surgery.

**The Doctor Is In**

If the simpler suggestions don't work, you'll find a recovery procedure referenced in the next chapter. In this example, if rebuilding the volume directory were necessary, you would be directed to a section called "Volume Directory." Reading the recovery procedure is like consulting your doctor before an operation—you get a general explanation of the procedure's purpose, learn what 'tools' are required (in this case, the *1st Aid Kit* software and a blank disk), and are warned of any possible side effects (thankfully, in this case there are none). As you're taken step by step through the procedure, you'll see screen shots of the alert boxes that will appear. Finally, a number of related references are listed for those who want to find out more about what was just done and why it worked (or didn't). I found the software ran without a hitch, and all the disks I recovered still work well.

**How Important Is It?**

There's no substitute for backing up important data. Nevertheless, because even the best-laid plans sometimes go awry, you should always be prepared to rescue a crashed disk or file. Although I highly recommend *1st Aid Kit*, don't expect it to work magic—if you've left a disk in your shirt pocket, chances are when it gets back from the laundry, nothing will recover it. But if it's fixable, *1st Aid Kit* can do the job. Those who use double-sided disks should keep a lookout for the HFS upgrade, which *1st Aid Software* plans to make available at a reasonable price.—Laurence Kirsch

See *Where to Buy* for product details.
C Is for Complete

Consulair Mac C 5.0
Macintosh software development system.
Pros: Powerful, complete development system.
Cons: Editor, compiler, linker, and utilities are all separate applications; development-cycle time lost in transferring from one application to another.

Over three years ago, while creating the Macintosh Development System (MDS) for Apple, Consulair Corp. bootstrapped Mac C 1.0, one of the most flexible C development systems available for the Mac. Although the current version resembles the original structure (an editor, C compiler/68000 assembler, and a smart linker), Consulair has improved the system. In addition to the exec application, which provides a simple batch-processing capability, and RRMaker, Apple's resource compiler, the system now includes the Path Manager, the first one of the more elegant HFS management systems. Consulair also has managed to double the overall speed of the compiler.

With the development tools Consulair includes a disk full of useful sample source code and a toolkit. The samples range from basic event demonstrations to a simple telecommunications program. The Mac C Toolkit is a library of useful routines, complete with source code for the tasks that are fundamental to most programs.

Compiler and Linker
The apparent simplicity of this C system belies its power. It provides a complete Kernighan and Ritchie implementation of the C language, as well as enumerated types, bit fields, and structure assignment. It also fully supports Apple's SANE floating-point package; a special version of the compiler is available for several floating-point hardware add-ons. The Mac C compiler also implements the Pascal function type, which lets you easily interface your code with some of the ROM routines, thus eliminating the need for assembly language "glue" routines. Should you require an in-line assembly language, however, you can use the Mac C compiler. In fact, the compiler is a fully MDS-compatible 68000 assembler that can generate 68000 assembly source code from a C source file as well as assemble MDS source files.

In addition to creating stand-alone applications, the linker provided with the Mac C development system is capable of producing driver and Defproc resources.

The link can also include an existing resource file in the final application, relieving you of the task of manually copying your program's resources. To minimize the size of the final code, the linker will remove any unused code from your application. The program supports symbolic debugging by generating a symbol map file. The linker also enables the programmer to create and manipulate library files.

To assist the compiler and linker in locating the many header and library files needed to create a final application, Consulair created the Path Manager, which turns the Mac into a truly HFS-compatible development system. The Path Manager identifies all the different types of files associated with creating an application (such as source files, header files, and libraries) and associates each type with a set of search paths. In other words, the Path Manager keeps track of which folder contains each of the different types of development files. The programmer has the option to set up each of the default search paths. The Path Manager then creates a special file that the compiler and linker consult when locating their various files.

Control Files
The programmer must create a file that tells the linker which files to include in the final application. An exec control file can automatically launch each of the applications and pass them the appropriate files. The edit-compile-link cycle is thus simplified to launching the exec.

Consulair offers a "Compile & Go" option to facilitate using the compiler without creating an exec control file. The programmer only has to ensure that the linker file is present, and the system will take care of invoking the compiler and the linker and launching the application. This makes things easier on beginners who may find creating control files a little confusing.

Utilities
To develop anything beyond a simple program and to maximize the efficiency of the Mac C system, you should consider a separate product, the Consulair Utilities. These four programming utilities include SuperMake, an intelligent batch preprocessor; Grep, a sophisticated text-pattern searching utility; Diff, a file-comparison utility; and the Maximum Performance Analyzer, an application profiler. SuperMake checks all the source files and creates an exec file that compiles only files modified since the last time the program was built. SuperMake also frees the programmer from the chore of providing a control file to tell which source files make up which object files. By analyzing the object file after the application is first built, SuperMake can create its own dependency list to determine which files need recompiling.

Consulair's Mac C generates respectable code that's competitive with any Macintosh C compiler. Its updates are always timely, and its support staff boasts some of the most experienced Macintosh programmers around. The Mac C is a robust and proven system that can handle even the largest commercial project. Its documentation is lean and to the point and is not intended as a tutorial for the novice. Although it may be somewhat intimidating to beginners, Consulair puts all the pieces in place for intermediate and advanced programmers who must produce sophisticated applications.—Jim Takata

See Where to Buy for product details.
Sound Choice

Sound Lab 1.1


Manipulating digital sound once required high-end computer keyboards systems costing up to $150,000. Recent developments in technology have brought the price of sampling keyboards, such as the Ensoniq Mirage, down as low as $1300. Sound Lab, by Blank Software, is an interactive visual editing system for the Mirage that makes precision work with sampled sounds relatively inexpensive.

Lights Out? Ready, Aim...

Sample manipulation on the Mirage's front-panel keypad is definitely a hit-and-miss process—like throwing darts at a target in the dark. Sound Lab solves this problem by drawing the sound sample or waveform for you and displaying the entire contents of the waveform memory for editing. Sounds can be copied, pasted, and inserted between markers (called sound cursors) that are placed within the sampled waveform. Clicking on the speaker icon plays the selected sound through the Mac's internal speaker or external speaker port.

The Mirage displays only one of 85 parameters or values at a time. Sound Lab allows many parameters to be displayed and changed simultaneously, and it maintains a link between the Mac and the Mirage so changes can be heard almost instantly. Sample looping is also simplified by the Loop Splice window, which graphically compares the loop start to the loop end in order to create a smooth transition (see "Loop Splice and Page Windows").

Snap, Crackle, Pop

Many sampled sounds contain pops, clicks, or other forms of noise. Several unique features of Sound Lab allow for precise sample refinement. The Page window enables you to zoom in on one "page" (256 samples) of a sound and redraw the waveform using a Macpaint-style pencil.

Compression and 3 dBA liner fades are also possible with Sound Lab, so you can decrease unwanted volume changes within a sample and let sounds fade evenly in or out. A unique Interpolate feature increases frequency response by inserting a new "page" between every two samples in the waveform.

A Discouraging Word?

The documentation provided with Sound Lab is not consistent with the features added in the latest program update. Sound Lab is so complex that it requires a good deal of practice before the program is fully usable. Another shortcoming is that when waveform data is "cut," it is not saved on the Clipboard; this adds unnecessary steps to the manipulation process. Finally, if your computer activity is limited to working with sampled sound on the Mirage, you might consider lower-priced alternatives.

There are Mirage editing systems for the Apple IIe and the Commodore 64 that, while not as fully featured as Sound Lab, do get the job done.

Still, Sound Lab can perform a variety of sample manipulations that greatly improve the versatility of the Mirage. Sample looping and parameter set-ups are much quicker, and sounds can be enhanced with the Page window and Interpolate functions. Sound Lab's features and performance make it a good choice for those who already own both a Macintosh and a Mirage. —Erik Holsinger

See Where to Buy for product details.
Monday Morning Quarterbacking

Mac Pro Football

Football simulation game. Pros: Incredibly realistic football simulation; very challenging; great value for the money. Cons: Requires knowledge of complex football strategy; play screens are too small; play calling involves too many steps. List price: $49.95. Requires: 512K. Copy protection: None.

NFL Challenge 1.02

Football simulation game. Pros: Easy to use and understand; great animation, especially for play execution; well-designed screens. Cons: Doesn't fully use the Mac interface; uses only fixed plays; pricey, considering limitations. List price: $99.95. Requires: 512K. Copy protection: None.

Armchair quarterbacks will appreciate two new football simulation games for the Macintosh—but from different ends of the spectrum. While Mac Pro Football is geared for the serious student of the pigskin, NFL Challenge will appeal more to the casual fan who has less extensive knowledge of the game.

Mac Pro Football

Mac Pro Football, from the Avalon Hill Game Company, is to football what Flight Simulator is to flying—a realistic simulation that gives the user complete control. To benefit from this detailed recreation of the game, the user must have a firm grasp of play calling as well as offensive and defensive strategies.

Avalon Hill provides a data disk with 39 championship teams, from the 1968 New York Jets to the 1985 Chicago Bears, sort of like a best-of-NFL-teams album. To set up “what-if” scenarios, you can schedule a match between any two teams on disk.

After selecting the opposing teams, you choose between playing the computer or a second player. The visiting team calls the coin toss, and the game gets under way. The screen then displays four windows: the first provides a scoreboard that indicates the down, yards to go, location of the ball, and time left on the clock; a second window keeps track of game statistics, such as attempts, completions, and yards gained; the other two windows show almost identical side views of the playing field, a rather useless duplication of effort.

Once the game clock starts ticking, you'll discover what really sets Mac Pro Football apart from the competition—it's amazing flexibility. There are no fixed plays—as “coach” you choose among numerous variables to call either a passing or running play, designing pass-route patterns and setting distances and variables such as upfield yards and lateral movement. On most pass plays you can select from three different types of passing drop-backs: straight, play-action, or rollout (a fourth option, shotgun, is only available on third down and long). Before executing the play, you can call an audible at the line of scrimmage and switch to a run, if you have a change of heart.

When calling plays for the 49ers, I had Joe Montana execute a play-action pass to Dwight Clark. The pass route I designed had Clark run 20 yards upfield, cut laterally 5 yards, and run another 3 yards upfield. With running plays you have the same options for upfield yards and lateral movement, except that you must select a lane to determine the path your running back will take (see “Running the Ball”).

On defense, Mac Pro Football maintains the same realism. You choose between a run or pass defense; select either a zone or man-to-man coverage to double-team your opponent's receivers; and set the defensive alignment to tight, spread, or head-up, depending on what kind of play you're expecting from the opponent.

Play execution is swift, and you see the familiar chalkboard X's and O's as the lower-side-view screen switches to an overhead view of the gridiron gladiators lining up. When the ball is hiked, you watch the play unfold as the X's and O's realistically traverse the field.

Along with its interactive environment, Mac Pro Football's well-thought-out design, attention to detail, and authentic game simulation make it a worthwhile investment for any football fanatic.

NFL Challenge

NFL Challenge from XOR Corporation is a football simulation for the novice or casual follower of the game. The NFL Challenge team disk provides the NFL's current 28-team roster, with

Calling the Shots

NFL Challenge's well-designed, uncluttered screens make calling a play fun and effortless, even for rookies. Here, in the opening seconds of a game between the San Francisco 49ers and the Miami Dolphins, the 49ers have the ball on their own 39-yard line on first down and 10.
each team's strengths and weaknesses based on the most recent statistics available. XOR also offers an optional disk of NFL championship teams.

Originally designed for the IBM PC, NFL Challenge was not redesigned for the Mac and doesn't offer much control over play calling.

Unlike Mac Pro Football, NFL Challenge has you coach from a playbook of predetermined passing and running routes. You choose your plays from six different offensive sets that together provide 40 different offensive formations. On defense, you choose from 39 defensive alignments. But NFL Challenge offers certain advantages over Mac Pro Football: primarily ease of use and better screen design.

When you start the game, you select a team and then choose one of among three different playing modes: the one-player mode, the two-player mode, or the computer versus itself (a nice feature, if you're a gambler). With a word processor capable of editing a text-only file, you can edit team rosters to customize your starting lineup. But be cautious; although substituting rookies for veterans and altering players' skill levels can enhance the game's appeal, this sort of operation is only for the serious hacker.

When NFL Challenge executes a play, you get an overhead view of the X's and O's moving down the field. At this point the program displays the playing field across the whole screen, rather than using only a small portion of it, as Mac Pro Football does. With NFL Challenge you get better play animation plus an instant-replay mode—a clever touch for a game emulating a televised sport.

If you're a rookie who's not yet ready to call the signals, you'll probably find NFL Challenge enjoyable and easy to use, although its limited use of the Mac interface doesn't give you full control. But if you're a veteran football fan who likes devising your own strategies with a minimum of guidance, then Mac Pro Football is your game. —Ken Smith

See Where to Buy for product details.

### Tracking Mac Usage

**MacInUse 1.0**

**Time log for the Mac.** Pros: Easy to use, multipurpose. Fills a void in the Mac software inventory.

Cons: Requires other applications to view or analyze its data files; cannot be used with disk accessories and some games. List price: $49.

Requires: 128K. Copy protection: None.

Some utilities for the Mac—like menu clocks, print spoolers, or MiniFinders—work quietly in the background and perform specialized but important tasks. SoftView has just added another strong silent type: MacInUse, which measures the time an application is in use. Firms will find the program useful for developing productivity profiles or for tracking usage of office equipment. Consultants can use it as an adjunct to client billing, and home business usage can be documented for tax purposes. Since this time log can be set to work invisibly, it can also monitor unauthorized use of documents.

**The Timekeeper**

You install a working copy of MacInUse in each System Folder used to start up your Mac. (A hard disk requires only a single installation.) You can choose the disk to install it on, decide where to store the data file, and set four operation preferences. If you choose “invisible,” you won’t see it on the desktop or in the “Welcome to Macintosh” window. If you choose “visible,” you have two other choices. You can “allow installation override” to inactivate MacInUse until the next time you start up the Mac. Or you can choose to have a dialog box appear each time you close an application, asking you if the application was used for personal or business purposes. Judicious use of this dialog box gives you greater control later, when you need to sort or summarize the data file, for instance, by project or by client.

Once installed, MacInUse begins logging application usage time. Every new entry includes the name of the application, the date, and the time it was in use. One drawback is that you need another application to read the log (anything that reads ASCII files). Fortunately, SoftView provides you with templates for MacWrite, Microsoft Word, Multiplan, and Microsoft Excel to make this easier.

To use a template, you first make sure the data icon and template are on the same disk (or under HFS, in the same folder) as the application you're using to read the file. You double-click the data icon and a dialog box appears indicating the available applications. You make your choice, and the data file is automatically pasted into the Clipboard as the application opens.

With MacWrite, you select Paste, and the data appears in plain text, tabbed to line up with column headings. With Microsoft Word the procedure is slightly more complex, but the instructions appear on screen within Word, so you'll probably get it right the first try (see “Standard Data File”). Multiplan works much the same way, but the Excel macro offers a more spectacular way to track Mac time. Once MacInUse has automatically opened Excel, you can instantly shift between the raw data file, a summary of the data, or a bar chart of the summary. You will often find the results surprising, even after a week of heavy Mac use. Upon opening the data file, you may be startled to find that it has
Apply Yourself

MacMathPac 1.1


There are three basic types of microcomputer programs currently used to automate math functions. Accounting and business packages automate simple arithmetic operations. On a more advanced level, packages such as BrainPower’s PowerMath use artificial-intelligence techniques to aid in symbolic mathematical manipulations. In the middle range, applied math programs use actual numbers instead of abstract symbols to solve problems of numerical analysis.

Operation Operation

MacMathPac comes on two disks, but currently you must use a launch facility to transfer between modules on different disks. Advanced Logistics says it plans to release a more integrated version in the near future. To use MacMathPac, you request a specific operation from the menu and then enter any required information—such as the equation to be integrated—via dialog boxes. When you’re finished, the program

Math Power Tools

Contents

Typical Applications

Algebraic systems

matrix operations, linear equation solutions, eigenvalue calculations

Roots of equations

bisections, Newton-Raphson, nonlinear systems, cubic splines

Ordinary differential equations

nth-derivative, partial-derivative, initial-value problems, boundary-value problems

Graphing

two- and three-dimensional function plotting

Integrals

trapezoid rules, adaptive quadrature, Gaussian quadrature, double integrals, multidimensional integrals

Statistics

simple statistics, correlations, polynomial fitting of data, statistical distributions

Optimization

simplex, conjugate-gradient multidimensional minimization, Wolfe quadratic optimizations

Partial differential equations

parabolic heat equations, hyperbolic wave equations, two-dimensional Poisson equations

Series operations

power series

Special problems

complex powers, Fast Fourier Transforms (FFT), inverse FFT

Special functions

Legendre, Bessel, Chebyshev, Laguerre

MacMathPac, from Advanced Logistics for Mathematics and Science, is the first stand-alone applied mathematics package for the Macintosh. The program provides a complete set of operations for use in any field of numerical analysis. MacMathPac solves math problems in 10 different areas by means of 65 integrated program modules. The available functions range from simple equations to special functions used only in engineering and higher mathematics (see “Math Power Tools”).

grown to hundreds of entries involving dozens of applications. Using the Excel macro—or better yet, a full-featured database manager—you can quickly sort and summarize the data file.

Limits in Use

Unfortunately, MacInUse will not track every application, as stated in the manual. Games that automatically restart or make unadvised uses of memory won’t work. Programs that allow transfer between applications without returning to the desktop, as in Switcher, cause inaccurate tracking. Desk accessories do not track independently, and the Finder cannot be tracked.

By the time you read this, however, MacInUse version 2.0 should be available. Changes will include the ability to track separate applications under Switcher and set the minimum time an application must be open to be tracked. Desk accessory times will be logged under the application open when they’re used. Of interest to network users, MacInUse 2.0 will be compatible with AppleShare and MacServe, so you’ll be able to track remote Macs from the central unit.

I’ve used MacInUse for three months, and its operation has been bug free. I’d like this product even better if it tracked games and desk accessories. Still, I consider MacInUse one of the most useful utilities for my Mac. In fact, the only people who won’t have a use for MacInUse will be those who don’t want to admit how they spend their time on the Mac.—Scott Beamer

See Where to Buy for product details.
3-D CAD

Space Edit 1.5

As its name implies, Abvent's Space Edit lets you create and modify graphics in three-dimensional space. While Space Edit could stand alone on the basis of its 2-D CAD functions, the program's real strength lies in the speed and versatility of its 3-D drawing tools. The program is aimed at the CAD professional rather than at the beginner; newcomers to computer-aided design would do well to learn the fundamentals with a program such as MacDraft before tackling Space Edit.

Space Edit's line drawings could be appropriate for architects, interior designers, or urban planners who want to show numerous views of building layouts. The program could also be used by industrial designers to create exploded views of machine assemblies or subassemblies. Features such as text, dimension lines, and scaling make Space Edit a candidate for architectural or mechanical illustrations. The program is less appropriate for graphic artists, since it doesn't provide shading; however, Space Edit illustrations can be copied to MacPoint or FullPoint and enhanced with those programs.

Creation, Modification, Visualization
When you boot up Space Edit, you'll see a familiar Mac screen layout: a tool palette on the left and a string of menu titles across the top. But at the bottom of the screen is a "geometry bar" that provides continuous digital readouts of the cursor's position in all three axes of three-dimensional space.

Space Edit divides its tools into three categories: creation, modification, and visualization. Each category has its own tool palette, which is entered by clicking on an icon. Unfortunately, the program goes overboard in its use of icons; in addition to 55 icons in the various tool palettes, there are 29 cursor shapes, each with a distinct function. While the developers undoubtedly thought that heavy use of icons would simplify Space Edit, actually the opposite is true. In many instances the familiar arrow cursor would be preferable to the often obscure icons that pop up.

Like many 3-D drawing programs, Space Edit presents a drawing in four views: top, front, side, and axonometric. Unlike those programs, though, Space Edit allows you to draw in the axonometric view as well as the other views. A modification made in one view is reflected in the other three, allowing the designer to visualize the object in three-dimensional space. Space Edit offers a good deal of flexibility when you're drawing in four views. For example, you can "untie" the windows if you want to draw in only one. This not only speeds up the redrawing time but also lets you assign a different scale to each window if you wish.

Special Effects
A drawing may be viewed from various angles and distances. True perspective with three vanishing points can be achieved with a few commands, as well as perspective with two vanishing points or with no vanishing point (axonometry). Once the perspective has been set, you can produce some striking animation effects for presentations. Use the Rotation command to make an object appear to move in space, or the Path of Visualization feature to simulate the viewer following a path through a scene (see "Room to Move"). Space Edit's quick screen regeneration produces smooth animation effects.

Another impressive viewing option is Space Edit's heliodonic view, which simulates a perspective view along the sun's axis according to the season, the latitude,
and the time of day. When you enter information for a particular time and location, the program shows which part of a structure would be in shadow and which in sunlight under the specified conditions. This feature could help architects, urban planners, and builders planning to make use of solar energy.

**Output**

*Space Edit* supports the LaserWriter, the ImageWriter, and several pen plotters. The program generates vector-based documents in real size on the screen; scaling is done when a drawing is output. A unique algorithm calculates the intersections of vectors on the x-, y-, and z-axes, resulting in true hidden-line removal. Vector processing and hidden-line removal for plotting are normally slow operations, but *Space Edit* performs these calculations surprisingly quickly.

*Space Edit*'s manual provides an easy-to-follow tutorial and thorough instructions on using each command. Despite the detailed instructions, however, *Space Edit* is not a program that will be quickly learned by newcomers to 3-D graphics. Familiarity with *MacDraft, MacDraw,* or another 3-D program helps, but even so, figure on a learning curve of 20 to 30 hours before you can take advantage of *Space Edit*'s many features.

According to Abvent, version 2.0 of *Space Edit* will provide multiple fonts, a variety of dimension line styles, and color support for the Mac II. —Chuck Carroll

See Where to Buy for product details.

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**Dark Waters, Deadly Seas**

**Sub Battle Simulator**

*Submarine simulation game.* **Pros:** Brilliant historical replication of WWII sea-battle conditions. **Cons:** Not fully Mac compatible. **List price:** $39.95. **Requires:** 512K. **Copy protection:** None.

The Klaxon horn sounds as your first officer cries, "Battle stations! Battle stations!" You are underway in one of the most vital and vulnerable weapons of World War II, the submarine. You have a crew to command, machinery to maintain, and a mission to complete. You must respond to events with speed and authority. Oceans are not the playgrounds of the indecisive.

**Choose Your Side**

*Sub Battle Simulator* from Epyx lets you command a German U-boat assigned to Atlantic duty in 1939, or an American submarine scouring the Pacific Ocean to engage the Japanese Imperial Fleet in 1942. In either case you call the shots. You're skipping one of the deadliest fish in the sea, bristling with the most sophisticated equipment and weaponry of the day—sonar, radar, torpedoes, mines, and antiaircraft guns. This is total submarine warfare.

**Commanding Your Vessel**

Glowing before you are the eyes of your vessel and the control panel. There are two windows on screen. To the right is the visual display showing periscope, deck, and binocular views, as well as sonar and radar screens. On the left is a map display that shows the local geography, your location, and the location of enemy craft. Between the two windows is a toggle-button strip that controls the various views. The control panel allows you to set your depth, speed, heading, and view gauges. Above the controls is the crew-speech display. Several toggle buttons also allow you to control power sources, diving, periscope height, weaponry, and time compression.

It takes a while to master *Sub Battle Simulator.* Not all commands are on pull-down menus or the screen display—you must use the keyboard to lay mines and perform some other operations. While Epyx provides excellent documentation and a command summary card, the keyboard commands do prove to be a nuisance. And beware: there is no on-line help.

However, when you get the hang of *Sub Battle Simulator* the game changes dramatically. Suddenly it all makes sense. You know the keyboard. You know your ship. You are in command.

**The Reality of Command**

Humans and their machines are fallible. In *Sub Battle Simulator,* the higher the level of the game, the more likely you are to experience the actual failure rate of crew and equipment. In this sense *Sub Battle Simulator* is more than a game. It is an exercise in living history, painstakingly researched and crafted by the same mad geniuses that created *Orbiter* and *Gato.*

*Sub Battle Simulator* represents a milestone in computer software—it is the most accurate simulation I've ever seen. I expect that *Sub Battle Simulator* will become the new benchmark for simulation programs. —Ken Goebner
A Champ Comes Back

Spelling Champion 2.2


Similar to Spellswell but much more elegantly executed, Spelling Champion from Champion Software is one of the best stand-alone spelling checkers for the Macintosh—slim, speedy, and accurate. The original version of Spelling Champion, released last year, was agonizingly slow to load, but the latest upgrade zips through the loading process at well under a minute for a one-thousand-word document. The dictionary is now up to 125,533 words, yet program and dictionary together account for only 231K—small enough to fit comfortably with either MacWrite or Microsoft Word 1.05 on a single-sided disk. This size allows easy use of the built-in transfer utility, which instantly enters corrections into your word processing document. Spelling Champion can also fit on an 800K disk that contains MacWrite, Word, and a healthy System Folder.

Errors and Additions

Spelling Champion is a breeze to use. The program counts words, shows all possible errors in context, usually suggests correct alternatives, and enables the user to edit not only the words it flags, but also any part of the document that shows up in its window. As with most spelling checkers, words can be ignored or replaced, or accepted for one or all documents (see "More Than a Suggestion"). If you accept a word for all documents, Spelling Champion won't flag further occurrences in that document, but the program waits to add the word to the main dictionary until you confirm it later, using a command called "Review new words one by one." Then, for each root word, it accepts up to eight suffixes and lets you decide whether to double the final consonant. Again, at this stage you can ignore, remove, add to the main dictionary, type your own choice, or quit.

The only problems I've experienced involve adding new words to the main dictionary. Sometimes words selected as "Accept in any document" don't show up in the new words dictionary and don't get added to the main list, which means that you must add the words again when you come across them.

If a word gets in by mistake, it can be removed easily: open the dictionary, type the first couple of letters to scroll to the general area, click on the root, and use the Remove command.

Room for Improvement

Although Spelling Champion is smarter about adding words and takes up significantly less disk space, it is inferior to Spellswell in two areas. First, it is not case sensitive. It can't differentiate between proper nouns and ordinary words, and it can't catch a stray capital letter in the middle of a word. Second, it can read MacWrite 2.2 files but it can't correct them. You have to reenter the word processor to fix errors. However, it automatically corrects MacWrite 4.5, Word 1.0 and 1.05, and text-only files.

Also, the dictionary resists hyphenating words and almost always suggests the unhyphenated version of a word, a stylistic preference that should be left up to the author. But unless you make many capitalization errors or need a homonym dictionary, Spelling Champion may be the best combination of reasonable price, functionality, and ease of use—at least among stand-alone checkers. If you want a desk accessory checker, you'll have to look elsewhere; otherwise this program is a very good choice.—Shel Horowitz

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New Products

Information on the Mac’s latest software, hardware, and accessories

Edited by Eileen Drapiza

New Products includes Macintosh products that have been formally announced but not yet evaluated by Macworld’s editors. All prices are suggested retail prices. Please call vendors directly for information on availability.

SOFTWARE


Cue, The Film Music System Support system for film composers and music editors. Automates paperwork and calculation procedures for creating music that synchronizes to visuals. Prints cue sheets and score paper for each cue, a master cue list, and a performing-rights cue list for the entire production. Cue fits tempos and offsets (if required) to key cue points in film and video. Click tracks can be played through the Mac, and streamers and punches may be displayed on screen. 512K minimum memory. $499. Opcode Systems, 415/321-8977.

Desktop Desk accessory that enables you to copy, rename, delete, set Finder file information, select multiple files to work on simultaneously, and move files on the desktop while within a program. Includes LaserStatus, a DA that monitors the AppleTalk network, and Widgets, a collection of utilities for downloading PostScript programs, printing Paint file catalogs, and converting from PICT to Paint files. Introductory price $25, suggested retail $35. CE Software, 515/224-1995.

FileStar Shareware desk accessory for file management tasks such as Delete, Rename, Copy, Duplicate, Move, Get Info, Transfer. Allows multivolume search by file name, type, creator, or creation or modification date. Registration for copies obtained on line $15, source code $5, direct purchase $20. Searle Software International, 206/745-3964.

HFS Backup for AppleShare Designed for workstations on AppleShare. Enhances speed, backs up the directory for up to 5000 files, and includes a file "filter." 512K minimum memory: $149. Personal Computer Peripherals Corp., 813/884-3092.


Lottomation Generates random numbers and lottery ticket database for selecting Lotto numbers based on winning number frequency. 128K minimum memory: $9.95. Hot Data Software, 213/393-6405.

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New Products

PUP (Paragon Update Procedure)  Facilitates developer distribution of updated software with an encryption program that can be deciphered only with the original software. 512KE minimum memory. License fee to software developers $195. Paragon Concepts, Inc., 619/481-1477.


Real Estate Partners  Management program that helps novice investors get started in the business of buying and selling real estate with no money down. Helps professional investors determine appropriate partnership interest to give each partner an attractive rate of return. Reports can be used for presentation. 512K minimum memory. $295. Meta Venture Technology, 818/796-5479.

Scholar's Aid  Shareware designed to search text for figure, table, equation, and reference citations. Automatically numbers references and sets up Microsoft Word files to be printed. 512K minimum memory; requires an external drive. Registration $35. Stuart E. Strand, 206/542-1312.

Whodunit  Mystery game that presents a scenario in French, Spanish, or German. 512K minimum memory. $49.95. Gessler, 212/673-3113.

HARDWARE

The Administrator  Formatted storage sub-system in either 150MB or 300MB, with or without a 125MB streaming tape backup, 512K to 16MB of cache RAM, and system and utility software. Requires a SCSI port. $5995-$18,445. Racetr Computers, Ltd., 714/997-4950.

ArtScan  Software interface for the Kurzweil 4000 ICR Scanner. In one pass of a document page, users can scan line-art graphics and text at full resolution into SuperPaint, MacPaint, or PICT format files for editing, storage, or printing on ImageWriter and LaserWriter. 512K minimum memory. ArtScan with 10MB configuration $4,500, with 30MB configuration $5,500, 4000 ICR scanner $36,500. Kurzweil Computer Products, 617/864-4700.

AST-ICP, AST-RM4  AST-ICP, an intelligent communications processor, off-loads I/O processing from the Mac II to increase system performance, speed, and efficiency. Supplies extra serial ports, allowing up to four additional users to connect to the Mac II's UNIX operating system. Two of the ports may be configured to work with AppleTalk. AST-RM4, a memory expansion board, provides up to 4 additional megabytes of memory on the Mac II for use by processors residing on the NuBus under Apple UNIX. Memory expansion is incremental in 1MB units. AST-ICP with two connectors $949, AST-ICP with four connectors $999. AST-RM4 $899. AST Research, Inc., 714/863-1553.

(continues)
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New Products

AST-Pak A 1MB memory expansion board (upgradable to 2MB) for the Mac SE. Allows attachment of option boards for added system customization. $499. AST Research, Inc., 714/863-1333.

GPIB-SE Interfaces the Mac SE to the IEEE-488 and expands the 8-bit data path of the 68000 processor. Two options are available: an 8-MHz 68440 DMA controller and a 12-MHz 68881 math coprocessor. The GPIB-SE implements the full range of talker, listener, serial and parallel poll, service request, remote programming functions, and complete controller capabilities. The card uses a single expansion slot and supports LabVIEW. Base card $495, DMA option $795, math coprocessor option $995, both options $1295. National Instruments, 512/250-9119.


MacMainFrame SE Software and an internal card that plugs into the Mac SE expansion port, providing 3278 terminal emulation and file transfer. A coaxial connector extends from the Mac SE's access panel to an IBM control unit or display printer adapter. $795. Avatar Technologies, Inc., 617/435-6872.

Mac86 Add-on board based on a 10-MHz Intel 8086 for the Mac SE. Provides a link to the MS-DOS environment allowing creation or editing of MS-DOS files from either the Macintosh SE's hard disk drive or an external 5.25-inch MS-DOS floppy disk drive. The Mac86 offers printer support for both MS-DOS and Mac applications. $599. AST Research, Inc., 714/863-1333.

MacOCR, Microtek SCSI Interface Scans pages of text into files compatible with popular word processing programs. Recognizes different faces, including Courier 10, Prestige Elite 12, Victoria 12, Prestige Pica 10, Pica 10, Elite 12, and Bookface Academic 10. Works in conjunction with the MSF-300C, a 300-dpi raster-image flatbed scanner, and VersaScan Plus. MacOCR price to be announced, MSF-300C $1995. 512K min-

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New Products

Maximum memory. Microtek SCSI interface, an interface box for hooking up hard disk to scanner, cuts down transmission time. 50-pin to 50-pin. $295. Microtek, 213/321-2121.

Mac286 A self-contained 80286-based microcomputer for the Mac II. Includes 1MB of RAM, a direct-memory-access controller, a socket for an optional 80287 math coprocessor, and a controller for a 5.25-inch MS-DOS floppy disk drive. $1499. AST Research, Inc., 714/863-1333.

Memory Upgrade 4MB upgrade for the Mac Plus. $400 per module. Performance Electronics Packaging Services, Inc., 310/455-7787.


NB-MIO-16 A multifunction analog and digital I/O board for the Mac II. Includes a 12-bit A/D converter with up to 16 analog inputs, two 12-bit D/A converters with voltage outputs, eight lines of TTL-compatible digital input and output, and three 16-bit counter/timer channels for timing. Interfaces with the National Instruments RTSI Bus for high-speed data acquisition and handling. The 12-bit D/A converter is available in three speeds: 25-second version $1195, 15-second version $1295, 8-second version $1495. National Instruments Corp., 512/250-9119.

Nutmeg Full Page Display Xerox-manufactured 15-inch portrait screen. Displays an entire 8½- by 11-inch page, has full brightness and contrast controls, and offers 720- by 900-pixel, 90-dpi resolution. The Nutmeg video interface card clips onto the 69000; the connector is installed flush into the security port on the back of the Mac. A low-glare filter and swivel-and-tilt stand are built into the unit. $1995. Nutmeg Systems, 203/966-3226.


(continues)
When they say a picture is worth a thousand words, they're describing LaserView, ultrahigh-resolution large-screen monitors from Sigma Designs. Available for the Macintosh SE and Macintosh II in 15-inch and 19-inch sizes, LaserView provides a 1664 x 1200 on-screen pixel display (equal to 11 Macintosh SE screens). And because LaserView is a noninterlaced monitor, text and graphics are displayed virtually flicker-free. Even facing pages. You can select the default display mode of 1664 x 1200 pixels (2,000,000 pixels). Or choose the standard Macintosh resolution of 72 dots per-inch which yields an on-screen pixel resolution of 832 x 600 (500,000 pixels). You can choose from three cursor sizes and two system font sizes for legibility.

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For more information on LaserView, call Sigma Designs today at (415) 770-0100. Or visit an authorized Sigma Designs dealer.

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**Parrot 1200** A cassette-sized modem (4½ by 2¾ inches by ⅛ inch) that weighs only 3 ounces. Requires only the power available from the host computer’s RS 232C serial port. Requires no batteries or A/C power: $119, bundled with communications software and an interface cable $135. Novation, 818-998-5060.

**Prodigy SE** Accelerator board for the Mac SE with expansion options, including a floating-point math coprocessor (16-MHz Motorola 68881), 2, 4, or 8MB of memory, and a paged memory management unit (PMMU). Base configuration $1995, math coprocessor and 2MB memory $350 each ($475 if added later). Other options to be announced. Levco, 619/457-2011.

**Radius Performance Accelerator** 68020 accelerator board for the Mac SE, Mac Plus, and 512KE that increases speed and graphics performance. Clips onto the logic board or the Radius FPD board. Works in conjunction with the hardware cache. $995. Radius, Inc., 408/732-1010.

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**MacDesk, MacStack, Printer Stand** Three colors available. Each comes in veneer or solid oak. MacDesk is 20 inches deep, 48 inches wide, and 26 inches high. MacStack and Printer Stand fit on the desktop, and may be purchased separately. Veneer MacDesk $194, solid oak MacDesk $224, veneer desk with two extra drawers $259, solid oak desk with two extra drawers $289, MacStack $42.95, Printer Stand $34. Kamar Wood Products, 602/764-3300.

**Macintosh Floppy and Hard Disk Systems** A book that provides details on the disk structures of MFS and HFS operating systems. Some of the sections covered in depth are sector allocation, volume-information file systems, and file allocation. Explains block, file, network, and LAN servers. $20 plus $3 shipping and handling. Micro/Analyst, 512/926-4527.

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Quick Tips
Answers to your questions

by Lon Poole

Apparently lots of people out there like to load up on desk accessories; several readers have responded to February's discussion on getting past the limit of 15 desk accessories. Often mentioned: the shareware desk accessory Double Apple, which creates a second Apple menu where you install a file full of desk accessories that you have assembled using Apple's Font/DA Mover. But I still prefer the shareware desk accessory Other ($15) or its function-key twin DA Key, because those two don't mix up the menu bar as Double Apple can.

Desk accessories you add with Other or Double Apple disappear from the menus when you change applications.

Other's author, Lofty Becker, adds a caution to my February instructions for using ResEdit to install extra desk accessories: take care when renumbering a desk accessory that has resources of types DLOG, ALRT, or DITL. Those resources may have other types of resources, such as CNTL, PICT, and ICON, embedded in them, and ResEdit does not renumber the embedded resources. You could renumber the embedded resources yourself, but it's easier to remove and then rearrange your DAs: use Apple's Font/DA Mover to install the desk accessories that have embedded resources, and then use ResEdit to renumber the desk accessories without the embedded resources for positioning in the extra desk accessory slots.

The shareware products are available from on-line services such as Genie and CompuServe or from user groups such as the Berkeley Macintosh User Group, 1442A Walnut St. #62, Berkeley, CA 94709, 415/549-2684. Or call 800/558-9696 ext. 500 for the name of a user group near you.

Cover Squashes Printing
Squashed lines of type printed on an ImageWriter I may be caused by the printer's clear plastic cover. Brigid Duffy of San Francisco believes the lines compress when the paper hits the clear plastic at the wrong angle, impeding the paper's advance. She suggests leaving the clear plastic cover open, or at least propping it open part way with a pencil.

Larry Widigen, of Santa Barbara, California, also used to have trouble with squashed, wavy lines and generally non-uniform printing on his ImageWriter I. "In a moment of desperation, I raised the plastic cover and blew air across the printhead with a table fan. The results were amazing—clean, uniform print quality over hundreds of pages."

Q

Lost in CompuServe
I have been a member of CompuServe for about a year now, but the menu system deters me from using it. I realize I could buy a binder that lists all the commands or I could download them from the service itself. But I am interested in only two aspects of CompuServe: the mail service, which I have figured out, and the Macintosh user group.

Once I've reached the user group by typing GO MAUG or GO MACUS, I'm able to read messages. But I get lost in the data libraries. I'd like to find and download software such as a new System file, Finder, and Switcher, or get information about Macin-

A

You've described a feature, not a bug. When you quit an application, it converts the Clipboard contents to a form any other application can use. Otherwise, you would be unable to paste information from one application into another.

Until recently, there was no convention for formatted text on the Clipboard. All text had to be simplified to plain text (ASCII text). With the Mac SE and Mac II, Apple introduced conventions for maintaining some text formatting on the Clipboard. Text can now retain combinations of fonts, sizes, styles, and colors between applications. There is no provision to retain paragraph and document formats, only character formats. At this writing, it wasn't clear whether these changes would be retrofitted to the Mac Plus, Mac 512K Enhanced, and earlier models. In any event, applications written before the introduction of the new machines don't take advantage of the new Clipboard features; until upgrades and new products emerge, you'll still get plain text when you cut and paste between applications.

Q

Clipboard Formats
In Microsoft Word, I can copy formatted text from one document window and paste it into another without losing any formatting. But if I copy formatted text, quit Word, immediately reopen Word, and then paste, I get plain text. The only formatting that's left is tabs and carriage returns. No boldface, no underlining. Does Apple know about this bug?

Bill Davies
Fairbanks, Alaska

(continues)
How To/Quick Tips

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data libraries while you’re on line because many of the files aren’t plain text. Those
you must download.)

Once you know the name of a file, you can download it by entering DOW at the
Data Library menu or command line. You’ll be asked to enter the name of the file you
want and to choose a transfer protocol.

Most Mac terminal applications work best
with the Xmodem protocol.

After you download files, many of them require massaging before they’re usable
on your Mac. This includes all software, pictures, fonts, and formatted text.

Some files exist on CompuServe in coded form and must be decoded. Their file
names have the suffixes .HEX, .HCX, .HGX, and .BIN. Some terminal applica-
tions, such as Software Ventures’ Micro-
Phone ($74.95, 415/444-3323), automatically
decode files with the .BIN suffix as
they download. In contrast, MacTerminal
doesn’t decode, so you have to use an ap-
plication like BinHex to do the decoding
in a separate step. For more information,
read files BINHEX.HLP and MACBIN.HLP in
MAUG’s Data Library 0.

What’s more, MAUG files with the suf-
fix .PIF contain several related Macintosh
files packed together. For example, a desk
accessory and its instructions might be
packed together. You must unpack them
after downloading. Use the application
Packet III (file PACKIT.BIN in DL14) or Un-
Pack; (file UNPACK.BIN in DL14).

For a complete list of commands you
can use in MAUG, enter IN at the main
MAUG menu. When asked to state a sub-
topic, press Return. Then when asked
to name a topic, enter three periods. You’ll
get about 20 pages of instructions on your
screen.

Improving SuperPaint’s LaserBits

Tip: One of SuperPaint’s best fea-
tures is its LaserBits drawing mode that al-
 lows you to create images at 300 dots per
inch (dpi). However, LaserBits objects can-
not be grouped with other objects. Also,
they are opaque, so you cannot success-
fully overlay two LaserBits objects. I have
found a way to get around both these prob-
lems by doing a little of SuperPaint’s work.
Here’s how: select an area of your drawing,
copy it to a new document, scale it to
400%, and edit as necessary. Copy your
finished masterpiece to the draw layer,
erase the draw layer, and then once again
copy it to the draw layer—this makes it
transparent. Scale the finished image down
to original size (25%) and paste it into the

Steve Peha
Boston, Massachusetts

Line Up Your Decimal Points

Tip: When dealing with dollars and cents,
you can use two of Excel’s standard number formats, $##,##0.00
and $##.##0.00, to accomplish this. But the space preceding the semi-
colon in the first format means that the
decimal points don’t quite line up. (The
space appears in positive numbers to bal-
ance the parentheses used in negative
numbers.)

The solution: make your own format.
Choose Number from Excel’s Format
menu and select the $##.##0.00
format. Remove the space preceding the
semicolon, and click OK.

(continues)
How To/Quick Tips

Use the new format for the first and last cells in the column of dollar amounts. If your column of numbers includes negative amounts, you will have to create different formats to align the decimal points.

Paul E. Mack
Dubuque, Iowa

For columns with negative amounts, use the formats $#,##0.00 and #,##0.00. That's a blank space before each semicolon.

Remote Control Lasso

Tip: The article "Insights on MacPaint" [Macworld, February 1987] states you can move a lassoed item by remote control "by lassoing an object and moving the lasso pointer to the bottom left corner of the drawing window, carefully positioning it until the pointer turns into an arrow." Pressing the mouse button at that point allows you to drag the lassoed object.

Actually, the remote control lasso area extends from the top right corner of the drawing window across the entire top edge, down the entire left side, and about one inch toward the bottom right corner (see "The Lasso Zone"). It can also be accessed directly in the bottom-right corner.

Steve A. Carpenter
Truckee, California

Word Insights Update

Tip: Here is a more efficient technique for handling paragraph formatting with Microsoft Word version 1.05 than that suggested in "Insights on Microsoft Word" [Macworld, March 1987]: store paragraph formats, as well as division breaks, in a Word glossary. Glossary entries are easily called up by typing a short mnemonic abbreviation or by choosing from a scrollable list.

Tony Edwards
Washington, D.C.
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How To/Quick Tips

Word's glossary feature is more powerful than it might appear at first glance. It's not just for boilerplate text. You can store a template for an entire document—say a letter and invoice, or an envelope—as a single glossary entry. Just create a sample of the document using dummy text but actual character, paragraph, and division formats. Then copy it all and paste it into the glossary. Similarly, you can use glossary entries for often-repeated parts of documents that you want formatted alike, such as tables, figure captions, chapter openings, and numbered lists. The procedure for creating and using glossary entries is slightly different for Word 1.05 and 3.0. Read all about it in your Word manual.

And if you want to copy the format of one character, paragraph, or division to another, don't overlook Word's shortcuts for format copying. In Word 3.0, select what you want to copy from and press & V. Then select what you want to copy to and press Return or Enter. (See the Word 3.0 reference manual, page 33, for another method.) In Word 1.05, select what you want to reformat, and then press & Option while you click on an instance of the format you want.

Tip: In Microsoft Word, to avoid page breaks in the middle of paragraphs without scanning for undesirable page breaks and fixing them manually, select the paragraphs whose lines you don't want split, choose Formats from the Paragraph menu, and select the "Keep lines together" option.

Marshall Plaut
Baltimore, Maryland

Static KO's Optical Mouse

Tip: In our cold, dry winter climate in eastern Massachusetts, there is lots of static electricity. Bedroom slippers on a nylon carpet are especially bad news. The slightest zap to a Mouse Systems A+ optical mouse causes it to freeze and appear to be malfunctioning. Simply unplugging the mouse for a moment unfreezes it.

Liane Reij-Lehrer
Belmont, Massachusetts

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Getting Started with Basic Maintenance

Where and how to set up your Mac, fighting dust and grime, and becoming a fan of proper cooling.

by Jim Heid

In computing's primeval period (30 years ago), computers used vacuum tubes—those glowing glass bulbs—to shuttle the binary code's ones and zeros. One IBM SAGE computer, 48 of which formed the backbone of the United States' air defense system from 1958 to 1983, used 25,000 tubes. Maintenance was hellish. A staff of technicians worked full-time keeping the four-story behemoth running, and even with a battery of built-in diagnostics, finding a faulty tube often meant turning the room lights off and looking for its weakened glow.

Today you can service a computer with the lights on. But despite the reliability of solid-state electronics, computers like the Mac still have some mechanical parts that require routine attention. You'd be surprised at how many people ignore the basics of setup and maintenance vital to a healthy Mac. Or maybe you wouldn't. If you're part of the group that believes even preventive maintenance should be prevented, this column is for you.

You'll be glad to know that keeping your Mac and its peripherals in tune doesn't require fancy equipment or a technical background. You don't have to learn a single acronym. In fact, Mac maintenance can be summarized in one phrase: keep it clean and cool.

Clean Up Your Mac

Electronic chips don't have to sparkle to work; the only items on a Mac that need cleaning are the screen and the mechanical parts—the keyboard, the mouse, and possibly the disk drives.

Maintaining a clean keyboard involves keeping it free of dust and liquids. Each key is a switch with two contacts that close; the key generates a signal when you press it. Dust or spilled maple syrup will either prevent that signal from being generated, or will cause a kind of keyboard stuttering: you press c, and get six of them as the contacts intermittently make and break their connection through the grime.

To dust a keyboard, disconnect it from the Mac, take it into a different room (one without computers), turn it upside down, and blow into the keys with short, powerful breaths. Keep those breaths dry by swallowing a couple of times beforehand, and don't think about Grandma's cookies as you work. Better still, rest your lungs and buy a can of compressed air, such as Falcon's Dust-Off, at a camera store. Read the directions on the can first: with some products, unless you hold the can at a certain angle, icy wet liquid escapes that could defeat your purpose. Don't substitute a bi-
cycle pump, air compressor, or other unfiltered air source. It could make matters worse by blowing dust into the keyboard.

Compared to liquids, though, dust is a minor enemy to keyboards. Crying over spilled milk may serve no purpose, but orange juice or soda spattered on a keyboard is definitely weep-worthy. When sugary liquid dries, it leaves a sticky residue that may seal the key's contacts or even corrode them. If you commit this cardinal sin, take your keyboard to a dealer for a complete cleaning.

If you're in the middle of a big project and can't do without the keyboard, there is one small hope. It's a desperate measure that won't replace professional service, but it may get you through a crunch. Buy a bottle of spray contact cleaner (not tuner cleaner) at an electronics store, then unplug the keyboard, hold it over a sink, and spray a generous amount of cleaner into the keyboard while repeatedly pressing its keys. Quickly turn the keyboard upside down to let it drain. Wait half an hour or so, then try typing. If the keyboard works, say a prayer of thanks and vow to take it in for service as soon as possible. If it doesn't, or if one or two keys still act up, try cleaning it again. If you can't locate contact cleaner, try a bottle of tape-recorder head cleaner. But remember that this technique is a last-ditch effort. If you can live without your keyboard for a while, having it properly cleaned is the best solution.

The mouse is another component to keep dry. Spilled liquids can seep in around the mouse button and gum up its switch. Again, professional cleaning is the best remedy, but you can probably make do by disassembling the mouse and spraying contact cleaner into the switch. A mouse can also take in liquid from the bottom. If you roll it through a puddle, its rubber ball will pick up liquid and transfer it to the contact points, causing sluggish pointer movement or none at all. If that happens, turn the mouse upside down, remove the retaining plate that surrounds the ball (turn the plate counterclockwise), then invert the mouse and catch the ball as it falls out. Clean the ball with a lint-free cloth and clean the rollers inside the mouse using a cotton swab moistened with tape head cleaner or alcohol.

In any case, cleaning the mouse regularly is a good habit to get into, since the mouse picks up dust and lint during use. Ergotron of Bloomington, Minnesota (800/328-9839), makes a mouse-cleaning kit that lets you do the job without getting dirt under your fingernails.

**Dusty Drives and the Screen**

The debate over whether to clean floppy disk drives has been known to spark brawls at user-group meetings. Some say regular cleaning helps prevent disk errors by removing dust and particles that occasionally flake off a disk's surface. Clean-drive advocates regularly use kits containing a disklike item that houses a circular pad of fiber-based cleaning material. You moisten the pad with cleaning fluid, insert it in the holder, and put the holder in the drive, where it spins like a disk and cleans the heads.

(continues)
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Circle 711 on reader service card
How To/Getting Started

Others say, leave drives alone unless they're acting up. They claim that cleaning can do more harm than good because you can easily use too much or too little fluid, and because dirt and grime in the cleaning pad can act like sandpaper on the drives' heads. I'm from that school. Two of my Macs are approaching their fourth birthdays, and their never-cleaned drives have never misbehaved—despite nearly constant use in a house plagued with woodstove dust in the winter and pollen in the summer. I'm not saying that cleaning is bad for drives, mind you: I'm just presenting both sides of the story. I believe cleaning is unnecessary—if you avoid bargain-basement disks and prevent an accumulation of dust in your work area.

Improper cleaning can also damage the Mac's screen, since it has a nonglare coating that common glass cleaners will promptly dissolve, turning the finish from matte to glossy. You can keep the screen clean with lint-free tissues (such as Kimwipes) or photographic lens-cleaning tissue. If you must use a liquid to remove sticky fingerprints, use a cleaning fluid made for computer screens. It won't harm the finish, and some of those products repel dust. Although you can use window cleaner to clean the Mac's case, make sure to spray it on a cloth (not a linty paper towel) rather than directly on the case.

Cleaning is important for the Mac's mechanical parts; cooling is vital for its electronic ones. Electronic components have self-destructive lifestyles. Heat is their worst enemy; yet they generate heat as they work. To keep the parts cool, you must ventilate a computer's case so that cool air can replace hot. The designers of the first Macs (the ones preceding the SE and II) placed cooling vents at strategic locations in the machine's case to provide what's called convection cooling. Heat created inside the machine rises and exits through vents in the top of the case, drawing in cooler air through vents at the bottom. This clever arrangement allows air to circulate through the case without the need for a noisy fan.

But you can easily thwart the process by blocking a set of vents. If you cram a Mac between books or magazines (or use it on a bearksin rug), you'll block the lower vents, preventing the intake of cool air. If you put it under a shelf or set books or papers on top of it, you'll block the top vents, trapping the hot air inside. Either way, the result is the same: you'll choke off the flow of air, allowing heat to build to potentially damaging levels. And damaging doesn't have to mean chip meltdown. Even if it doesn't damage the hardware, too high a temperature can cause a system crash.

To beat the heat, then, give a Mac room to breathe; an inch or two on the sides and several more on the top. Keep it away from a radiator or other heat source. Also, keep it out of sunlight. Direct sun will bake a Mac and cause screen glare to boot.

A Case for Fans

An especially effective way to chill your chips is to add an external fan such as Beck Tch's Fanny Mac (its real name) or Kensington Microwave's System Saver. External fans usually fit in the niche that forms the Mac's carrying handle, which may be a drawback if your Mac moves around with you. An alternative is an internal fan like Levco's MacBreeze, a piezoelectric fan that moves air with a special solid-state device instead of the common

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How To/Getting Started

motor-and-blades arrangement. MacBreeze is said to be noiseless, although I've never heard (or not heard) one to verify the claim.

A fan increases the flow of air through the machine, although keeping the vents clear is no less important. Some people think fans are for ballparks and hate the idea of losing the Mac's aural unobtrusiveness, but if you work in a large office or use a hard disk or some other fan-equipped gear, you won't notice a fan's extra decibels.

But don't feel you must have one; the returns aren't in yet on the effectiveness of these fans in preventing damage to your components or data. Your Mac's fan-free cooling scheme will keep it temperate, provided you follow the ventilation rules. Consider a fan, however, if you've added a memory upgrade of at least 1 megabyte to a 512K Mac, if your Mac Plus brims with SIMM memory upgrades, or if you live in a tropical climate.

The Complete Mac Wardrobe

Cleaning and cooling will keep your Mac healthy, but what about you? Your equipment should be set up to allow you to use it without having to hire a live-in ophthalmologist and chiropractor. Fortunately, several companies have come to the rescue with gadgets and gizmos that all the well-dressed Macs are wearing.

Tilt-and-swell stand For me and many others, the Mac's screen is too low to look at for hours on end without developing a pain in the neck. Swivel stands made by Curtis Manufacturing, Ergotron, or Kent-

singcon raise the Mac and let you tilt it to a more comfortable viewing angle. You can also try propping up the front of the machine by placing something under it, such as the lid of a disk box or two 1½-inch-high plastic furniture-leg tips (my personal choice). Incidentally, tilting a Mac does not affect the operation of Pinball Construction Set.

Mouse pad This square of rubber smooths mouse movement and protects furniture. You can even make one yourself from wet-suit neoprene.

Glare filter If you work near a bright window or under a bank of fluorescent lights, screen glare may take its toll on your eyes. Kensington Microware's Polarizing Filter is made by Polaroid and attaches with velcro to the Mac's screen.
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How To/Getting Started

- **Typing desk** Many desks are too high for comfortable typing. To avoid back strain, you should use a typing desk that’s roughly 27 inches high. Get a desk intended for typing, and avoid those so-called computer tables with shelves that place the screen at forehead level. To protect your neck and your ego, you should look down slightly on a computer.

- **Surge suppressor** To guard against lightning bolts and power surges (very brief but potentially very damaging in the power company’s voltage), you might want to consider a surge suppressor. Some surge suppressors also contain power filters, which smooth out the incoming voltage and help remove “noise” that power equipment or thunderstorms can cause. Many people swear by these items, but I’ve never found one necessary.

Engineers I’ve talked to say a more common power problem is a voltage sag, also called a brownout, which can occur when a nearby power-hungry device like a clothes dryer or air conditioner comes on. Surviving voltage sags requires more complex and more expensive circuitry. The best power security is a device called an uninterruptible power supply or standby power supply, which contains batteries that provide a minimum of five minutes of juice after a power failure—not a long time, but enough to save and shut down safely.

**Odd and Ends**

While we’re talking electronics, I should pass on some other electricity-related maintenance tips. One concerns the battery that goes in the slot above the power switch on pre-SE Macs; this battery powers the built-in clock and saves the Control Panel settings when the machine is off. It looks like a 1.5-volt AA flashlight battery, but it isn’t. It’s a 4.5-volt battery, an Eveready 523 or equivalent. If your Mac’s clock starts losing track of time, the battery is probably exhausted. You can buy a replacement, which should last about two years, at a camera store. (The Mac SE and II have lithium batteries that last for seven years.)

Then there’s static electricity, which can be as disastrous to an integrated circuit as heat. If you’ve just shuffled across a wool carpet on a dry winter day, touch a metal light switch plate, a radiator, or your spouse’s nose before touching the Mac. That’s especially vital if you’re about to install or remove an expansion board in a Mac II or SE. The closer you get to integrated circuit chips, the more important it is to be static-free.

Static electricity can also zap disks, scrambling just enough information to make the disk unreadable. Speaking of disks, they warrant their own special care, which boils down to no heat, no dust, no bending, and no magnetic fields (see “Getting Started with Disks,” Macworld, December 1986). And if you have an external disk drive, don’t set it to the left of the Mac (near the power supply) or underneath a high-intensity desk lamp (the kind with a transformer in its base). Both generate magnetic fields that can cause disk errors.

All in all, Mac maintenance isn’t a full-time job. It certainly beats the hoops I had to jump through to keep afloat my first computer, a 1977 Radio Shack Model I. Its copper connectors corroded faster than an old Chevy in an acid bath, causing frequent system crashes. The solution: a weekly “Pink Pearl treatment,” which involved polishing three sets of connectors with a pencil eraser. I’m glad the only eraser I see these days is MacPaint’s.

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Insights on Microsoft Works

Tips and strategies for exploiting the best-seller's teamwork and versatility

by Charles Seiter

Microsoft Works made the Macworld Best-Sellers list within months of its release last fall, and it now competes with Microsoft Word for the number one spot. Using the same simple approach that made AppleWorks the best-selling program for the Apple II, Microsoft Works offers basic word processing, spreadsheet, database, and communications functions. While there are no reports of Omnus 3 users standing in line for the Works database, nor of Excel users furiously exporting their spreadsheets downward, the popularity of Works rests on two unshakable foundations. First, the program is easy to use—my ten-year-old daughter taught herself to do a mail merge from the manual in five minutes. Second, with a little thought you can make Works do nearly anything you might reasonably require from a computer. The spreadsheet is fast, the database supports complex conditional searches, and the word processor even has box/line/circle drawing functions à la Word 3.0. Here are tips from various sources on making Works work.

Mailing Labels

Microsoft reports that it fields more questions on mailing labels than on any other Works topic. For accurate printing, follow these hints:

- Make sure you've deleted any blank lines after the placeholders in your word-processed merge document. If you leave the blank lines there, the first few labels will look OK, but later on in the job the printing may gradually drift across label boundaries.

- Set your top and bottom margins for .125 inch. In principle, margins of zero would work, but because the slick backing on label stock tends to slip on the ImageWriter platen, it's advisable to build some margin into your printing instructions.

- Choose No Gaps Between Pages on the Page Setup menu.

- For paper height, measure from the top of one label to the top of the next label, not the height of the label itself. Otherwise, part of the address may end up in the space between labels.

Works doesn't let you choose more than one copy of the labels; Microsoft suggests using Silicon Press version 1.1 from Silicon Beach Software if you want to make multiple copies of labels in a single run.

Improper Bostonians

The default font in Microsoft Works is Boston—a nice, plain, legible font that doesn't look good in LaserWriter output in some sizes. In fact, the font selection that comes on the Works system disk doesn't include any LaserWriter fonts; if you're printing with a LaserWriter, replace Athens or another less-versatile font with Times or Helvetica (see "Font Facts," Macworld, February 1987).

Keyboard Tricks

There aren't any. That is, none of the $&-Shift arcana that delighted users of Word 1.05 apply, despite a powerful operational resemblance between Word and the word processing module of Works. The only keyboard hints to impart are the reminders that Shift-Return moves you up in the spreadsheet and database, and Shift-Tab moves you to the left.

(continues)
How To/Insights

Seek and Ye Shall Find

In an advance over Word version 1.05, however, you can find such typos as a space before a period or a comma and a period outside a quotation mark simply by typing them into the Search menu. The program recognizes a space as a leading character in a Search expression.

Department of Amplification

Packages are available that you can add to Works for increased power and flexibility. I recommend WorksPlus Spell from Lundeen & Associates, a low-cost spelling checker that installs as a set of options within existing Works menus, and the template sets from WorksXchange (see "Tax Template"). Currently available templates include taxes, utilities, a tutorial, small business accounting, and personal productivity.

Works in its current version supports only the ImageWriter and the LaserWriter. For those with non-Apple printers, Works-compatible drivers include The Print Link from GDT Softworks and SoftStyle's 2.5 printer driver collection.

Picture This

With the addition of a few desk accessories and utilities, you can make Works produce all sorts of nifty graphics without trouble to quit and open MacPaint. For example, you can capture any Works screen with Camera, edit it with Artisto, and paste it into a word processing document. This is particularly helpful if you want to select and print split-view windows from the spreadsheet or from the database List view in a report. Artisto allows you to open a MacPaint or FullPaint document and clip a selected portion for pasting into the word processor. Thus you can keep a file of MacPaint graphics for letterheads or theme illustrations on your Works program disk and call up items whenever you like.

When adding graphics to a Works word processing document, remember to leave yourself enough white space; Works plunks your picture right down on top of text if that's where you left the insertion point. Correct a picture/text jumble by choosing Select Picture and Cut from the Edit menu. That's also how you remove a box or Works line drawing that's embedded in a text file.

Before you add lots of fancy graphic touches, though, consider whether you can make your document look exactly the way you want using Works alone. If you eventually do the final layout with a desktop publishing package such as PageMaker or ReadySetGo, you'll have to pull all the graphics and convert the document to plain text anyway for exporting.

Style Consciousness

The Copy Format and Paste Format commands from the word processor Format menu can be used to mimic the stylesheet function of sophisticated products like Word 3.0. If you have a long document with several paragraph formats, make up dummy paragraphs at the top of your text with tags like a1, a2, and so forth, and set your margins, tabs, and indents for these. Put the specially formatted paragraphs in a small split-view window where you can see them without scrolling through the entire document. Then just copy and paste the formats to new paragraphs as you write. You might want to prepare a word process-

(continues)
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<td>$569</td>
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**Communications Keys**

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<tr>
<th>Terminal Command</th>
<th>Mac Keyboard Command</th>
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<tr>
<td>CTRL-C (RUBOUT)</td>
<td>Option-C</td>
</tr>
<tr>
<td>BREAK</td>
<td>Option-3</td>
</tr>
<tr>
<td>ESCAPE</td>
<td>Option-1</td>
</tr>
<tr>
<td>DELETE</td>
<td>Option-Backspace</td>
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</tbody>
</table>

**Communications Keys**

Post this table near your modem. Substitute the Mac equivalents for commands required by an on-line service or a remote host computer.

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**Hanging on the Telephone**

You've decided to test the communications section of Works and are merrily searching through an on-line database when you decide you want to quit. If you just hang up, the service doesn't terminate properly, leaving you with charges for extra time. Meanwhile, Telenet and service charges are ticking away on your MasterCard as you stare at the keyboard wondering where the Esc or Rubout key is. You have just discovered that most on-line systems use commands based on the keyboards of older terminals or IBM PCs. So when you're on-line and are asked for a command that isn't on the Mac keyboard, refer to the table "Communications Keys." The Option-Backspace command is especially important for on-line message writing. You can hit Backspace and see characters disappear on your screen, but they don't disappear in the transmission unless you hit Option-Backspace. Picture your favorite embarrassing scenario for this one.

If you are having trouble sending text files at 1200 bps through a packet-switching network such as Telenet or Fynnet, try setting the Line Delay from the Settings menu at 5. This produces a negligible (to you, anyway) no second delay at the end of each line, enough for the switcher to catch its breath between 128-byte packet transmissions.

**ReZoom**

Resume Works starts up the program and opens all the documents that were open when you quit. You can take advantage of this feature to make a very fast-working system. The next time you use Works, make up the empty work files $W(WP)$, $S(SS)$, and $D(DB)$, all formatted to your preference. When you quit, these files are saved, and they reappear in the Window menu when you choose Resume Works.

This means you can always bring a new work file—preset to your specifications—to the screen at any time with exactly one mouse click. It's even faster than Switcher because you're working in memory most of the time rather than having to access the disk. If you use one of the empty files, rename it when you close (or quit) so that you won't lose the handy, always-ready blank file.

**High Finance**

When Works first appeared, reviewers complained that spreadsheet cells had to be identified as A3 and J7 instead of CashFlow or NetProfit. Although this is strictly true, there's a way to develop your own cell-naming convention so that you can compose formulas on screen without much effort.

It's easiest to show by example (see "Cell without a Number"). The PMT function requires you to input interest rate, number of periods, balance to be financed (present value), future value (zero for a loan that will be paid off), and type (a flag set to zero for most consumer or mortgage loans). If you plug in 9.5 for the interest rate on a 9.5 percent mortgage, you get an incorrect result—the PMT function wants the interest rate per month, which is (9.5/100)/12. So label a cell "Interest rate = " and enter 9.5 in the cell right next to it. Below "Interest rate = " label a cell "Rate for PMT = " and in the cell to the right (under 9.5) perform the divide-by-1200 arithmetic. Do the same for number of periods (usually this is a conversion of number of years to number of months). Then calculate payments by typing =PMT( in a blank cell and clicking on the cells for rate, period, and loan amount, followed by the closing parenthesis. To compare various loans, you can copy this block of definitions to different parts of the spreadsheet.

Note that the way the PMT function is set up, if you type 50,000 as the loan amount, the function takes your amount financed as $50 and puts in zero for the FV (full value). Use 50000 (no comma) instead.

**A Capitalist Plot**

Figures on a spreadsheet translate nearly effortlessly to charts. Because a spreadsheet and its associated Chart window appear on screen at the same time, you can simply call up a new Chart window and move it around on your spreadsheet until you find the rows (for line or bar (continues)
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How To/Insights

The Plot Thickens
Two versions of a series plot show the total interest payment on a 30-year, $200,000 mortgage at various interest rates. To achieve round figures in the scale, start the plotting with a cell containing a dummy figure at the high end of the scale, in this case cell B12 on the spreadsheet in "Cell without a Number."

A Quick Click
A double-click anywhere on a Form page in the database immediately transports you to the List view. The return trip requires a double-click specifically in the little boxes on the left of the List page.

Database Subsets
If you have filtered a database with the Match Record option, which lets you look through your database AllMyFriends for Pisces and Cancers who like garlic and who have zip codes lower than 20000, you get a database subset that can be admired but not manipulated. Rename it with the Save As command to turn the record set into a new database you can modify or sort.

charts) or columns (for pie charts) you want to plot.
The Works: charting function makes up a vertical scale based on the values in the first row of data plots. This can result in weird scale intervals (see "The Plot Thickens"). To normalize vertical-scale intervals, pick a dummy first row with a single point that defines the maximum value you are likely to plot (it's the point at 600000 in the figure). This way you force the plot into regular intervals.

As you modify charts associated with a particular spreadsheet, they begin to stack up as Chart 1, Chart 2, and so on, in the Chart Definition window. You will rapidly lose track of your chart definitions unless you resort to Change Chart Name on the Edit menu.
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Until the latest Mac II/SE keyboards were introduced, the Macintosh was the only major personal computer that lacked function keys—those specially labeled keys dedicated to performing a specific task. But even without dedicated function keys on the keyboard, any computer can have what are called F-keys. F-keys are programs invoked by pressing ⌘, Shift, and a number key all at once. All Macs come with four preinstalled F-keys: two that eject disks in the internal and external drives (⌘-Shift-1 and -2) and two that send images of the screen to disk files or the printer (⌘-Shift-3 and -4). But there’s no reason to stop at four—F-keys designed to perform all kinds of useful tasks abound.

F-keys work much as desk accessories do: you call them up from the desktop or while you are working in an application. Many F-keys provide functions that are otherwise unavailable. Other F-keys are functional equivalents of familiar desk accessories. (And by replacing desk accessories with F-keys, you free up a few slots under the Apple menu, which ordinarily can hold only a limited number of desk accessories.) F-keys are often free, or at most, inexpensive—a whole suite of F-keys and a program to manage them should cost less than a single computer game at mail-order prices.

Although F-keys have many good points, they do have one drawback: you can’t keep an F-key window open while you work. Until you close an open F-key, you can’t return to your main application. If you are looking for a desktop utility, such as one that shows free memory or disk space, and you have a choice between an F-key and a desk accessory, remember that only the desk accessory can remain in view while you work on other things.

Managing Your F-keys
The preeminent F-key utility is actually a trio of programs by Carlos A. Weber: an application, FKey Manager version 2.5, and two Init resources that add capabilities to the System file, Pop-Keys and KeyPad. FKey Manager is the most important member of the set and looks and works a lot like the Font/DA Mover, except that it’s much more versatile. With FKey Manager, you can install, rename, renumber, and remove any number of F-keys and assign up to eight functions to the ⌘-Shift-(number key) keyboard command of your choice.

The FKey Manager window shows a scrollable list of all F-keys installed in your System file (see "Installing an F-key"). A resource number precedes the name of each F-key on the list: 0 through 9 for the F-keys that can be called up with a keyboard command, 10 and above for the rest. Renaming,
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Installing an F-key

Installing an F-key with FKey Manager is like installing a font with Font/DA Mover. The numbers next to the F-key name are resource numbers. F-keys with numbers less than 10 can be called up from the keyboard at any time, and F-keys with higher numbers are called up from the FKey menu.

The Pop-Keys Menu

FKey Manager’s Pop-Keys menu appears whenever you move the pointer to a hot spot on the screen, or when you click the mouse while pressing certain keys. Because you can call up any number of F-keys with the Pop-Keys menu, you can install many more than the keyboard limit of ten.

renumbering, and removing F-keys is simply a matter of highlighting one or more F-keys and clicking on the appropriate command button next to the list. Installing F-keys requires two extra steps: opening a source F-key file and assigning it a resource number.

You can install F-keys in F-key files, in System files, or in application files, and FKey Manager allows you to work with them no matter where they are. However, if you keep them in the System file, you can back them up with FKey Manager’s Archive command and restore them should disaster strike. With FKey Manager you can remove the Apple F-keys that take a snapshot of the screen (13-Shift-3 and -4) and replace them, either with revised versions such as LaserKey or with entirely different F-keys. You cannot, however, remove or replace Apple’s disk-eject F-keys (3€-Shift-I and -2).

To run F-keys not available from the keyboard, you select them from a special menu created by Pop-Keys (which must be placed in your System Folder). The Pop-Keys menu works in one of two ways, which you determine with the Configure Pop-Keys command in FKey Manager’s Options menu. In one, the FKey menu opens whenever and wherever you click the mouse button while pressing a previously specified combination of keyboard F-keys as a reminder, alphabetical or numerical order. The menu always appears temporarily any F-key which you click on or simply move the pointer over the hot spot, the menu drops down (see “The Pop-Keys Menu”).

The Pop-Keys menu lists all of the installed F-keys. The menu can display resource numbers as a reminder and lists F-keys in either alphabetical or numerical order. The last item on the menu is always the Other command, which allows you to access any F-key not currently installed.

The final member of the FKey Manager trio is KeyPad. If you have a Mac Plus and put KeyPad in your System Folder, you can call up the keyboard F-keys by pressing a single key: either a number from the top of the keyboard or one on the keypad. You select these options, or turn them off altogether, with FKey Manager’s Configure KeyPad command; you can even assign a keyboard command to toggle this feature on and off so you can choose the keypad or the number keys according to the task.

FKey Manager, Pop-Keys, KeyPad, and the comprehensive, illustrated FKey Manager manual (a MacWrite document) are free and available from many user groups and information utilities such as CompuServe.

Some Fancy F-key Footwork

Two other programs enable you to further fine-tune the way you work with F-keys. One, KeyString (by Joseph P. McLain, Jr., $20 shareware fee), makes it possible to call up any installed F-key with a multiple-keyboard command. KeyString is actually a set of programs that allows you to redefine the keyboard in various ways. To assign F-key keyboard commands, you need KeyString’s Key Edit desk accessory, the Key Str Boot Init resource, and the Key Str Boot Builder application. Since KeyString’s documentation is a little sketchy, here is a quick summary of the steps used to assign keyboard commands to F-keys:

First, use FKey Manager to find out which F-keys are numbered 10 or above. Place Key Str Boot in the System Folder and restart your Macintosh. Now open the Key Edit desk accessory and choose the Select command from the Key Edit menu. Type the keyboard combination you want to assign to your F-key and then type the number of the F-key in the F-key # text box. Finally, select the Replace Selected Key command from the Key Edit menu to put your changes into effect. Repeat this process for every F-key you want to access with a keyboard command. If you use applications like Microsoft Word version 3.0, which uses many # (key), #Shift-(key), and #Option-(key) combinations, take special care not to assign key combinations already spoken for.

Although you can save the new keyboard configuration with Key Edit’s Save To File command, a better method is to load

(continues)
the commands automatically with a special file—called a boot file—created with the KeyStr Boot Builder program. To create the boot file, start the program while your F-key assignments are in memory and click on the Make Boot File button. Then remove the original KeyStr boot file from the System Folder and put the new boot file in its place.

One other notable F-key utility is FKey Maker by Loftus E. Becker, Jr. FKey Maker creates a file (called Open DA FKeys) full of F-keys, each of which opens one of the desk accessories in your System file. Installing some or all of these F-keys allows you to open the corresponding desk accessories with keyboard F-key commands. If you have KeyString, you can even install the entire set of F-keys and then use KeyString to assign keyboard commands to those F-keys that lack them.

F-keys in Review

Even if you've never used an F-key, by now you must have some idea of how handy they are. Small wonder, then, that there are so many available—far too many to describe here. What follows is an annotated list of some of the most useful F-keys that are widely available either from user groups and electronic bulletin boards or in commercial software packages.

- **Available Key Version 1.0**, part of *Quick & Dirty Utilities, Volume 2*, $39.95. Select this F-key to find out how much memory remains available in RAM and how much unused space there is on all mounted hard and floppy disks.
- **BigCursor** by Andy Hertzfeld, free. This F-key doubles the size of the Mac's pointer, for those who have trouble seeing it at standard size. Select BigCursor again to return the pointer to normal size.
- **Copy Screen** Version 2.0, by Joe Miller, free. This F-key provides a variation on Apple's standard screen-to-disk-file F-key. When you call up Copy Screen, a small upper-left-corner angle replaces the pointer. Dragging the pointer creates a rectangle for selecting an area of the screen (as with MacPaint's rectangle tool); release the mouse button, and a copy of the selected area goes into the Clipboard.
- **DA Key** Version 2.15, by Loftus E. Becker, Jr., $10. This F-key allows you to use desk accessories that are not installed in the System file. Since DA Key places the selected desk accessory under the Apple menu, you can close and reopen it as often as you like, just as you would any other desk accessory. When you quit your current application, all desk accessories installed with DA Key are automatically removed. DA Key comes with its own installer program.
- **Date Key** Version 2.02, by Loftus E. Becker, Jr., $3. Select Date Key to enter either the current date or the current time at the text insertion point. You choose from four formats for both date and time. Date Key comes with its own installer program.
- **Disk-File Utility** Version 1.0, by John Holder, $3. This F-key is a fairly wide-ranging disk-and-file management program. With it, you can rename and delete files, copy 400K disks, determine how much free space is available on floppy disks, and change (or just view) the Finder attributes of any file.
- **Dvorak** Free. To convert your keyboard from QWERTY to Dvorak, simply select this F-key. Of course, you labels stay where they are, so you need to know the Dvorak layout to use this one. Select it again to revert to QWERTY.
- **Flush** Free. In an effort to make the Mac's built-in RAM cache a little safer, Flush sends to disk any disk writes cur-

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current held in Apple's RAM cache (and therefore not yet saved).

- Fontsie Version 1.52, by Loftus E. Becker, Jr., $5. Fontsie makes it possible to temporarily add fonts not installed in the System file to your application's font menu. Fontsie doesn't work with some programs, for example, MacDraw, Microsoft Word, and SuperPaint; for these programs, there is a less-convenient variation called Fontsie Special. Fonts installed with Fontsie are available throughout the current work session, but when you quit the application you used Fontsie with, all the temporary fonts are removed.

- GetInfo Version 1.0, by Carlos Weber, free; also part of Quick and Dirty Utilities, Volume 2, $39.95. If you are running an application and want to read the Finder's Get Info comments, use these F-keys to do so. Weber's F-key only displays the text. You can edit the comments with the Quick & Dirty F-key, which also displays information about the file's size, location, and the creation and last modification dates.

- Init Version 5.2, Scott Winders and Alan Pavlish, free. Init initializes or erases both 400K and 800K disks from within an application, using either the internal or external drive. It comes with its own installer program.

- LaserKey Version 1.0 by Lew Rollins, $15 shareware. LaserKey replaces Apple's standard F-key 4 (which sends the active window or the entire screen to the ImageWriter) with one that works with the ImageWriter, the AppleTalk ImageWriter, and the LaserWriter. In addition to the image, the printout contains the name of the application, the date, and the time. Each time you use it, you can request multiple copies, turn smoothing on or off, and if desired, hide the cursor before printing.

- Moving Lines By John Raymonds, free. This screensaver draws an ever-changing pattern of white lines on a black background. Click on the mouse button or press a key to turn the screen back on.

- Password Version 1.1, by William Steinberg, free. Once Password is invoked, your Macintosh doesn't respond until you enter the correct password or reset your computer. To change the default password ("Password," with an uppercase P), which you should do before you install the F-key, you'll need Fedit Plus and the courage to alter real, live code. Password is also available in Init resource and application format.

- Pathname Free. This F-key provides a quick and accurate way to enter the path for any file. (A path is the route you take, from disk to folder to file, to locate a given document or application.) Pathname places the complete and properly punctuated path name of the selected file in the Clipboard. Use the Paste command to move the path name into your document.

- SafeLaunch Version 1.0, by Fred Reed, $5. SafeLaunch transfers you quickly from one application to another without the usually obligatory stop at the Finder. For programs that have a 3C-Q keyboard Quit command, SafeLaunch automatically initiates a safe, orderly quit sequence and then opens the requested application. For programs that do not recognize 3C-Q, SafeLaunch waits for you to quit the program and then initiates the transfer. SafeLaunch can also remember a specific application and, until you tell it otherwise, always transfer to that application automatically. As with any transfer program, I recommend

(continues)
mend that you test it well before incorporating it into your daily routine.

- **ScreenToPaint** By Steve Maller, free. This is another variation on Apple's screen snapshot F-key. Like Apple's F-key, it saves an image of the screen to disk. But ScreenToPaint does it much more elegantly: it centers the image on the page, defines the edge of the screen with a line, and labels the MacPaint files it creates from A to Z.

- **Screen Saver** By Mike Cohen, free. When invoked, Screen Saver installs a RAM-resident utility that waits for you to stop working. After a minute or two of inactivity, it inverts the screen to white on black, then back to black on white, and so on, every 15 seconds or so, until you start typing or using the mouse again. Select Screen Saver a second time to remove the program from memory. Be sure to test Screen Saver, especially while printing and telecommunicating; some screen savers have the unpleasant side effect of turning off printing or communications sessions when they blank the screen.

- **Set File Key** Part of **Quick & Dirty Utilities**, Volume 2, $39.95. This F-key displays information about the selected file (size, location, and dates created and last modified), and allows you to change the type and creator of the file and reset its Finder attributes. (If you don't know what those last terms mean, you would be well advised not to change them.)

- **Space Warp** Free. This screensaver puts a stream of fast-moving stars on the otherwise black screen. To return to earth, press a key or click the mouse button. As with Screen Saver or any similar program, be sure to test it out.

- **Timer Key** Version 1.0, by Loftus E. Becker, Jr., $5. This is an F-key version of Becker's Time Logger desk accessory, a cheap and easy way to keep track of how you use your Mac. Timer Key stores in text-only files, information on each file you open: date and time opened, date and time closed, number of minutes used, a file description, and special code entered by you when the file is opened. You can store everything in a single time log or maintain separate logs for each job. Timer Key logs can be read by most spreadsheets and databases.

- **Toggle Key** Free; also part of **Quick & Dirty Utilities**, Volume 2, $39.95 and FKToggle 0.1, free. These two F-keys change the right and left angle brackets (< and >) to a comma and a period, so you get commas and periods even when the Shift key is depressed. Some programs, such as *Word 3.0*, do not work with either F-key.

- **Version Reader** Version 2.6 by John Holder, free. This F-key displays the contents of a selected application's signature resource, which usually contains the program's version number and date.

- **Set Sound Key** Version 1.0, free. Use this F-key to quickly change the volume level of the internal speaker. Simply call up Set Sound Key and press a number key: 0 for silent running, 1 through 7 for ever greater volume levels.

- **Window** By Charlie Bounds, free. Window sends the current window to the back and brings all other windows forward one level. It is a primitive but useful addition to any multiwindow program (including the Finder) that lacks a Window menu. Be sure to close any Alert or Dialog boxes before invoking Window.

See Where to Buy for product details.

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This section contains information about products featured editorially in this issue. Programs are not copy protected unless otherwise indicated. All prices are listed prices. An asterisk indicates that a product review appears in this issue.

Public domain software and shareware are available through on-line information services, through user groups such as Berkeley Macintosh Users Group (415/849-2684) or the Boston Computer Society's Mac special interest group (617/367-8080), or through mail-order clearingsouses such as Educomp, 2429 Oxford St., Cardiff-by-the-Sea, CA 92007, 619/912-3838 or the Public Domain Exchange, 673 Hermitage Ln., San Jose, CA 95134, 408/942-0309.

Pages 57 to 68
Where Are the Heavy Hitters?

Championship Star League Baseball
Version 1.0. Gamestar, P.O. Box 7286, Mountain View, CA 94039, 415/960-0518, 800/227-9759. Key-disk copy protection. 128K minimum memory. $34.95.

Computer Baseball

Hardball
Accolade, Inc., 20813 Stevens Creek Blvd., Cupertino, CA 95014, 408/446-5757. Key-disk copy protection. 512K minimum memory. $44.95.

MicroLeague Baseball II

Pinball Construction Set
Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404, 415/571-7171, 800/245-4525, 800/562-1112 in CA. Key-disk copy protection. 128K minimum memory. $39.95.

Pages 108 to 115
Chasing Rainbows

39" Color Monitor for the Mac II

19" Monochrome Monitor for the Mac II

Apple High-Resolution Monochrome Monitor for the Mac II
Apple Computer, Inc., 20252 Mariani Ave., Cupertino, CA 95014, 408/996-1010. Requires Macintosh II Video Card. $399.

AppleColor High-Resolution RGB Monitor for the Mac II
Apple Computer, Inc., 20252 Mariani Ave., Cupertino, CA 95014, 408/996-1010. Requires Macintosh II Video Card. $999.

Graphix for the Mac II
SuperMac Technology, 295 N. Bernardo Ave., Mountain View, CA 94043, 415/964-8884. $495.

Jasmine Video Card for the Mac II

LaserView for the Mac II and Mac SE

Macintosh II Video Card

MegaScreen for the Mac II and Mac SE
MicroGraphic Images Corp., 20954 Osborne St., Canoga Park, CA 91304, 818/407-0571. Price to be announced.

NSC Video Card for the Mac II
National Semiconductor, 2900 Semiconductor Dr., P.O. Box 58090, Santa Clara, CA 95052-8090, 408/721-5000. Price to be announced.

Sony Multiscan CPD-1302 for the Mac II
Sony Corp. of America, Sony Drive, Park Ridge, NJ 07656, 800/222-0878. Requires video adapter card and adapter cable. $945.

Spectrum 1000/1 for the Mac II

Spectrum 1000/8 for the Mac II

The Big Picture for the Mac II and Mac SE

VideoWorks II
Macromind, Inc., 1028 W. Wolfram St., Chicago, IL 60657, 312/871-0987. 512K minimum memory. $149.95.

Pages 116 to 121
Scanning the Horizon

Abaton Scan 300
Abaton Technology Corp., 7901 Stoneridge Dr. #500, Pleasanton, CA 94566, 415/463-8822. 512K minimum memory; requires external drive; Mac Plus with hard disk and Laser...
Where to Buy

Writer recommended. Model 1 $249, Model 2 (includes Abaton Character Reader for optical character recognition) $319.

Adobe Illustrator

AST TurboScan

Cricket Draw

MacPaint

MacScan
New Image Technology, Inc., 10300 Greenbelt Rd. #104, Seabrook, MD 20706, 301/464-5100. IBM minimum memory; LaserWriter recommended. $9154.

MS-300A

PageMaker

PC Scan Plus
Dest Corp., 1201 Cadillac Pl., Milpitas, CA 95035, 408/946-7100, 800/538-7582. IBM minimum memory; $3185; includes software and cable.

Pro3D

SuperPaint

ThunderScan

XPress
Version 1.0, Quark Inc., 2525 W. Evans #220, Denver, CO 80219, 303/954-2211. 512K minimum memory; requires external drive or hard disk. $695.

Pages 122 to 125
Into the 4th Dimension

4th Dimension
Acus, 20300 Stevens Creek Blvd. #145, Cupertino, CA 95014, 408/252-4444. Product specifications to be announced. $695.

(continues)

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Where to Buy

Pages 126 to 131

Raising the Roof on Storage

AST-4000
AST Research, Inc., 2121 Alton Ave., Irvine, CA 92714, 714/553-0340. 512KE minimum memory; requires SCSI port for the Mac 512KE. 70MB hard disk $599.50, 70MB hard disk/60MB tape drive $529.50, 140MB hard disk $999.

Direct Drive 80
Jasmine Computer Systems, 555 De Haro St., San Francisco, CA 94107, 415/621-4339. 512KE minimum memory; requires SCSI port for the Mac 512KE. Prepaid cash $1,580, Visa/MasterCard $1,312.

MagNet 172x

Memorybank 261
Northern Telecom, Inc., 100 Phoenix Dr., Ann Arbor, MI 48106, 313/973-4000, 800/521-3278. 512KE minimum memory; requires SCSI port for the Mac 512KE. $13,500.

PL172
Peripheral Land, 47800 Westinghouse Dr., Fremont, CA 94538, 415/657-2211. 512KE minimum memory; requires SCSI port for the Mac 512KE. $4,995.

S-240
CMS Enhancements, Inc., 1372 Valencia Ave.,ustin, CA 92080, 714/259-9555. 1MB minimum memory; includes SCSI utilities. $4,195.

Sun Streak SCSI-245

Pages 132 to 137

The Architect's Apprentice

Artisto
Version 1.42. Shareware by Tom Taylor, 3707 Poinciana Dr., 9077, Santa Clara, CA 95051. 512K minimum memory. Contribution requested.

ComicWorks

EZ-Draft

Frame Mac

LaserWriter
Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014, 408/996-1010. 512K minimum memory; requires AppleTalk. $4,999, LaserWriter Plus $5,799.

Linotronic 100, Linotronic 300

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Circle 435 on reader service card
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MacFrame 2D

MacPaint
Version 1.5. Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014, 408/996-1010. 128K minimum memory; 512K recommended. $125.

MacPerspective

MacPlot

MacPlot II

MacServe
Version 2.2. Infosphere, Inc., 4730 S.W. Macadam Ave., Portland, OR 97201, 503/226-3620. Copy detection; cannot be used by more than one server. 512K minimum memory; requires hard disk and AppleTalk. $250.

MacSpec
Version 2.0. iM Software, P.O. Box 93, Belmont, CA 94002, 415/345-0388. 512K minimum memory. $199.95.

MGMStation
Version 2.5. Micro CAD/CAM, 3230 Overland Ave. #105, Los Angeles, CA 90034, 818/277-6880. Key-disk copy protection. 512K minimum memory; requires 800K drive space; Mac Plus and hard disk recommended. $495.

NewStudio
Version 1.0. NewLine 7 Graphics, P.O. Box 1211, Culver City, CA 90232, 213/277-7217. Key-disk copy protection. 512K minimum memory; external drive recommended. $549.

SpaceEdit

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Where to Buy

Page 150

Data In, Data Out

Aztec C 68k

Version 1.06l. Manx Software Systems, P.O. Box 55, Shrewsbury, NJ 07701, 201/542-2121, 800/221-0440. 512K minimum memory; requires external drive and PostScript printer. $79.*

GPIB-MAC

National Instruments, 12109 Technology Blvd., Austin, TX 78727, 512/250-9191, 800/531-4742, 800/433-3488 in TX. 512K minimum memory. $59.5.

LabVIEW

Version 1.0. National Instruments, 12109 Technology Blvd., Austin, TX 78727, 512/250-9191, 800/531-4742, 800/433-3488 in TX. 512K minimum memory. $59.5.

MacADIOS

GW Instruments, Inc., P.O. Box 2145, 264 Monsignor O'Brien Hwy., #8, Cambridge, MA 02141, 617/625-4996. 512K minimum memory; requires MacADIOS; Mac Plus recommended. $399.

MacSpeech Lab

Version 2.0. GW Instruments, Inc., P.O. Box 2145, 264 Monsignor O'Brien Hwy., #8, Cambridge, MA 02141, 617/625-4996. 512K minimum memory; requires MacADIOS; Mac Plus recommended. $399.

Microsoft BASIC Interpreter


Page 151

Losing the Newsletter Blues

PageMaker


PageMaker Portfolio: Designs for Newsletters

Aldus Corp., 411 First Ave. S #200, Seattle, WA 98104, 206/622-5500. 512K minimum memory; requires external drive and PostScript printer. $79.*

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In Gangland Chicago

King of Chicago

Version 1.0. Mindscape, Inc., 3444 Dunwood Rd., Northbrook, IL 60062, 312/480-7667, 800/221-9884, 800/942-7315 in IL. Key-disk copy protection. 512K minimum memory; requires 800K drive. $49.95.*

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The Good and the Ugly

Apple Macintosh Communikit

Version 1.0. Racial-Vadic, 1525 McCarthy Blvd., Milpitas, CA 95035, 408/446-2227, 800/482-3427. 128K minimum memory; requires SOOK drive. $79; kit includes cables. MacGeorge version 1.0, and two hours of network service.*

Apple Personal Modem

Apple Computer, Inc., 2052 Mariani Ave., Cupertino, CA 95014, 408/996-1010. 128K minimum memory. $399.

Maxwell 1200VP

Racial-Vadic, 1525 McCarthy Blvd., Milpitas, CA 95035, 408/946-2227, 800/482-3427. 128K minimum memory. $295.*

MicroPhone


ProModem 1200


(continues)
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- Computing Needs in Business, Engineering, Humanities, and Sciences

- Marketing Strategies
- Pricing and Distribution
- Case Studies
- Site Agreements
- User Support Issues

- Business Contacts
- Developer/Publisher Alliances
- Public Relations, Promotion and Advertising
- Campus vs. Corporate vs. Commercial Markets

Speakers

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Where to Buy

Page 160
3-D CAD

SpaceEdit
Version 1.5, Abvent, 9903 Santa Monica Blvd. #330, Beverly Hills, CA 90212, 213/659-5157. Key-disk copy protection. $12K minimum memory; Mac Plus with external drive recommended. $625.*

Page 161
Dark Waters, Deadly Seas

Sub Battle Simulator
Epyx, Inc., 600 Galveston Dr., Redwood City, CA 94063, 415/366-0666. Not copyable. 512K minimum memory. $39.95.*

Page 162
A Champ Comes Back

Spelling Champion
Version 2.2, Champion Swiftware, 6617 Gettysburg Dr., Madison, WI 53705, 608/233-1777. 128K minimum memory. $39.95.*

Pages 185 to 192
Getting Started with Maintenance

Fanny Mac
Beste Tech., Inc., 8327 Clinton Rd., Cleveland, OH 44144, 216/631-4214, 800/772-4536. $74.

MacBreeze
Levco, 6160 Lusk Blvd. #C-203, San Diego, CA 92121, 619/457-2011. $49.95.

Maccessories Circular Polarizing Filter
Kensington Microware Ltd., 251 Park Ave. S, New York, NY 10010, 212/475-5200, 800/535-4242. $49.95; platinum or beige.

Maccessories Tile/Swivel
Kensington Microware Ltd., 251 Park Ave. S, New York, NY 10010, 212/475-5200, 800/535-4242. $39.95; platinum or beige.

Microsoft Works
Version 1.0, Microsoft Corp., 16011 N.E. 36th Way, Box 97017, Redmond, WA 98073-9717, 206/882-8080, 800/426-9400. 512K minimum memory; requires 800K drive storage; Mac Plus with external drive recommended. $395.

Page 193
Microsoft Word
Version 3.0, Microsoft Corp., 16011 N.E. 36th Way, Box 97017, Redmond, WA 98073-9717, 206/882-8080, 800/426-9400. 512K minimum memory; requires 800K drive storage. $495.

Page 195 to 201
Insights on Microsoft Works

Artisto
Version 1.42, Shareware by Tom Taylor, 3076 Poinciana Dr. #137, Santa Clara, CA 95051. 512K minimum memory. Contribution requested.

Microsoft Works
Version 1.0, Microsoft Corp., 16011 N.E. 36th Way, Box 97017, Redmond, WA 98073-9717, 206/882-8080, 800/426-9400. 512K minimum memory; requires 800K drive storage. $295.

Page Maker

(continues)
Where to Buy

ReadySetGo
Version 3.0. Letraset USA, 40 Eisenhower Dr., Paramus, NJ 07653, 201/845-6100, 800/526-9073. 512K minimum memory; external drive recommended. $39.95.

Silicon Press
Version 1.1. Silicon Beach Software, Inc, P.O. Box 261430, San Diego, CA 92126. 619/695-6956. 512K minimum memory. $79.95.

Small Business Works
Version 1.0. Heizer Software, 5120 Coral Ct., Concord, CA 94521, 415/827-9013. 512K minimum memory; requires Microsoft Works; Mac Plus with external drive recommended. $50.

SoftStyle Start Printer Driver

Copy Screen
Version 2.0. Public domain software by Joe Miller. 128K minimum memory. $39.95.

DA Key
Version 2.15. Shareware by Lotus E. Becker, Jr., 41 Whitney St., Hartford, CT 06105. 512K minimum memory. Registration $10; or send $15, blank disk, and SASE. $29.95.

Disk-File Utility
Version 1.0. Shareware by John Holder, 7563 El Tomaso Way, Buena Park, CA 90620. 512K minimum memory. $3.

SoftStyle Spell
Version 1.0. Public domain software by Andy Hertzfeld. 128K minimum memory. $39.95.

Coral Ct., Concord, CA 94521, 415/827-9013. 512K minimum memory; external drive recommended. $50.

SoftStyle Start Printer Driver

Tutorial Works
Version 1.0. Heizer Software, 5120 Coral Ct., Concord, CA 94521, 415/827-9013. 512K minimum memory; requires Microsoft Works; Mac Plus with external drive recommended. $50.

Utility Works
Version 1.0. Heizer Software, 5120 Coral Ct., Concord, CA 94521, 415/827-9013. 512K minimum memory; requires Microsoft Works; Mac Plus with external drive recommended. $50.

WorksPlus Spell
Version 1.0a. Lundeen & Associates, P.O. Box 30038, Oakland, CA 94604, 800/233-6851, 800/922-7587 in CA. 512K minimum memory; Mac Plus recommended. $59.95.

Camera
Version 1.0. Public domain software by Keith A. Esau. 512K minimum memory.

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Mac System Tools

BigCursor
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Dvorak
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FKey Maker
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Micro Dynamics, Ltd., 8555 16th St. #802, Silver Spring, MD 20910, 301/899-6300

MacPalette
By microspot prints multicolored graphics & text from most Macintosh software using the ImageWriter II. MacPalette will colorprint documents from MacDraw, MacDraft, MiniCad, MacProject, MacWrite, JAZZ, Microsoft Chart, Word, Excel etc. (no MacPaint) It prints black as a true black instead of mixing a black. $69.
CompServCo, 800 Freedom, Slidell, LA 70458, 800/272-5533 or 504/649-0484

Desktop Engineering

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Designed for people who need to manage, analyze & graph time, date, or sample-based data. No macros or templates are needed to produce trend plots, strip charts, histograms, forecasts, parametric plots, statistics, correlation, and financial high-low charts. Plot up to 32,000 data points, 96" x 48" in size. Text export & "Calculated Parameters" $495. Complete Demo $10. MC/Visa.
Structural Measurements Systems, Inc. (SMS), 651 River Oaks Parkway, San Jose, CA 95134, 408/263-2200. To order call 800/654-5147, 800/247-4994 (CA)

Educational

Gradebook/Test Generator
MICROGRADE—flexible course & grading, 400 students and 100 assignments per class, prints stats & various reports. Ideal for any grade level. MICROTET II—create, update, generate, & store exam materials. Easy question entry, large database, multiple test versions. Free brochure—$5.
Brainchild Corp., 3609 Indiana St. #MDJ, San Diego, CA 92103, 619/298-0202

Brainchild Grade™

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Logic eXention Resources, 5651 Business Center Dr., Ste. C, Rancho Cucamonga, CA 91730, 714/980-0046

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Mintics Software, 21 Wood St., Eastwood NSW 2122, Australia

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LogicWorks is an interactive digital logic drawing & simulation package for the Macintosh. Features:
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MacANATOMY
A complete electronic atlas of human anatomy in MacPaint document form. The drawings may be modified and merged into MacWrite documents using the Clipboard. Comprised of four volumes, available singly or as a collection.
MacMedic Publications, Inc., 4805 Westheimer, Houston, TX 77077, 713/977-2655

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Interactive learning program for preschool children, ages 2-6. Totally mouse-driven, Kieran uses a speech synthesizer to TALK to your child. Kieran can learn names and speak directly to your child. Covers alphabet, time-telling, counting, upper-letter cases, and numbers! $98.95
Dom Software Co., 163 Richard Dr., Tiverton, RI 02878, 401/253-9334

Educational/Games

Engineering

Macintosh Directory
File Conversion

File Conversion
File Converter (V2) is a fast file-conversion program for the Mac. It does search and replace operations on text files up to 400K on a Mac Plus in 20 sec. It changes spaces to tabs for Excel, adds/deletes tabs, carriage returns, line feeds, or spaces as well as printable characters. $24.95.
Phillips Software, 1633 Commonwealth Ave., West Newton, MA 02165, 617/332-1373

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Neoscribe International, P.O. Box 633-MD, East Haven, CT 06512, 203/467-9880

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Sgl. disks $98.95. Full library $250. Sampler $49.95. $3 s/h. Other disks. CompUCRAFT, P.O. Box 3159, Englewood, CO 80113, 303/791-2077

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B. Knick Drafting, 313 Marlin Pl., Melbourne Beach, FL 32951, 305/727-8071

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T.B.S.P., Inc., 8821 Alcott St., Los Angeles, CA 90035, 213/275-0208

Imports

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Thursby Software Systems, 5840 Interstate 20 West #145, Arlington, TX 76017, 817/748-5070

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Macworld 235
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   b. Department manager
   c. MIS or micro manager
   d. Engineering or scientific
   e. Professional
   f. Reseller/VAR
   g. Self-employed
   h. Other

2. Number of employees in your company:
   1. 25 or fewer
   2. 26-50
   3. 51-100
   4. 101-250
   5. 251-500
   6. 501-999
   7. 1000 or more

3. Plan to buy:
   a. Now
   b. In 4-6 months
   c. In 7-12 months
   d. For reference only
   e. For future reference

4. For how many personal computers do you buy products? (Include both company and personal units, please.)
   1. 1
   2. 2-4
   3. 5-9
   4. 10 or more

5. How many of the above are Macintoshes?
   a. 1
   b. 2-4
   c. 5-9
   d. 10 or more

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   a. Corporate or general manager
   b. Department manager
   c. MIS or micro manager
   d. Engineering or scientific
   e. Professional
   f. Reseller/VAR
   g. Self-employed
   h. Other

2. Number of employees in your company:
   1. 25 or fewer
   2. 26-50
   3. 51-100
   4. 101-250
   5. 251-500
   6. 501-999
   7. 1000 or more

3. Plan to buy:
   a. Now
   b. In 4-6 months
   c. In 7-12 months
   d. For reference only
   e. For future reference

4. For how many personal computers do you buy products? (Include both company and personal units, please.)
   1. 1
   2. 2-4
   3. 5-9
   4. 10 or more

5. How many of the above are Macintoshes?
   a. 1
   b. 2-4
   c. 5-9
   d. 10 or more

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   d. Engineering or scientific
   e. Professional
   f. Reseller/VAR
   g. Self-employed
   h. Other

2. Number of employees in your company:
   1. 25 or fewer
   2. 26-50
   3. 51-100
   4. 101-250
   5. 251-500
   6. 501-999
   7. 1000 or more

3. Plan to buy:
   a. Now
   b. In 4-6 months
   c. In 7-12 months
   d. For reference only
   e. For future reference

4. For how many personal computers do you buy products? (Include both company and personal units, please.)
   1. 1
   2. 2-4
   3. 5-9
   4. 10 or more

5. How many of the above are Macintoshes?
   a. 1
   b. 2-4
   c. 5-9
   d. 10 or more

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This list brings you highlights of software updates recently received but not yet tested. The first price is the upgrade cost for registered owners; the second is the current list price.

**Bridge** version 5.0 improves bidding and will store interesting hands for replay. The player may choose the number of high-card points to be dealt or set the auto-play mode so that the computer controls bidding. Artworx Software Co., 1844 Penfield Rd., Penfield, NY 14526, 800/828-6573. $12 and original disk; $34.95 new.

**Cricket Draw** version 1.01 fixes problems with grouping and resizing, reflection and tilting, and style changes for texts on a path. The new version also prints combined graphics and text documents to an ImageWriter. The program has been enhanced for importing PICT files. Cricket Software, 3508 Market St. #3206, Philadelphia, PA 19104, 215/251-9890. Free; $295 new.

**EGBridge** version 2.2 and **EGWord** version 2.2 are available from Japanese Language Services, 186 Lincoln St., Boston, MA 02111, 617/338-2211. $10 each; EGBridge $249 new; EGWord $399 new.

**ExperProlog II** version 2.3 includes a new assert procedure that lets the program run more efficiently, a new world-free-space function for identifying the amount of memory given to any portion of a program, and an error-hook procedure that closes off the source code by automatically restarting the program each time it encounters an unreadable error. The internal tracking procedures and window labeling have been improved. Automatic memory adjustment enables retention of configuration and memory-requirement changes. Expertelligence, 559 San Ysidro Rd., Santa Barbara, CA 93108, 805/969-7871. $35; $495 new.

**Hypernet** version 2.0 supports multiuser applications designed for AppleTalk and AppleShare, operates transparently over the AppleTalk network, and allows for concurrent file access and password protection. The new version is compatible with all leading Mac hard disks. General Computer Corp., 215 First St., Cambridge, MA 02142, 617/492-5500. Free; $299 per server.

**MacChoro** version 1.4 enhances printing resolution on the ImageWriter, prints graphics and statistics to the LaserWriter; and allows view sorts and cut and paste to the Clipboard. Image Mapping Systems, P.O. Box 31593, Omaha, NE 68132. Free; $295 new.

**MacDewey Library Catalog System** version 2.5 fully supports the HFS filing system. Book and circulation files created with version 2.0 are compatible with ver-
MathWriter version 1.2 fixes bugs and includes cosmetic changes to superscripts, subscripts, and line widths. The new version offers keyboard equivalents, a grow box, more sophisticated memory management, and new commands.

MacSafe version 1.03 has a new decryption safety latch and improved on-line help. The new version corrects a problem with modification dates for MacSafe files, and its icon changes to reflect the type of disk a safe is on. Kent Marsh Ltd., Inc., 1200 Post Oak Blvd. #210, Houston, TX 77056, 713/623-8618. Free with return of original disk; $149 new.

MacZap version 4.5 supports all Macintosh disk systems that are block server or network servers, such as MacServe. Micro Analyst, Inc., P.O. Box 15003, Austin, TX 78761, 512/926-4527. $18; $65 new.

MathWriter version 1.2 fixes bugs and includes cosmetic changes to superscripts, subscripts, and line widths. The new version offers keyboard equivalents, a grow box, more sophisticated memory management, and new commands.

MacPublisher version 3.52 adds multitasking, text editing, and run-time application development capabilities. Creative Solutions Inc., 4701 Randolph Rd. #12, Rockville, MD 20852, 301/984-0262. Level 1 $99, Level 2 $49, Level 3 $35; $199 new.

MacPerspective version 3.0 is faster than the previous version and handles very large, complex structures. It now includes an Undo command, the ability to draw circular and elliptical arcs in 3-D, and a hidden-line editor. Drawings may be copied to the Clipboard and transferred to FullPaint for rendering in landscape orientation. B. Kneick Drafting, 313 Martin Pl., Melbourne Beach, FL 32951, 305/727-8071. $25; $179 new.

MacPublisher version 3.52 adds multitasking, text editing, and run-time application development capabilities. Creative Solutions Inc., 4701 Randolph Rd. #12, Rockville, MD 20852, 301/984-0262. Level 1 $99, Level 2 $49, Level 3 $35; $199 new.

MacPublisher version 3.52 adds multitasking, text editing, and run-time application development capabilities. Creative Solutions Inc., 4701 Randolph Rd. #12, Rockville, MD 20852, 301/984-0262. Level 1 $99, Level 2 $49, Level 3 $35; $199 new.
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When the Macintosh was first introduced, it was heralded as the computer “for the rest of us.” Now it’s expanded the definition of “us” to include corporate users, professionals and others who need a powerful personal computer at work.

If you recognize yourself in that definition, we’d like to introduce you to a family of peripherals from General Computer.

Because each was created not simply to tap the Macintosh’s resources as a tool for business, but dramatically enlarge them in the process.

**HYPERDRIVE LENGTHENS ITS LEAD OVER THE LATECOMERS.**

HyperDrive was the first hard disk to be installed inside the Macintosh—and it gave the Mac unprecedented increases in speed and capacity.

Now General Computer extends these increases to the Macintosh SE with a new internal hard disk—HyperDrive Fl/40.

Given its heritage, it should come as no surprise that HyperDrive Fl/40 is extremely fast. Once installed, an Fl/40 will speed power-up time by 57%. Load Microsoft's Excel two times faster. And Aldus' PageMaker three times faster.

These and other reductions in work time are matched by a correspondingly vast increase in the capacity for work. An Fl/40 will enable the Macintosh to store the data that would otherwise occupy an astonishing 14,000 pages.

But all this isn’t to say that HyperDrive’s elevated performance is denied those who prefer an external hard disk.

HyperDrive FX/20 and FX/40 provide the same speed and capacity to any Macintosh with an SCSI port. And like all internal HyperDrives—which is to say unlike any other hard disk—the FX drives come with a complete array of software.

Including a back-up program that makes quick copies of your data onto diskettes. LaserWriter and ImageWriter print spoolers that queue up documents for your printer, while you go on to other jobs. And a security program that protects your files from unauthorized entry.

**NETWORKING SOFTWARE THAT OUTWORKS THE OTHERS.**

If networks exist to promote the free exchange of information, it follows that the freer the exchange, the better. By that standard, HyperNet 2.0 creates new possibilities for desktop communications.

HyperNet enables up to 32 Macintoshes to read, edit or transfer files from any hard disk in an AppleTalk network. Even if everyone wants to refer to the same information at once.

Unlike other networking software, HyperNet works without need of a dedicated Macintosh to run the network. Or a network administrator to maintain it.

In fact, HyperNet doesn't even require Hyper-
Drive. It works with any Macintosh and any hard disk made for the Mac. Not to mention all the software compatible with AppleTalk.

Which means you can take full advantage of multi-user programs for electronic mail such as Think Technologies' InBox. Or powerful database managers such as Blyth's Omnis 3.

The resulting network provides a fully compatible complement for people who use AppleShare. And for people who don't, HyperNet provides a fast, easy-to-use network on its own.

**INTRODUCING TWO NEW EXPANSIONS OF THE OUTERMOST LIMITS.**

If you bought the Macintosh because it delivers "the power to be your best," then more power should make you even better.

That's the mission of the two newest additions to the General Computer family—HyperTape 40 and HyperCharger 020.

HyperTape 40 may not make diskettes obsolete, but it can decrease your dependence on them.

Plugged into any Macintosh with an SCSI port, HyperTape allows you to back up the equivalent of 50 diskettes of data onto one compact 40-megabyte cartridge. HyperTape can be programmed to back up automatically—even when you're away from your Macintosh. And you have the peace of mind that comes with knowing your documents are stored using the most reliable method for protecting data from accidental loss.

Even greater economies of time and effort are available through HyperCharger 020—a powerful enhancement board which, installed inside the Macintosh SE, delivers the processing prowess of the Macintosh II.

A Macintosh SE thus equipped not only runs most software up to an incredible four times faster. HyperCharger's optional floating point co-processor also allows it to handle financial modeling, statistical analysis, and other tasks which ordinarily would require a much larger, more complex and more expensive computer. And since HyperCharger is internally installed, the SE remains as compact and portable as before.

In sum, no other family of peripherals leaves the Macintosh so thoroughly equipped for superior performance. Or so thoroughly qualified for a career in business.

For a detailed review of those qualifications, stop by an authorized General Computer dealer. And for the name of one near you, call (800) 634-9737. In Illinois, (800) 854-9737.*

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Macworld Best-Sellers

Business Software

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Education Software

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<td>The Printed Word David A. Kater and Richard L. Kater, Microsoft Press</td>
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<td>Microsoft BASIC Book/Macintosh Edition Walter A. Etting and Gregory Solberg, Osborne/McGraw-Hill</td>
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Product Watch

Editors' choice:
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* Formerly bundled with the Mac.
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