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New AppleLink Service

Many crashed hard disks still contain all their files and programs, but it has been impossible to access this information from their corrupted directories. Coming to the rescue is Symantec Utilities for the Mac (SUM). This utilities package contains a program called Guardian, which can often restore a crashed hard disk in less than a minute by building a desktop-style directory on the hard disk, and ideally on a floppy disk as well. But remember, this program must be used preemptively; it’s intended to augment, not replace, backups.

Another major feature of Guardian is a virus-protection utility. While it cannot prevent a System from becoming infected, this utility informs you when a virus has invaded. The program prevents most crashes by blocking illegal System calls. Other SUM features are disk optimization, hard-disk partitioning with encryption, and rescuing of deleted files.

SUM’s list price is $99.95. With the first 5000 copies sold, purchasers can obtain an additional program free—either HFS Navigator or Laser-Speed; a print spooler. For further information, call Symantec at 408/253-9600.

Impressive Printing

One way to substantially improve the appearance of laser printer output is with specially designed paper such as Laseredge from CG Graphic Arts in New York (212/925-5332). It increases clarity by providing a flat, smooth surface for deposited toner—no longer does toner drop down into the valleys of duplicator paper, which has a much rougher surface. Laseredge is available in a wide range of weights and in films.

There’s also a new product for the ImageWriter II that, while not improving print quality, will certainly make tractor-fed paper handling more convenient. This $49.95 paper stand from StayUp (602/966-6886) automatically refolds tractor-fed paper as it comes out of the ImageWriter.

Suggested retail price for the package is $35, plus an annual subscription fee of $35 after the first year. Connect charges are $15 per hour for prime-time use (7 a.m. to 6 p.m. weekdays), and $6 per hour for non-prime-time use. To make accessing Personal Edition more affordable, Apple will lower the price of its Personal Modem by $120, to $279.

Paper 68020-based coprocessor board, called FirePower, for Mac IIs running under the A/UX operating system. FirePower is not an accelerator that replaces the II’s CPU; rather, FirePower runs in conjunction with the CPU as an application coprocessor for computation-intensive A/UX tasks.

For example, users can off-load certain processor-intensive tasks to FirePower and thereby prevent tying up the Mac II system. If FirePower’s Mac II host is on an Ethernet network, any other network node can access that FirePower board, providing that the node supports TCP/IP protocols. One Mac II can host up to five FirePower boards.

The board includes 1 megabyte of ROM, two AppleTalk-compatible serial ports, and one high-speed SCSI interface that’s said to be four to ten times faster than the Mac.
World Markets Await

Travel to a foreign country and you might be amazed to see your favorite program working in any one of 17 languages, including Japanese and Arabic. That's because it's relatively easy to 'internationalize' Mac software: all of the language components—the menus and dialog boxes—are kept in separate modules that are quickly modifiable.

Apple is urging software developers to take advantage of its new Global Software Information evangelism program, which offers a new technical design manual, marketing information, and access to 27 versions of the Mac operating system (also available through the Apple Programmer's and Developer's Association).

An example of the growing internationalization of Macintosh markets is Rav-Ktav, a Hebrew/English word processor, and MacKtav, a Hebrew/English desktop publishing program, with list prices of $350 and $595, respectively, from Davka Corporation (800/621-8227).

Changes for SE and Plus

By fall, you can expect to see the elimination of differences between the European and U.S. versions of the SE and Plus chassis. From a user perspective, the most visible change will be the elimination of a mounting bracket for plug-in cards on the SE. Previously, Apple spot-welded this bracket to the SE chassis. In the future, developers must provide this bracket—which costs about 20 cents—with each plug-in card. There should be few substantive differences for the Plus, which will continue with no fan and no slot for internal cards.

Extending the Reach

In setting up a LocalTalk network, large factories, office complexes, and college campuses can run up against LocalTalk's 3000-foot line-length limitation. That's why Farallon Computing is offering LineDriver, which amplifies LocalTalk signals so they can reach at least 6000 feet. LineDriver works well with Farallon's PhoneNet as well with FlashTalk. List price is $395. For further information, call Farallon at 415/849-2331.

New Mac II Newsletter

Macintosh II Report is a monthly newsletter focusing on information specific to the Mac II. Its first edition, which came out in April, features a description of differences between the Mac II, the SE, and the Plus. Also included is a list of programs that have problems running on the Mac II, information on internal hard disks, and the latest word on upgrades and bug fixes. A sample issue is available for $2; a year's subscription costs $48. Write to Macretains, 329 Horizon Way, Pacifica, CA 94044.

Full-Fledged AI

In March, Apple and Texas Instruments announced the microExplorer AI (artificial intelligence) workstation, based on a Mac II with a LISP coprocessor chip, that offered near-workstation-like performance at a greatly reduced price. All that was missing was the appropriate software.

Inference is filling this need by offering expert-system software called ART (Automated Reasoning Tool), which can be used to develop and implement AI applications that can combine with Macintosh programs. For instance, a Mac application that controls a manufacturing process can feed data to an ART program that sends decisions back to the Mac application for implementation. For further information, call Inference at 213/417-7997.

New CD ROM

Both Toshiba and NEC are bringing CD ROM drives to the Mac, thus competing with Apple's $1,199 Apple CD-SC, which has an average access time of 600 milliseconds. Toshiba's XM-2100A-MAC claims a significantly faster access time of 400 ms and sells for only $999. NEC's Intersect CDR-77 drive costs $1,199 (including a $199 Mac-SCSI interface) and offers an average access time of 500 ms. All three units will support the High Sierra CD ROM and Mac HFS file formats.

One important extra, available only with NEC's drive, is a $599 CD ROM that includes 2500 3-D objects and fonts ready for importation to various graphics and publishing programs. Since the images are object-oriented, they can be edited, resized, and reshaped for many purposes.

A Science Cornucopia

Apple Engineering/Scientific Solutions Guide (Summer 1988), a 278-page publication that describes nearly 500 software and hardware products, is now available at Apple dealers for $6.95. This Apple-produced document also includes information about price, support, and how to contact manufacturers. Products are listed in the following categories: architecture, manufacturing planning/control, mapping/earth resources, scientific/laboratory, software development, and technical productivity.

Apple's First Network Manager

Apple now has its first network-management program for AppleTalk networks, InterPoll. With it, network administrators will be able to view the network number, node number, socket number, name, and device types of everyone on the network. The network can also be viewed on a zone-by-zone basis.

InterPoll can turn off the LaserWriter initialization dialog box. It can also determine if everyone on the network is operating with the same version of the System, Finder, and LaserWriter driver. InterPoll can send signals to any device on the network, determine where a break in the network has occurred, and determine whether all bridges are functioning properly. List price of InterPoll is $129.
Reflex Plus can show you more about relationships than Dr. Ruth

The relationships between different pieces of data within your database are all important ones. Because Reflex Plus is truly relational, it can "relate" and cross-reference your data.

Many "database managers" are not much more than "list managers"—simple lists that can't connect and cross-connect one item with another. So while they can "list," they can't really "manage."

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It's easy to customize your output with Reflex Plus. Whatever you're working on—letters, invoices, quotations or data entry screens—Reflex Plus lets you add graphics, position them wherever you want, change sizes, change fonts and produce truly professional results. Reflex Plus lets you make the most of your Macintosh.

Some of the power pluses of Reflex Plus

- Visual database design—a "natural" for your Macintosh
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- Truly relational database manager
- Auto-Save—which means you'll never lose data again

- Paste Choice command that saves you enormous amounts of time
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- Automatic creation of formulas to let you instantly search, sort, calculate, qualify and more
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- GROUPBY function
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- New rewritten documentation

"Borland's new relational database, Reflex Plus, is the best Macintosh database... It is simple to use and operate, very flexible in design, low cost (only $279 compared to $500 for dBase Mac), and small in size (250K versus 730K for Fourth Dimension)... We converted an Omnis 3 database that took two weeks to design into Reflex Plus in two days... We think Borland is right on target with their approach.

David Smith, MacTutor"

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Chet: And faster, too, Frank. It's hard to believe that with only five clicks of the mouse you can turn your Macintosh into a LAN workstation. In a total elapsed time of less than one minute.

Frank: It's all because TOPS is the easiest to use network in the Mac and PC worlds. If you already have AppleTalk cabling in place, all you have to do is insert the TOPS diskette, click the mouse five times, and you're ready to start sharing information.

Chet: And with just a few more clicks, you get print spooling. It's no wonder these folks have the time to develop such incredible maneuvers!

Frank: Right you are. And that means users not only share their printers, but with TOPS they can share their hard disks and MS/DOS files too.

Chet: But you know me Frank. The thing that excites me the most is the price. TOPS/Mac costs only $249 per node, and there's no need to purchase an expensive dedicated file server.

Frank: You bet, Chet. With the lengths people are going to, I'm sure this is going to become a major international event...

Want to try it yourself? For more information call us at 800-445-TOPS (from outside the U.S. and Canada, call 415-769-8700). Or write to us at TOPS, 950 Marina Village Parkway, Alameda, California 94501. And get ready to become a network star.
When Software Ventures set out to create MicroPhone, it had a simple mission: to develop the most intuitive communications software ever written. Indeed, when MicroPhone was born, it was universally hailed as a breakthrough in communications software. A product so friendly, it turned novices into experts. So sophisticated, it became, in the words of MacUser, a power user's delight.

MicroPhone is a legend. One of those precious software creations that single out the Macintosh as a superior computing machine.

With MicroPhone II, Software Ventures has set out to surpass itself: redefine power in telecommunications for years to come.

MicroPhone II is so revolutionary that PC Magazine was moved to say: "MicroPhone II is arguably the best comm software ever written." We won't have it any other way. MicroPhone II. The freedom to be yourself. At the top.

Critics' Choice

Stewart Alsop, P.C. Letter:
"MicroPhone ... sets the standards that general-purpose communications software will have to follow."

The New York Times:
"MicroPhone is a breakthrough in communications software ..."

Let's Get Technical

MultiFinder compatible. Supports background file transfer and script execution. Offers a full-featured script language: variables, counters, and expression-analyzer for string and arithmetic operations. Scripts allow: control of all communications settings; screen addressing and text editing; filtering of incoming text.

I see in recent issues of Fortune and Business Week that Apple is inviting readers to discover what the Mac II can do for their businesses. The II has not done as well as was hoped; the Mac SE is the current darling. Estimates I’ve seen indicate that 18,000 SEs are sold each month, and only 7000 Mac IIs.

What I’m wondering is why the Mac II, with its 68020 chip, is sitting in Business Week ads flanked by word processors and spreadsheets. During Jean-Louis Gassée’s first year at Apple, one of his favorite savings was, “Apple should be marketing to its friends.” He often mentioned how many high-tech and engineering firms were purchasing Macintoshes. So why aren’t we seeing Apple’s ads in Scientific American and other magazines favored by engineers and scientists?

There are about three million engineers in this country. They use computers for word processing and databases, and they need better graphics in all of their applications than do other PC users. They also tend to be more informed about the technology in general, and they really care about what kind of chips their PCs have.

These engineers and scientists are the natural friends of the Macintosh. Certainly their companies spend more on workstations than do most companies with white-collar workers, where the allure of machines that cost under $1000 is irresistible.

I think that Apple is overlooking a potentially larger market in this group than the one it is seeking in business. Meanwhile, Sun Microsystems is preparing to launch its first line of retail workstations. Apple has squandered its head start with the Mac II, and now it’s losing its slight lead by focusing the wrong machine on the wrong market. Sun has not so quietly become a one-billion-dollar company, and soon it could dominate the market for scientific and technical desktop computers.

It’s not that developers have let Apple down. I know they’re trying to push CAD and engineering applications for the Mac II. But Apple isn’t helping them. This is very different from the way the company’s marketing executives created and advertised desktop publishing alliances two years ago. There are no equivalents to the campaigns featuring Living Videotext, Filevision, and PageMaker that we saw then.

If Apple were interested in creating a greater demand for the Mac II in the technical user market, it would have already signed deals with national developers to port existing software to its machines. Developers like Daisey, The Mentor, and Valid for integrated circuit design; SDRC, PDA, and Swanson in engineering; MCAuto and Control Data in CAD. How can a company savvy enough to build a Mac II overlook its loyal developers and the major software vendors in one of the most lucrative markets of all?

During a recent Apple developers’ conference, there were several questions from developers asking when Apple was going to add a plotter driver to system software print drivers. The glib answer from an Apple staffer was, “We can develop our own as quickly as we can buy one from another company.” It’s clear to me—as it was to the audience—that Apple intends to sit on the issue until it is forced to act. Whenever developers ask questions at Apple’s public forums, I sure don’t see many Apple executives in the room. If they were there, maybe they would be better prepared to deal with the competition from Sun’s new desktop machines.

It’s as if Apple has forgotten that it can create its own role in the business market. It has a tremendous entrée into technical corporations like Lockheed and General Electric. These are places where the II could sell like hot cakes, but Apple seems determined to slavishly emulate IBM and only go corporate. That’s about as smart as treating the Apple II line as a poor relation, instead of realizing that it’s a moneymaker with a very healthy installed base. Apple should be so lucky as to develop the same kind of market in engineering—and it will need a lot of luck to make up for its neglect of this important arena.

Or, is it already too late for Apple to reach some of the Mac II’s natural friends?
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Rising from the Ashes
It is with mixed emotions, mostly disbelief, that I realize Ashes to Ashes may be one of our most successful programs. It was born out of momentary boredom while Stanley Crane and I were learning to program the Mac. At a trade show, Stan found a couple of copies in his pocket and gave them away. Since then, they’ve been turning up everywhere. I keep magnets on my refrigerator so they won’t take to breeding in the lettuce bin.

Your response to Jim Flores’s complaints about the bug that causes the score to decline at the 200,000 mark (Letters, March 1988) expresses our mercenary sentiments exactly—why put extra time and effort into a program that’s provided us no income? I might also add that no one had broken 200,000 before the game made its public debut. We’d fix it, but we’re not entirely certain we still have the development system. Maybe there’s a copy in the butter dish . . .

Daniel Matejka
via CompuServe

Landscapes in Color
Are there any programs that will colorize black-and-white MacPaint images on the Mac II? Also, are there any fractal programs that can produce color mountains and other landscapes?

Robert A. Wyatt
Berryville, Virginia

Correction
The 24-bit programmable color video card shown on page 113 (Macworld News, May 1988) is the Spectrum/24 by SuperMac Technology, not RasterOps. It offers 1024-by-768 pixel resolution and sells for $2995.
Not Just for Typesetters

In "Page-Makeup Roundup" (April 1988), Steve Cummings refers to programs like JustText, TeX, and Textures as packages that "are not for graphic designers." Most professionals agree it is the fanatical pursuit of the finer points of typography that separate the pro from the less finicky craftsman. WYSIWYG programs are certainly lacking in this respect.

As a teacher of typographic design, I encourage my students to use PageMaker and ReadySetGo as well as JustText. While the last program is less intuitive, its typical results outweigh those of the other two. Once Display PostScript becomes available, JustText will become very attractive to those now groping their way through the plethora of menus that are part and parcel of the supposedly easier programs.

Joost van de Woestijne
Utrecht, The Netherlands

A Prize Market

In his April column, "Eyes on the Prize," David Bunnell said just what I've been saying about Apple for a long time. There would certainly be many more Mac owners today if only Apple had offered them an affordable Macintosh.

I use a Mac Plus at work, and I like it a lot. But I voted with my wallet, as Bunnell put it, and bought an Amiga 500 with a megabyte of memory and two disk drives for less than half the price of a similarly equipped Mac Plus. Multiply me by over a million people tired of waiting for an affordable Mac who decide to buy something else, and you can see Apple is obviously missing a large market.

Larry Kollar
Dawsonville, Georgia

Protecting Its Image

No business likes to mess with a successful product—in Apple's case, the Apple II line (David Bunnell, April 1988). Until Apple is relatively sure that a cheap Mac won't hurt sales of the Apple II, you won't see a significant drop in the price of the Mac. If the Mac maintains its fashionable image and newfound business contacts, the price may stabilize or even increase.

Apple may be afraid that a low-cost Mac will tarnish its image in the minds of business people, but it may also find the business market is no sure bet either.

Victor Rosengren
Fort Collins, Colorado

(continues)
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Presenting Professional Image

“Get to the Point” (April 1988) was an interesting overview of presentation graphics that contained two slides produced by our software. However, the captions were inaccurate. Our product is called Professional Image, not Management Graphics, which is actually our competitor. The article also quotes typical prices ($15–$50) and turnaround times (4-5 days) for slide services. Our users get slides in 24 hours for $7.

Allan D. Clarke
20/20 Data Systems
Austin, Texas

Fixing TOPS

We enjoyed your informative article on TOPS network software (“Insights on TOPS,” March 1988). We use a TOPS LAN, but after upgrading to version 2.0, we discovered that while we could use an SE as a “many writer” server, we were unable to do the same with a Mac Plus. We’ve been informed that TOPS is working on a fix, but we’re still waiting to get it.

Dave Davis
Broderbund Software
San Rafael, California

Mike Rogers, TOPS technical manager, says the fix will go into the next upgrade, which should be out by now. In the meantime, a patch is being sent to customers who report the problem.—Ed.

Fish or Cut Bait

How nice of Apple to turn over MacWrite, MacPaint, and MacDraw to Claris for further development. But why wasn’t MacTerminal given the same treatment? Apple should either get on with MacTerminal’s development or admit that it has no plans to do so.

Vanya Matzek
Cupertino, California

When Apple spun off its software division, it decided to keep networking, communications, and system software, and hand over all other applications to Claris. According to an Apple representative, Apple plans to make MacTerminal a more integral part of future Mac operating systems.—Ed.

APDA Has Its Say

I noted with interest that Apple gave no response to Mark Jennings’s complaint about Apple Programmer’s and Developer’s Association (Letters, April 1988). Since APDA is (continues)
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bership fee Mr. Jennings complains about
is necessary to cover overhead and is re­
quired by our contract with Apple.
Frank Catalano
APDA
Renton, Washington

Leading the Blind
After reading about The Blind Watch­
maker book and program (Macworld
News, March 1988), I decided I wanted to
buy it, but you didn’t give an address for
the company.
Steven W. Pollard
Montgomery, Alabama

The address for book publisher W.W. Nor­
ton & Co. is 500 Fifth Ave, New York, NY
10110 (phone number is 212/354-5500).
You can obtain addresses of book pub­
lishers by calling your public library or
local bookstore.—Ed.

A Sour Note
In “The Numbers Racket” (February 1988)
you erroneously claimed that Jazz can read
and write WKS and SYLK files, including
formulas. Lotus technical support informed
us that Jazz only imports WKS or SYLK
files; it cannot export them. Only Lotus
1-2-3 version 2 can read Jazz files and save
them in another format.
Rita Gelhausen
St. Meinrad, Indiana

You’re right. Lotus’s planned export utility
for Jazz 1.A failed to materialize; this fea­
ture is now supposed to appear in Mod­
ern Jazz.—Ed.

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ID: lives

1. quality that distinguishes a vital and functional being from a dead body or inanimate matter.
2. physical and mental experiences of an individual.
3. biography:
4. period of existence.
5. way of living.
6. liveliness.

- lifeless adj.
- lifelessly adv.
- lifelessness n.
- lifelike adj.

Cross-reference any word in either the Thesaurus window after window of definitions.

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Commentary/Jerry Borrell

How Hollywood Moved to Silicon Valley

Or, what multimedia really means

We sat outside on the lawn, squinting against the sunlight on one of those glorious first days of California's spring. Trip Hawkins, founder of Electronic Arts, was talking about the future of the game industry when the conversation shifted to his observations of Silicon Valley.

"Within 20 years this will be Hollywood. Look, the computer game industry is already here in the Valley—Activision, Spectrum Holobyte, and Electronic Arts, with Broderbund nearby in San Rafael. Together we produce the majority of all entertainment software for all home computers. When we have optical memory, sound, interactive graphics, and better software, we'll be producing applications that rival films from Hollywood."

One might expect to hear this from the founder of EA. After all, Hawkins originated the idea of calling programmers producers and directors. But Bruce Davis, the CEO of Activision (now Mediagenic), a somewhat less flamboyant figure, now has the same starry look in his eyes when he talks about the future.

It's a time of transition in Northern California. It's like Orange County in the fifties, when Walt Disney's vision of the future turned orange groves in Anaheim into Disneyland. Today, the last of the fruit orchards are being cut down around Santa Clara County in the southern end of Silicon Valley. The physical resemblance of Santa Clara's evolution to Los Angeles's is inescapable. Just the names of the places have changed. In LA it was aerospace, petrochemicals, and entertainment. Now, in Silicon Valley, it's semiconductors, computers, and entertainment.

All of the major players in personal computers (save Tandy) are here; Sun, Hewlett-Packard, Apple, and dozens of other computer companies. IBM, DEC, and Xerox all have major research facilities here. George Lucas and Francis Coppola have brought substantial film industry work to Northern California. Industrial Light and Magic, a Lucas company, produces special effects for many of today's films. The Valley has become a cauldron of creativity, innovation, and hard work. Not one that glitters with the sybaritic lifestyle of LA, but one that races along quietly, fueled by the enormous efforts of its engineers, programmers, and marketers.

It's not just hyperbole. I worked for years in Boston and Washington, D.C., prowling the high-tech corridors there, talking with computer company execs, and it's clear to me that there's something different about Silicon Valley now. Excellent companies reside in all of this country's high-tech centers, but now the talent flows noticeably, increasingly, toward the Valley.

It's no coincidence that Apple's new vision of the future involves multimedia, user programmability, natural language use, and the visualization of data. John Sculley's vision leaps ahead to the end results of these trends, while Jean-Louis Gassée articulates the goals that must be reached in order to achieve these ends. And the engineers groan about how to accomplish all that's needed. I sit now and imagine what the book will look like that records this transition.

Gassée's thoughts these days about multimedia go something like this: "To be successful, the next generation of machines must be contextual. That is, computers must allow us to work within whatever is our context—in any subject area, by all appropriate means of access (audio, graphic, tactile), in any style of interaction we desire.

Second, they must provide "reusable experiences." Unlike videocassettes, computers must give people the perception that there are no bounds to what they can do with them—that each use can be an entirely new experience. (Gassée raises the concern, though, that the computer industry could fall into the media/advertising trap that television has, and produce mindless babble.)

Third, the future machines must be user programmable. It's refreshing to hear Gassée say that HyperCard has allowed Apple inadvertently to begin along this path.
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Commentary/Jerry Borrell

Gassée suggests that user-programmable, multimedia computers must have tools that incorporate a knowledge of aesthetics and other types of rules that nevertheless do not constrain the user's freedom to create. In his example there will be few home users with the skills of a Kubrick, but the computers should allow them the opportunity to create work of masterpiece quality if they have the time and ability to do so.

Unlike videocassettes, computers must give people the sense that there are no bounds to what they can do.

Finally, he recognizes (as do few of our academic pundits) that the development of these tools will be evolutionary, not dramatic (as was the arrival of spreadsheets). And if we accept that computers in the 1990s will become cultural icons, like cathedrals and books in the Middle Ages or like cars in the 1950s, then we can glimpse for ourselves what is coming.

Now when I sit in my office and notice the sky become brilliant blue with white clouds sweeping over Silicon Valley, I think of these things. And I try to remember that Cricket Presents and PageMaker represent only some fraction of the progress that we need to make. We have at least begun and have made great progress, but so much more is needed. I feel the desire to spend more time working with the technology and less time observing.

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(Left) WordPerfect offers parallel or newspaper-style column options. (Right) The interface is specially designed to be a familiar visual experience for Mac users.
for the Macintosh in

quickly scan and select files by employing “Word Search.”

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FoxBASE+/Mac blows away the competition in *InfoWorld's* speed benchmark tests!

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<tbody>
<tr>
<td>FoxBASE+/Mac</td>
<td>Only 1 Minute, 45 Seconds!</td>
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14 Times Faster Than
OMNIS 3 Plus
24 Minutes, 33 Seconds
82 Times Faster Than
Double Helix II
2 Hours, 22 Minutes, 53 Seconds
98 Times Faster Than
dBASE Mac
2 Hours, 51 Minutes, 23 Seconds
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4th Dimension
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Circle 152 on reader service card
Whose Music Is It, Anyway?

New Mac software makes virtuosos out of the fumble-fingered—so why learn the hard way?

I had learned to play guitar. I worked hard at it for ten more years, and when things were very very good, my being bled into the music itself, and maybe I impressed a few females.

So imagine my chagrin when I booted a $50 program named Jam Session on my Macintosh. Broderbund Software's promises on the packaging implied that all my hard work and practice on the guitar had been squandered. Make great-sounding music instantly...exercise your creativity without ever making a mistake...nothing to do except sit back and amaze yourself...If you don't know anything about music—who cares?

Could it be true? Could randomly hitting keys on my Mac Plus actually provide better guitar accompaniment than a Martin D-28 and my years of labor?

Yes, damn it. From the 19 possibilities, I chose a song called "Berry Jam," billed as "Classic rock 'n' roll from the '50s," and on my screen came an illustration of a rock group. Then the music started, a standard chord progression with bass, drums, and rhythm guitar. Even through my Mac speaker, they sounded like real instruments; they sounded more real when I patched the computer into my stereo system. All that was missing was the lead guitarist...me. Each letter on my keyboard corresponded to a guitar riff or note, all of them appropriate to a Chuck Berry-style rave-up. Most amazingly, the riffs would automatically accommodate themselves to where the song was at any given moment. No matter what I played, it sounded right.

I had to admit it—if I had plugged in a vintage Fender Telecaster and amplifier and attempted to play lead the old-fashioned way, any discerning rock fan would have chosen the prepackaged version.

(continues)
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Steven Levy

At that point, the delight of my new computer toy overwhelmed the feeling that the hours spent honing my technique had been in vain. I tried the different songs, some of them giving me the power of a jazz pianist, a country banjo-picker, or a techno-hip synth player. With each song I got more excited—I just could not believe the music I was making.

It was only later that I dared ask myself a daunting question: Was I really making music? Or was this some sort of stunt, a cheap trick? If this was really music, then I think we have to make some major adjustments in our view of what musicianship consists of.

To probe this conundrum I took a look not only at the origins of Jam Session, but also at those of a couple of other programs that provide high-level music output for people with low musical skills, and found that the issues behind these programs were almost as fascinating as the sounds they produce.

Bogus Music

Ed Bogas has had a checkered career in the music business, ranging from the composition of the soundtrack for television animation featuring the beloved but not very funny Garfield character, to an appearance as a clucking chicken in commercials for the California Egg Board. Now he’s focusing on computer software, particularly for the Mac. It was Bogas who headed the team that created the popular Studio Session program, which uses the metaphor of a multitrack tape recorder to allow users to create songs in layers, adding one instrument track to another. (By doing this, Bogas was offering a low-end version of professional sequencer programs, which use the Musical Instrument Digital Interface, or MIDI, standard to manage studio-quality recordings.) But to get the most out of Studio Session, one had to know something about musical notation and composition.

Bogas wanted to bring things down to the level of musical moronhood.

“‘A team of us were working on a toy project,’” he recalls, “‘where you could push a button and have elaborate sound come out. Then one day I was sitting at the piano keyboard and thinking about the way a jazz musician operates. He has a bank of...’ (continues)
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A Memo On The Lures Of Trade

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* SALES FIGURES FOR 1989 ARE JUST A WILD GUESS

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A Marketing Memo On The Lures Of Trade

Lure, line & sinker.
Our On the Fly authorized dealers have long been aware of both our in-store and customer support services. This season is no different. In fact, in addition to our advertising budget, we have plans to expand our in-store displays and re-package the lures for easier inventory and handling.

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Steven Levy

licks in his mind and, depending on the way he feels and the way the music is playing, he chooses one. It could be a fast one, a slow one, or a single note—it could be anything that fits the composition. A lifetime of experience is behind the choice, as well as a storehouse of dexterity required to play the riff once it's chosen. But Bogas intuitively and all the hard parts could be bypassed.

"Why not give nonmusicians the 'chops' the music has at his or her disposal," he asked, "and let the people make the aesthetic choices?" With a team that included Steve Capps, of the original Macintosh software group, Bogas created Jam Session, which does just that. He knew it worked when one day an observer who had been watching a demonstration began shaking his head and wondering aloud whether Oscar Peterson had just become obsolete.

That thought hadn't occurred to me. To the contrary, I'm not sure at all that when you’re jammin' with Jam Session, you’re actually making music. But Ed Bogas has no doubts.

"I say you are creating music when you use Jam Session," he says. He explains that you can, for instance, build a jazz solo in the same way that Oscar Peterson does, choosing slow riffs, climbing octaves, chording. "You have a sense of control," Bogas says. "You can play with feeling. You can express emotion."

Bogas admits that he has not yet heard any solos created with Jam Session that have startled him by going beyond the program's apparent limitations. The John Coltrane of Jam Session has yet to emerge, and it is questionable if he ever will. On the other hand, Bogas contends that nonmusicians are grateful. "They all say, 'It's like suddenly being able to do the thing I've never been able to do before. I'm not all thumbs!'"

Is it possible that the program and others like it will create a disincentive to traditional music training?

"I don't think so," says Bogas. "I know in music you cannot stop the desire to learn. Most musicians start very young. If they have the inclination, you cannot stop them."

The Mouse That Roared
If I was reluctant to accept that argument, I was more so after toy ing with another make-music-no-questions-asked program. This one is called Music Mouse, (continues)
Why You Need Cricket Draw

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Circle 15 on reader service card
available from OpCode Systems of Menlo Park, California. Though the compositions you create with Music Mouse sound less familiar than the instrumentals produced through Jam Session, it gives a rank amateur even more musical power.

Music Mouse is hard to describe. It is sort of a synthesizer with intelligence. (It is also best used in MIDI mode, with a synthesizer rather than the Mac’s internal speaker providing the sound—I used a cheap Casio CZ-101 digital synthesizer.) Basically, the program lets you play music by sliding the Macintosh mouse around; you have considerable power to shape the music by setting some simple parameters. You can set patterns in motion, strike harmonies, and create all sorts of highly evocative phrases. What comes out often resembles film soundtracks, for movies that could be anything from moody romances to spine-chilling horror flicks. All in all, Music Mouse seems especially geared to create the sort of compositions that would be favored by an avant garde composer who lives in a big funky loft in downtown New York City.

So it comes as no surprise that the creator of Music Mouse is Laurie Spiegel, an avant garde composer who lives in a downtown New York City loft. Spiegel has been composing with computers since 1973, when she worked at Bell Labs with the pioneers in the field. With Music Mouse she believes she has placed maximum power in the hands of minimally trained people, and she makes no apologies about it. In fact, she sees her program as a blow against “tyranny” in the music establishment, which she considers elitist and snobbish.

“First of all,” she says, “sheer physical coordination has nothing to do with musicality.” So much for those hours of training my fingers to make chords while the other hand picked at strings. “Second, the ability to deal with and manipulate symbolic notation is irrelevant to musical ability.” This is rather comforting, since I don’t read music. “All in all, we filter out 90 percent of the musicians [by those bogus criteria] and we’re left with virtuosos who play piano like it’s a sport—without soul.”

(continues)
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Aatrix Payroll Plus .......................... 195.

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New Turbo Mouse .............................. 115.

Utility Software

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| ALS
d Disk Express 1.0                       | 26.00  |
| Font/DA Juggler Plus                      | 32.00  |
| Berkeley Design                           | 26.00  |
| Stepping Out II                            | 54.00  |
| Beyond Inc. Menu Fonts 2 or Fore Runner 2 | 54.00  |
| CE Software Quickkeys (Macro Program)     | 940    |
| DiskTop 3.0 or CalendarMaker 3.0         | 21.00  |
| Central Point Software                    | 10.00  |
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| Design Software/Electronic Arts           | 49.00  |
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| Doe RamSnap                                | 26.00  |
| Electronic Arts Disk Tools Plus            | 39.00  |
| Emerald City Software LaserTalk           | 199.00 |
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| FaxBack For The Macintosh                 | 155.00 |
| Infoprep Disk 1.4                         | 203.00 |
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| Syntex Mac Envelope                       | 199.00 |
| Syntex Mac Envelope                       | 199.00 |
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| myDiskLabeler w/Color                     | 31.00  |
| Microlytics, Inc. Golder                   | 49.00  |
| Microlytics, Inc. Golder                   | 49.00  |
| Printing Software, Inc. Findwell 2.0      | 36.00  |

Communications Software

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<td>Microphone II (Includes Guide)</td>
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to Polish Up Your Mac...

Chuck Yeager’s Advanced Flight Simulator by Electronic Arts
Imagine racing through the clouds at Mach 3, putting one of the fourteen different aircraft at your disposal through it’s paces. Or screaming along just above the ground, racing against a computer controlled aircraft through skyscrapers, slalom and gates. These are just a few of the thrills you’ll experience flying Chuck Yeager’s Advanced Flight Simulator. Other features include Mach speed graphics with highly detailed 3D terrain, a black box recorder to save and playback your best tricks and races, and a choice of 10 distinct viewing perspectives with a zoom feature which can enlarge up to 256 times. All this and much more make Advanced Flight Simulator the ultimate way to make your Macintosh fly.

Chuck Yeager’s Advanced Flight Simulator ........................................... 36.

Gofer by Microlytics, Inc.
Gofer is the ultimate desk accessory for finding facts and numbers previously hidden from view on disks. Give Gofer a phrase, a fact or a date and send him looking for it on floppies, hard disks, ram disks, even most popular popular networks. You can search for up to eight items simultaneously, with or without leaving your application. Gofer also allows you to view, cut and paste the items you searched for, and include what you’ve chosen into your current program. Multifinder and Hypercard compatibility, the ability to search with AND, OR, NOT and Nearby criterion, and the fact that it’s not copy protected makes Gofer a real find for all Mac users.

Gofer .................................... 49.

GeoQuery by Odesta Corporation
GeoQuery puts your data — and you — on the map. This exciting new product turns your spreadsheet or database into interactive “pushpins” on a U.S. map. You’ll instantly see geographic relationships among your customers, employees, locations — anything! You have all 50 states to work with, and can zoom in to specific areas. Use the drawing tools to generate reports on or target mailings to specific areas, flag bad addresses in your database, turn one sales call into five on your next trip, and create spectacular presentation maps. If location matters to you, you’ll love GeoQuery.

GeoQuery (Plus, SE, & II) .......................................................... 275.

MacSnap Internal Memory Expansions by Dove Computer Corporation
It’s a safe bet that no matter what Macintosh model you have, Dove Computer has a MacSnap memory expansion product that matches your needs. That’s because Dove has an extensive line of high quality memory and productivity enhancement products available. All Dove products are easy to install and represent a superior value! We’ve selected some of the most popular models, and are offering them at special prices. All models listed include Dove’s RamSnap software, their intelligent ram management software.

MacSnap 2SE ........................................................................... 299.
MacSnap 524E ................................................................. 189.
MacSnap 524S ...................................................................... 250.
MacSnap 548E ...................................................................... 425.
MacSnap 548S ...................................................................... 489.
MacSnap Plus 2 ............................................................... 315.

Sensible Grammar by Sensible Software
Sensible Grammar, using its library of over 2200 commonly misused English phrases, allows you to check your manuscripts for common writing errors. Faulty phrases which are overly formal, informal, cliché, vague, wordy, or sexist are brought to your attention and suggestions are given which you can “click” into your text, or you may type a correction. Sensible Grammar also checks for common punctuation errors, as well as allowing you to customize the program and phrase library to your specific needs. Sensible Grammar works with multifinder, is not copy protected, and is the best way I’ve seen to take the drudgery out of analyzing your writing style.

Sensible Grammar ................................................................. 55.

Positively A Plus

PROGRAMS PLUS

800/832-3201

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Disk Drives/Hard Drives/Upgrades

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Music Mouse is her blow against that music establishment, but it is more than a musical tool. In fact, the program is so powerful that it goes beyond categorization. So easy to use that it has found favor with people attempting to rehabilitate prisoners and raise the self-esteem of physically impaired people. At the same time, such an intricate musical composition aids professional musicians have told Spiegel they consider the program a full collaborator—and they've listed it that way on record albums and in performance notes.

This brings up an interesting question. Since it is so easy to produce engaging music with Music Mouse—one can virtually press a few keys on the Mac, step back, and listen as the program generates complex counterharmonies and rhythms—is it the user or the program that has created the music? Or the creator of the program? The problem is so vexing that the U.S. Copyright Office has yet to figure it out. In fact, it still can't decide whether Music Mouse is a software program, a musical instrument, or a musical composition with infinite sheet music.

Meanwhile, Spiegel does admit that extending such power to nonmusicians—or boosting the power of trained musicians—can have its problems. She cites one example: the faculty at the Berklee College of Music is having trouble judging student tapes because "they can't tell who has talent or who used the software to do the creation for them."

Music for Millions

Certainly that confusion will only get worse as this genre of software proliferates. The Intelligent Music Corporation of Albany, New York, which publishes something more technical composition programs like M and Jam Factory is, according to its president Joel Chadabe, planning several programs that will enable musical virgins to make music. One is a mouse-driven program called Ovaltunes; another, called Riff, is "an improvising program that places a band of players under your direction."

Ultimately, does it matter if software makes Eric Claptons out of klutzes, or Steve Reichs out of the tone-deaf? When we hear or create pleasing or stirring music, what difference does it make how much sweat went into creating it? The creators say that Music Mouse, Jam Session, and other tools provide the essence of music without the fuss and muss, and that those with superior imagination, musical intuition, and theoretical vision will use the composing aids to go further. I have to admit that when I play with those programs, I am pleased with the sounds that emerge. As an added bonus, when I play a sizzling guitar lead on Jam Session, my face does not make the silly contortions endemic to note-bending lead guitarists.

On the other hand, I cannot imagine this brand of musicianship—which entails moving a mouse or hitting letters on a keyboard—as capable of elevating a teenage boy to Life of the Party, thus impressing females. As long as that's so, don't look for the computer keyboard to be the nexus of music creativity.
It was getting pretty crowded. As more and more Macintoshes started showing up at work, the duplication of computers, monitors, printers and keyboards was simply getting out of hand.

And while there was still a need to use vital programs like Lotus® 1-2-3® and dBASE; there was also an ever increasing demand for the Macintosh. Would the two computer environments be able to work together?

Times have changed. Now Macintosh™ IIs can run MS-DOS® software just as easily as Macintosh applications. With AST's Mac286®, the AT-compatible, 80286 computer-on-a-board that runs inside the Macintosh II. Its advanced hardware design actually runs faster than an IBM® PC AT.

With Mac286, familiar MS-DOS programs take advantage of many of the elements of the Macintosh environment. Copy and paste text, print on an Apple® LaserWriter® store your files on the Mac hard disk and share DOS files with other users. It's that easy.

Of course, the future is built in, too. By installing an advanced hardware solution for MS-DOS compatibility, you're insuring a home for the best of today's, and tomorrow's, software programs.

Because there's one thing you can always count on in the world of personal computers. Times will change.

If you're interested in putting an AT-compatible computer inside your Mac II, call AST at (714) 863-0181 or fill out the coupon, and we'll tell you how you can have the best of both worlds.
We always wanted to keep a low profile. But since we introduced the PhoneNET System two years ago, hardly a week goes by that we don’t make network news.

A leading Macintosh magazine advises that you install PhoneNET for any AppleTalk network. The PhoneNET StarController was selected as the best way to build large networks. And reporters are calling MacRecorder the new wave in sound technology for the Mac.

The result is a quarter-million PhoneNET nodes, and counting. Can we handle the exposure? Well, the inside story is we’re still the same friendly people, with the same great service. And we’ll continue to be an innovative company with new ideas. Just not as quiet.

Stay tuned. Your Farallon dealer has more good news and a free demo disk. For the dealer nearest you, call (415) 849-2331, ext. 83.

Circle 150 on reader service card
Macworld News

Desktop Video

Thanks to desktop video, which processes images and sound, in addition to words, the art of storytelling is evolving rapidly.

In fact, novelist Ken Kesey (author of One Flew Over the Cuckoo's Nest) predicts that the Kafka's and Joyce's of tomorrow will be using video as a means of expression. Already desktop video is producing segments of animation that look as if they might have been done on a much more expensive Pixar or Cubicomp system.

Aegis's video products for the Mac have helped create several TV commercials and music videos, including Coca-Cola's Max Headroom commercials and other productions by Timbuck III, Tom Petty, and Todd Rundgren. A key element is Aegis's Animation Workshop for the Mac II, which offers full-feature video titling with cell animation; the manipulation of video images with flips, turns, tumbles, and rolls; an animated-image compression system (to greatly increase the number of images that can be stored on a hard disk); and a HyperCard link with a 3-D animation player. Animations can be played back at a rate of up to 30 frames per second (fps) from a disk or up to 100 fps from RAM.

To implement desktop video software, Julian Systems is offering an NTSC video card to hook up standard video monitors to the Mac II. The company will soon be releasing a Mac II video production card, which will permit standard video signals to be mingled with Mac images.

If you're interested in creating your own movies or commercials—complete with soundtrack, animation, and special effects—for under $10,000, then a desktop video system may be your best choice. For further information, call Aegis in Santa Monica, California, at 213/392-9972; and Julian Systems in Concord, California, at 415/686-4400. —Allan Lundell

Easy Access to SQL

Mac users can easily and quickly use the power of SQL databases on Digital Equipment Corporation's VAX computers without sacrificing the Mac interface, thanks to Alisa Systems' SequeLink. Alisa's package enables Mac users to extract data from SQL databases (such as Oracle) using programs like 4th Dimension or HyperCard. HyperCard stacks can be created to access SQL databases using SequeLink's external commands (XCMDs). A 4th Dimension application, called SequeView, is included with SequeLink. It constructs queries to an SQL database using a spreadsheet-like format.

In order for SequeLink to work, a user's Mac must be connected to a VAX computer via either AppleTalk or DECnet. When a Mac-generated query for data is directed to the VAX, SequeLink's SQL server on the VAX communicates with the database, extracts the appro-
Suffering from a lack of memory?

Due to the memory demands of today's sophisticated software, insufficient memory can make any computer system seem . . . mindless. Micron can fill your system's memory void with high quality, add-in memory products.

We offer memory boards for the IBM PC/AT and compatible systems, memory expansion kits for the Apple Macintosh II, SE and Plus, and memory expansion boards for the Commodore Amiga 500, 1000 and 2000 systems.

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Macintosh is a trademark of Apple Computer, Inc. Amiga is a registered trademark of Commodore-Amiga, Inc. Commodore is a registered trademark of Commodore Electronics, Ltd. IBM and PC/AT are registered trademarks of International Business Machines.
This HyperCard application accesses information located on mainframe computers. Click on hot spots, like the part numbers above, and up pop new windows.

Private data from the SQL database, and sends only the requested data back to the Mac.

As a result of these features, SequelLink is one of the few products available that provide "seamless integration" of processes running on both the Mac and the VAX computers, making it easier for users to get the best of both worlds.

—David R. Kostur

PowerPoint in Color

Microsoft’s PowerPoint 2.0 presentation software for the Mac produces color slides that will knock your socks off. The program’s automatic color palettes let you choose from among eight complementary colors (based on your choice of a primary color); multidirectional washes allow you to create a gradually lightened background; and automatic formatting permits a specified combination of colors and fonts to be applied instantly to all slides in your presentation.

PowerPoint retains all of its capabilities for producing black-and-white slides and overhead transparencies, but it still doesn’t draw or paint complex images well. So it relies on such programs as Illustrator 88, FreeHand, and LaserPoint Color II for creating especially interesting backgrounds, which can be imported into PowerPoint 2.0 as PICT, bitmap, or encapsulated PostScript files and placed into one of many layers. By altering the position and density of the see-through layers, it’s easy to create unusual embossing and shadow effects, previously available only on much more expensive slide systems.

Once you finish designing your presentation, you can output it on a film recorder or send it to a slide service center like Genigraphics. Genigraphics, which has 24 locations around the country, can produce color slides using files created on any Macintosh (color or black-and-white) through the use of proprietary templates. But beginning in September or October, registered owners of PowerPoint 2.0 will receive a Chooser driver that makes sending slides (via modem) to Genigraphics as routine as printing—completed slides will often be returned to the sender by Express Mail the next day.

Other enhancements to PowerPoint include a spelling checker and a search-and-replace function. PowerPoint’s list price remains $395. For further information, call Microsoft at 800/426-9400.

Stop Mousing Around

The Apple Desktop Bus (ADB) is a serial communications bus that allows up to 16 peripheral devices to be connected to the Mac II or SE. Until recently, about the only input devices users could attach to the ADB on either computer were Apple’s keyboard and mouse.

Now, however, a host of input alternatives have appeared—from tablets to trackballs to devices that defy categorization. "But I have a Mac 512K or a Plus," you say. Don’t worry—Olduvai Corporation’s $129 AD-Bridge lets you connect to the new ADB devices, and it works the other way as well, allowing you to connect your old peripherals to the Mac SE or II.

Summagraphics and Kurta both offer ADB graphics tablets. Kurta’s $395 IS/ADB Input System consists of an 8½-by-11-inch tablet and a pen or cursor device (both are available with cord or cordless). Summagraphics has announced the $495 Bit Pad Plus, a 12-by-12-inch tablet with a stylus and a 4-button cursor device.

If you prefer a trackball to the mouse, you have several options. Asher Engineering offers the Turbo Trackball for $119.95, Abaton’s ProPoint optical trackball sells for $159.95, and Kensington Microware recently announced Turbo Mouse ADB for $169.95 (Kensington also offers a 7-foot ADB keyboard cable for $39.95).

For game fans, Advanced Gravis has announced an ADB-compatible joystick with a fire button at the tip and two mouse buttons on the base; it

(continues)
The largest capacities of any hard disk drives for Macintosh™—140 megabytes with the largest selections, 20, 45, 100 and 140! And the fastest average seek times...28 ms! A combination any Mac user would love.

The 450 RX™—45 megabytes of internal storage for the Macintosh SE and Macintosh II.

The 1000 RX™ and 1400 RX™—100 and 140 megabytes of internal storage for the Macintosh II.

And the PLUS External Series for the Mac Plus and SE. 20 and 45 megabyte capacities and our new 100 and 140 megabyte external box that fits right under the Mac.

The 20 and 45 megabyte internal PLUS drives have fans that cool the drives and the Mac Plus. Designed by Rodime for easy installation.

Best of all, the RX and PLUS Series drives have the unmatched reliability and support of Rodime—the largest supplier of hard disk technology for the Macintosh.

Rodime drives. The largest capacities and the fastest speeds. Load up with the leader and you'll be a believer.
can also be used as a mouse replacement.

Perhaps you want to try a new technology altogether. Lightgate's $149 Felix is an input-and-pointing device that consists of a small handle that you hold like a pen and move within a 1-inch-square area. Unlike the mouse, Felix offers an optical tracking system, and absolute positioning.

Or, you could try a mouse that contains none of the moving parts that can gum up a mechanical mouse. The optical mouse, A+, from Mouse Systems, skims over a shiny metal pad that reflects a tiny beam of light as it tracks every hand movement.

Finally, Personal Writer's handwriting-recognition system, Personal Writer 15S, which converts handwritten text and numbers to characters on the screen, is now ADB compatible. The grid-based Personal Writer 15S sells for $895; the Personal Writer 15SL, which allows you to write on unlined paper, costs $1795.

Easy CAD—a Reality

Dreams often set our mood for the day, and occasionally they reveal the future. Perhaps that's why Innovative Data Design (IDD), the publishers of the highly popular MacDraft, have called their next-generation CAD program Dreams.

Dreams is a very powerful program that's easy to use. For instance, you can specify the scale of your drawing in real-world terms. When you ask for an object's dimensions, Dreams calculates its actual size and displays it in the units you choose.

Other features include palettes that float above the document on a separate plane and are always active. Clicking on any of the palettes' tools gives you a menu of available options. Special editing tools allow rotation, gluing of edges, and merging of objects.

With Dreams you can draw using any of 16.8 million colors or 10 shades of laser-printer gray. The program generates color patterns using a 32-by-32-pixel tablet. The number of layers is restricted only by available memory. You can also take advantage of symbol libraries that will be commercially available, or create them using pre-drawn objects and text blocks.

Dreams helps define the Mac's long-term CAD future by supplying a "graphics engine" to which various capabilities are attached as modules. Using modules, both IDD and third-party developers can offer symbol libraries, integrated database functionality (for automatically generating proposals and reports from designs), and whole new programs.

Dreams is priced at $500. For more information, call IDD in Concord, California, at 415/680-6818.

HYPERCARD Hot Stacks

Today's emerging stacks seem to be either content-intensive or technique-intensive. Technique-intensive stacks work like mini-applications; a set of tools is offered to perform tasks. Content-intensive stacks work like mini-encyclopedias, authors cram the stacks full of information, and readers have it at their fingertips.

Two content-intensive stacks help you learn about Russian and dinosaurs. Dinosaurs are all the rage these days, and this stack has some great-looking beasts. Clicking on buttons provides the scientific details that everyone seems to forget. What this stack really needs is sound and animation. For example, HyperCard's magic could make a classic confrontation between Triceratops and Tyrannosaurus rex really come alive. The stack was produced by A. A. H. Computer Graphics Productions.

Another content stack is a set of Russian lessons, written by Martin P. Rice, which uses the somewhat uneven Macintalk voice synthesizer. Sections on grammar, vocabulary, reading, and exercises will have you saying nyet to IBM's offer of...
SURE, you're going to love the new look of Sigma Designs' LaserView Display System.

But the real beauty is in how well it handles your desktop publishing, spreadsheets and word processing.

QUITE SIMPLY, LaserView offers the sharpest image anywhere: an eye-opening 1664 x 1200 (115 dpi) resolution for detail drawings, halftone images, or even 6-point type. And an additional resolution mode of 832 x 600 for text-based work (for the Macintosh II and SE).

So what you'll get is the performance of a workstation in a PC environment. A full 19" monitor that's easy on the eyes, thanks to its high contrast screen; easy on the body because of its tilt/swivel base; and easy to work with, since you can view anything from a two-page spread to an engineering drawing.

PUT IT ALL TOGETHER AND YOU HAVE A SINGLE MONITOR SOLUTION FOR IBM PCs and Macintosh II or SE. With full software compatibility. LaserView allows you to see your work the way it was meant to be seen. No matter what software you're using — Ventura Publisher, Pagemaker, Excel, or whatever.

WANT A CLOSER LOOK? Visit your nearest authorized Sigma Designs dealer. Or call Sigma Designs today at 415-770-0100.

Then see why the newest screen star isn't just another pretty face.
Objects in Space

If you need 3-D objects for animations, modeling, or illustrations, the Modeler by Mira Imaging may be for you. It works like this. You set any small, nonmetallic object atop a special platform and “draw” a grid on the surface of the object with a pencil-like probe. Then you touch the probe to as many intersecting points as necessary to define the shape. As you draw, more and more triangles appear on the Mac’s screen as points are connected to form a wire grid that approximates the object’s actual shape.

Once captured, this 3-D image can be moved and edited. For instance, ask for 3-D bezier curves, and you can push or pull on any point to modify the shape. And since you can view any curve from multiple angles, you can reshape the bow of a speedboat, for instance, while looking at cross-sectional, side, and bottom views.

The next step is to create a solid object by filling in all the triangles; then you use a smoothing tool to round out each flat triangle until the final image appears like a polished sculpture. Give the program another command and you can use the probe once again to view your creation from any angle and change the light source to emphasize important features. Once you’re done, you can print the image using both PICT and PostScript. Images created on a Mac II can be saved in color PICT format for enhancement with a color paint program.

Prices begin at $5000 for the complete system including a McDonnell Douglas 3-D digitizer. For more information, call Mira Imaging in Toronto at 416/489-9247.

Dan Donaldson uses Mira Imaging’s 3-D probe, which images and rotates three-dimensional shapes, to define the surface of a heart model to a nearby Macintosh.

This three-dimensional image is composed of filled-in triangles that can be smoothed.

Concepts that may be destined for future versions of HyperCard.

If you order a recently released $10 disk from Eastgate Systems, you’ll discover a relatively unknown hypertext program called HyperGate, which functions somewhat like HyperCard’s Browse mode. Once in HyperGate, you’ll view selected quotes from last year’s first-ever Hypertext Conference, which featured more than 180 presentations on the future of hypertext.

The disk, called the HyperText ’87 Digest, exemplifies many of the difficulties and promises of hypertext. Divided into Issues, Applications, Systems, and Contributors, the digest is hierarchically organized by buttons and is generously cross-referenced. The navigation aids keep the browser from getting lost in hyperspace, a common complaint about many hypertext systems. Although you can insert “bookmarks,” add entries to the index, and make margin notes, you cannot create your own links. Unfortunately, embedded links are few and far between.

Although hypertext has a reputation for being all things to all people, the picture that emerges from the digest conveys the seriousness of the enterprise as well as enthusiasm for real-world projects such as the CD ROM version of The Oxford English Dictionary. To order, write Eastgate Systems, P.O. Box 1307, Cambridge, MA 02238. —Richard Rawles

Macworld News
You are looking at the leading edge in desktop publishing design. The distinctive documents featured here were created using ordinary page layout software programs such as PageMaker™, ReadySetGo™ and X-Press™. What makes them extraordinary is the innovative use of PostScript™ clip art, fonts and clip photography by Image Club.

Take a look at the art room and dark room of the future. The ArtRoom™ is a CD-ROM disk which contains over 70 megabytes (125 disks) of Image Club clip art and fonts - our entire library on one convenient compact disk. The DarkRoom™ is our newest CD-ROM - A 200 megabyte stock photo library containing over 100 useful clip photographs ideal for any publishing project.

The ArtRoom and DarkRoom CD-ROM require a CD-ROM disk drive such as the new Apple CD SC, Toshiba 2100A, or NEC's CD-ROM drive.

The ArtRoom™ CD-ROM Features:
- Digit-Art™ - Over 1000 high resolution encapsulated PostScript clip art images
- HotType™ - The complete set of over 100 fonts
- Pages™ - Over 50 pages of publishing templates
- ArtRoom Retriever™ - A handy desk accessory that lets you quickly access any image with the push of a button

Font Juggler™ - Instantly installs fonts

Network Compatibility - Your entire office can access the world's grandest collection of clip art and fonts.

The DarkRoom™ CD-ROM Features:
- 400 photographs - in gray scale TIFF format
- Enlarge, reduce or crop without loss of quality
- Edit with Image Studio or Digital Darkroom

Image Club's famous clip art and font collections are available as separate floppy disk packages starting from $99 or the entire $2500 library on the ArtRoom CD-ROM disk for $999. The DarkRoom clip photography library is available only on CD for $499. If you would like to try Image Club's clip art, fonts and clip photography, ask for the State of the Art trial package. A sample of PostScript clip art, clip photos, a type face and our 1998 product catalog for only $59. To order the trial package or any Image Club product call 1-800-661-9410. For a dealer nearest you phone 800-535-0900, (800-874-6622 in Cal.) For more information call 403-250-1969.

Image Club Digit-Art volumes, HotType sets, The ArtRoom CD and the DarkRoom CD - creating extraordinary documents with mere ordinary programs.
**Fonts for Display**

Designers will soon have a new set of tools at their disposal when Letraset ships a program, called LetraStudio, that is specially designed to handle display type in ways never before possible on the Mac.

For example, after typing out an advertising slogan and changing the type size to anything from 1 to 999 points (nearly 14 inches), you can choose from among a number of tools that distort or give perspective to the type. Select a tool, and a box with "handles" surrounds the slogan. Now click on any handle, move it, and the type moves too; you can slant it, change its height, and even flip it back on itself until it's upside down. Before Letraset, many of these tools were available only on much more expensive systems.

Other features enable you to edit fonts down to 1 pixel at a time, select half-tone templates, adjust letter or word spacing, vary the weight of strokes, fill a font or shadow with colors, use any size font from any available font, no matter how many fonts are already in the System Folder.

Font Manager will ship by September, list at $100, and include four Compugraphic typefaces. LetraStudio will cost under $400, come with two typefaces, and ship by fall. For further information, call Letraset in Paramus, New Jersey, at 201/845-6100, and Compugraphic in Wilmington, Massachusetts, at 617/658-5600.

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**Color DTP with Video**

Imagine a client arriving with a videotape that contains color images that are to appear in a brochure. Using a special card in your Mac II, you capture the video images right off a VCR. (You can also use scanned color images from slides, photographs, paintings, or printed materials.)

You then open up PageMaker 3.0 to a previously prepared photographic quality. You see everything just as it will appear in print.

All this is now possible using a new 24-bit color FrameGrabber card from RasterOps. The FrameGrabber can store in memory any picture that appears in one of two formats: standard American television (NTSC) and red-green-blue (RGB).

Your 21-inch, high-resolution video screen is driven by the ColorBoard 244. This card supports monitors capable of resolving 1280 by 1024 pixels with 24-bit color using the Mac's standard full-size 72-dpi resolution. In addition, you can automatically pan across a much larger virtual screen: up to 2048 by 1024 pixels.

Should you want to try animations, the ColorBoard 244 includes an 8-bit Alpha channel that lets you move colored objects in front of a 24-bit image. Each movement can be recorded as a single frame and a series can be played back as a movie using a frame recorder.

As of press time, RasterOps was the only manufacturer delivering 24-bit color video cards to end-users. All other video cards for the Mac II are limited to 8 bits, or 256 colors. For further information, call RasterOps in Cupertino, California, at 408/446-4090.

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**HYPERCARD**

**Reports for HyperCard**

Although sensational for inputting and viewing different kinds of data, HyperCard can print information only in a card format as pictured on screen. What's missing is the ability to print a list of all names appearing on all cards, for example. Coming to the rescue is Activision's Reports, which turns HyperCard into a powerful relational database with full report-generation capabilities, including full-page printouts.

To get an idea of how Reports works, consider a check-writing program created in HyperCard. Without Reports, you can print only the stack's cards, which in this case are likely to be just a series of checks. But with Reports you can sort financial records alphabetically, numerically, or by date, using up to 15 selection criteria. For instance, you can select checks from a certain time period, or checks relating only to utility costs, car payments, or food expenses. Then you can arrange this information in columns, add a heading and footer, and print the sorted material.

(continues)
Mac II Workstation

Everyone who needs the power of the Mac II also needs the space that the Monitor and Processor occupy. With no desk space to organize work and lay out projects, the Mac II's effectiveness is limited. The Mac II Workstation takes a totally new approach to workstation ergonomics. It provides a unique arm suspension system and shelf area giving the operator the ultimate in adjustability and space savings.

$499.95

MacTilt SE

The Mac SE sitting on the desk leaves the screen too low for comfortable operation. MacTilt SE elevates the Mac 4" and provides 30° tilt and 360° rotation for better viewing and greater operator comfort.

$89.95

Mouse Cleaner 360°

By regularly cleaning your Mouse, you can eliminate sluggish operation and expensive repair bills. By removing the grime from the tracking rollers, free cursor movement is quickly restored. Compatible with Macintosh, IBM, and any Mouse using either a 7/8" or 1" positioning ball.

$16.95

MacTilt for Mac II & Large Screens

The same outstanding features and user benefits of the MacTilt SE are now available for your Large Screen Display or Mac II Monitor. Call for specific models.

$89.95 - $99.95

The Muzzle

The Muzzle protects your confidential files, documents, and software on your hard drive by preventing the Mac SE from being powered up. Models are also available which allow operation of the Mac SE, yet prevent access to the 3.5" disk drive for showroom and software demonstrations.

$69.95

Mac Extension Cables

Ergotron's Extension Cables allow the user to position the Monitor or Keyboard up to 8' away from the Macintosh SE or Mac II.

$30.00-$45.00

Ergotron Accessories are available at your local Apple Dealer or Distributor including Bonsu, Micro D, and Ingram. In Canada contact Sofcode.

Ergotron, Mac II Workstation, and MacTilt SE are registered trademarks of Ergotron, Inc. Mouse Cleaner 360° is a trademark of Ergotron, Inc.
Programming Secrets

If you want to learn how to program the Macintosh, the first thing you need to do is distinguish among the Scott K's. There's a Kronick (that's me), a Knaster (whose book is being reviewed here), and a Kamins (who wrote manuals for Apple). These three Scotts do little else but write about Macintosh programming.

The rules for distinguishing among the three Scotts are simple:

To begin learning how to program in Pascal or MPW assembly, you read Kronick. If you're already an accomplished programmer and you want to know why your programs still don't run worth a darn, you read Knaster. If you know everything in Kronick's and Knaster's books, you read Kamins to determine if you want a job writing code for Apple.


Don't be misled by the simple names of Knaster's books. They do not offer introductory material or language tutorials of any sort. This is precisely the value of Knaster's contribution: his books really help professional programmers solve problems specific to the Macintosh.

Knaster has lots of experience with third-party developers' questions, and he addresses issues confidently and fluidly. He offers sometimes irreverent explanations of design decisions, which makes reading the technical material more fun.

Final note: Addison-Wesley and Hayden Books/Howard W. Sams deserve mention for the high quality of their books. They use clean white paper, firm bindings, and sharp covers. They're a refreshing contrast to the companies that make ugly books with brownish paper rough enough to give splinters.—Scott Kronick

Making Slides Easy

Options that let the Mac user create business presentation slides are multiplying. Three new film recorders—Matrix Computer Graphics' ProColor, Mirus Corporation's FilmPrinter, and LaserGraphics' Personal Film Recorder—have joined Presentation Technologies' ImageMaker, which has had the Mac market largely to itself.

At 8000 lines per inch, ImageMaker has the highest degree of text resolution available because it uses fully formed letters, a technology similar to that used in daisy wheel printers. That technology also limits the product, as the Mac community is used to having WYSIWYG output without the daisy wheel's restrictions as to number, size, or style of fonts (each new size or style of font requires a new daisy wheel). Priced at less than $5000, ImageMaker works with most software and all Macs.

In the same price range is LaserGraphics' Personal Film Recorder, which works with any Mac and most software. It offers only 4000- and 2000-line resolution but greater speed. In addition to the standard 35mm film camera, there's a Polaroid camera available for proofing.

More expensive ($6995), but claiming a superior image, is Matrix's ProColor. This recorder should be available in September, for the Mac II only. It will be compatible with any software that supports the PICT file format and will have a resolution of 4096 lines.

Mirus's FilmPrinter, priced at about $6000, supports 35 LaserWriter fonts in any size and 16 million colors. Resolution is up to 8000 lines per inch.

For those who can't justify the cost of one of these units, a slide production service remains a viable alternative. For further information, call Presentation Technologies in Sunnyvale, California, at 408/749-1959; LaserGraphics in Irvine, California, at 714/660-9497; Matrix Computer Graphics in Orangeburg, New York, at 914/365-0190; and Mirus Corporation in Los Altos, California, at 415/949-5544.—Scott Beamer

Film recorders like LaserGraphics' PFR, Matrix's ProColor, and Presentation Technologies' ImageMaker Plus (left to right) bring new color capability to the Mac.

Macworld News
Even the most sophisticated desktop publishing system is incomplete without VeloBind.

Don't let your desktop publishing stop at the printer. Complete it with VeloBind, the only binding solution that transforms the promise of desktop publishing into reality. VeloBind provides the crucial, finishing touch to desktop publishing by turning any printed material into impressive, authoritative documents. Desktop publishing that increases your document's chances of being noticed, read, and accepted.

Only VeloBind allows you to "publish" your desktop publishing in a library-quality hard cover. In under a minute. Or choose from a wide variety of soft cover materials and colors. Even without a cover, desktop publishing bound with VeloBind looks more professional.

All on your desktop. VeloBind binding systems are compact, fast and easy to operate. Binding that complements your desktop publishing and creates a positive reflection on you. So do yourself — and your desktop publishing — justice. Visit your local computer or stationery store today or call us for more information. Or stop by your local copy shop and use their VeloBind system to complete your desktop publishing.

Because, after all, your desktop publishing is just a stack of paper until it's bound. With VeloBind.

VeloBind®
The desktop binding for desktop publishing.

650 Almanor Avenue, Sunnyvale, CA 94086
(800) 672-1822 (inside California)
(800) 538-1938 (outside California)
High-End CAD

Question: What CAD software has 150,000 users on Suns, Apollos, DECs, IBMs, and clones, and will soon run on a 4MB–8MB Macintosh II with full file-interchangeability among all? Answer: AutoCAD version 10, with 3-D wire-frame functionality, surface modeling, 41 third-party software products, and a price tag of $3000.

First shown publicly at A/E/C Systems '88 as a Mac port from the MS-DOS version, its user interface and operation will appeal mostly to present AutoCAD users. Unless the final released version becomes more Mac-like, Mac II users will find that it doesn't take advantage of Mac capabilities that they take for granted, including copying and pasting from the Clipboard into AutoCAD, multiple windows and multiple screens, Mac fonts and fill patterns, and on-screen icons instead of text menus. Autodesk says its first release of AutoCAD has some basic Mac functionality; next year's version will have much more Mac compatibility. No performance comparisons are available yet, but the Mac version—4MB RAM resident—may prove to be faster than the MS-DOS version, which requires frequent disk accesses.

AutoCAD's 3-D capabilities extend its 2-D drawing tools. When you have selected a construction plane in 3-D space, the AutoCAD drawing tools enable you to create 3-D wireframes on that plane. You can create 3-D surfaces by rotating simple or complex lines; by using 3-D polylines, 3-D meshes, tabulated cylinders, or ruled surfaces; or by defining Coon's surfaces (surface patches). Dynamic viewing allows rotation of a 3-D model in real time. Also available is a choice of parallel or perspective projection, as well as dynamic pan and zoom. You can display 3-D images from one of 16 viewpoints.

The Mac version of AutoCAD will support AutoLISP (a programming language for creating macros) without the severe 640K memory limitations of MS-DOS machines. Users will be able to customize menus to meet their needs, and objects in a drawing can be included in a database automatically.

The availability of AutoCAD and third-party products firmly establishes the Mac II as a viable CAD platform for even the most demanding user. It also opens up the Mac to a host of specialized applications previously unreachable with Mac mechanical and AEC CAD software. Such applications include parametric drafting, piping, chemical engineering, mapping, and new areas in computer-aided manufacturing and structural and civil engineering. Release 10 will output to both laser printers and industry-standard plotters.

Autodesk will have version 10 available by September this year. In a unique upgrade offer, the company may prompt a user exodus to Macs. When upgrading from version 9 for $250, current AutoCAD users will be given a choice of switching platforms and receiving the Macintosh version. For further information, call Autodesk in Sausalito, California, at 415/331-8093.—David Peltz

Macworld News: Readers' Views

This month's reader survey focuses on brands and storage capacities of hard disks. We received 537 responses from a survey sent to 1000 randomly selected Macworld readers. Of those, slightly over two-thirds,

68.7 percent, use a hard disk with their Mac.

Not surprisingly, the favorite brand was Apple, with 58 percent usage, followed by SuerMac and Jasmine with 9 and 7 percent, respectively.

The most popular drive size was 20 megabytes, 68 percent usage; 40MB drives scored 15 percent usage. Only 4 percent of the respondents preferred hard disks with less than 20MB. Respondents split about evenly between internal and external mounting (48 and 52 percent, respectively).

If you're curious about your fellow readers' Mac habits, send your suggested questions to News Editor, Macworld, 501 Second St., San Francisco, CA 94107.

![Image](https://via.placeholder.com/150)

Bill Atkinson (left) shares the second annual Andrew Fluegelman Award with PageMaker developers Jeremy Jaech, Ted Johnson, and Clyde McQueen (right). PCW Communications chair David Bunnell presents the award.

![Image](https://via.placeholder.com/150)

Apple takes the lion's share of the Macintosh hard-disk market, while other suppliers compete for what's left.

![Image](https://via.placeholder.com/150)
SOFTWARE

NCP denotes not copy-protected.
CP denotes copy-protected.

Aha Software ... NCP
"Draw it again, Sam" (paint program) ... $89.

Access Technology ... NCP
MindWrite (outlining & word processing) ... 95.

Adept Development ... NCP
Turbo Pascal (NCP) ... 65.

Affinity Microsystems ... NCP
Sidelick (includes MacPlan) ... 59.

Adobe Systems ... NCP
Adobe Illustrator ... 325.

Adobe Type Libraries ... call

Adobe Win. (Century Old Style, ITC Jester, Gothic, ITC Galliard) ... 269.

Affinity Microsystems ... NCP
Affiniti (DA file) ... 46.

Alley Software ... NCP
Tempo II (power user's macro utility) ... 89.

Allan Bonadio Associates ... NCP
Expressi (equation processor) ... 84.

AlssetValue II ... NCP
DiskExpress (maximize disk performance) ... 26.

Apple ... NCP
Font/DA Juggler Plus (w/sound utility) ... 32.

Atmel ... NCP
FON-Tastic Plus 2.0 (advanced font editor) ... 54.

Ashton-Tate ... NCP
FullPaint (expanded paint program) ... 69.

FullWrite (the wait is over!) ... 275.

dBASE Mac (relational, req. MacPlus) ... 295.

Berkeley System Design ... NCP
Stepping Out II (screen extender) ... 54.

Blyth ... NCP
Omnis 3 Plus/Express (database) ... 275.

Omnis 3 Plus/Express (2-5 users) ... 489.

Bogus Productions ... NCP
Studio Session (music creation) ... 49.

Country, Heavy Metal, or String Quartet ... 15.

Borland International ... NCP
Turbo Pascal (HFS compatible) ... 65.

Eureka: The Solver ... 129.

Reflex Plus (info management tool) ... 165.

BrainPower ... NCP
StatView (full-featured) ... 32.

StatView Plus (full-featured) ... 175.

DataScan (converts charts to num. data) ... 119.

DesignScope (electronic circuit design) ... 128.

Math/View Professional (num. analyses) ... 145.

Bravo Technologies ... NCP
MacCalc (easy to use spreadsheet) ... 79.

Bright Star Technology ... NCP
Alphabet Blocks (teaches phonetic sounds) ... 32.

Broderbund ... CP
Jam Session (create your own tunes) ... 30.

Print Shop (create cards and memos) ... 36.

Geometry or Physics ... 60.

CAMDE ... NCP
Nutri-Calc (diet & nutrition analysis) ... 39.

Nutri-Calc Plus (full-featured program) ... 175.

CasadyWare ... NCP
Fluent Fonts (two disk-set) ... 27.

Fluent Laser Fonts (vols. 1-18) ... each 45.

CE Software ... NCP
Calendar Maker (create custom calendars) ... 28.

Disktop (powerful DA Finder) ... 25.

Quickkeys (reduce mouse movements) ... 54.

Challenger Software ... NCP
Mac3D (3D graphics, CAD features) ... 119.

Chang Labs ... NCP
Rags-to-Riches 3 Pak (GL, AR, & AP) ... 269.

C.A.T. (contacts, activities, time) ... 239.

Inventory Control or Professional Billing ... 239.

Professional or Retail Business 3 Pak ... 359.

Cricket Software ... NCP
Pic-O-Graph (color on the Mac II) ... 105.

Cricket Graph (multiple windows) ... 119.

Cricket Draw (advanced draw capabilities) ... 169.

Cricket Presents (MacPlus, SE & II) ... $289.

DataViz ... NCP
MacLink Plus (transfer Mac/IBM data) ... 145.

Davidson ... CP
Math Blaster! (grades 1-6) ... 27.

Deneba Software ... NCP
Merriam-Webster's Thesaurus ... 36.

Comment (electronic Post-it notes) ... 54.

Canvas DA (contains 80% of Canvas) ... 54.

Canvas 1.0 (free upgrade to 2.0) ... 109.

Coach (interactive spell checker) ... 54.

Coach Professional ... 109.

Dow Jones ... CP
Desktop Express (documents via MCI mail) ... 95.

Dubl-Click Software ... NCP
Calculator Construction Set ... 36.

World Class Fonts (both volumes) ... 36.

WetPaint Clip Art (both volumes) ... 36.

Electronic Arts ... NCP
Thundert! (batteries included spell checker) ... 30.

Disk Tools Plus (8 DAs plus tools) ... 31.

Deluxe Music Construction Set ... 61.

Enzak-Hoshigumia USA ... NCP
MacCalligraphy (create unique designs) ... 109.

Japanese Clip Art ... call

Farralon Computing ... NCP
MacRecorder* Sound System ... 145.

Fifth Generation Systems ... NCP
Suitcase (font and DA utility) ... 37.

PowerStation (alternative to Finder) ... 37.

Fastback Tutor ... 54.

1st Byte ... CP
First Shapes, KidTalk, MathTalk Fractions, MathTalk, SmoothTalker, Speller Bee ... each 32.

Forthought ... NCP
Facetfinder 1.1 (information organizer) ... 35.

FileMaker 1.0 (custom design reports) ... 39.

Foundation Publishing ... NCP
Comic People (create your own characters) ... 25.

Comic Strip Factory (create cartoons) ... 45.

FWB Software ... NCP
Hard Disk Partition ... 45.

Hard Disk Util (program backup) ... 54.

Great Wave Software ... NCP
TimeMaster (learn about time, ages 4+) ... 22.

KidsTime (educational, ages 3-5) ... 26.

American Discovery (U.S. facts & fun) ... 39.

Crystal Paint (graphic symmetries) ... 41.

BrainPower ... NCP
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William Lombardo
Modelmaker & Illustrator
New York, NY

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- Does fast floppy duplication (formerly MacZAP)

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### Software Products

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<thead>
<tr>
<th>Software Company</th>
<th>Description</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>Symantec/Turner Hall</td>
<td>NCP</td>
<td>49.00</td>
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<tr>
<td>MacSOZ! (use w/Microsoft Excel)</td>
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<tr>
<td>Symmetry</td>
<td>NCP</td>
<td>39.00</td>
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<td>Acta (outline/writing desk accessory)</td>
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<tr>
<td>HyperDA (access HyperCard stacks)</td>
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<td>PictureBase (clip art manager, 512k)</td>
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<tr>
<td>3G Graphics</td>
<td>NCP</td>
<td>59.00</td>
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<tr>
<td>Images with Impact (PostScript™ clip art)</td>
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<tr>
<td>Telegraphics</td>
<td>NCP</td>
<td>98.00</td>
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<td>HyperTutor (HyperTutor tutorial)</td>
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<tr>
<td>Think Educational</td>
<td>CP</td>
<td>28.00</td>
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<tr>
<td>MacEdge II or Mind Over Mac</td>
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<tr>
<td>T/Maker</td>
<td>NCP</td>
<td>39.00</td>
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<tr>
<td>ClickArt Personal Graphics, Effects, Publications, Letters Vol. 1 or 2, Holidays, Business Images</td>
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<td>Christian Images</td>
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<td>Bombay, Plymouth, or Seville Laser font</td>
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<td>EPS Illustrations (over 3 Meg's worth)</td>
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<td>Write Now (word processor/spell checker)</td>
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<td>TOPS</td>
<td>CP</td>
<td>39.00</td>
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<td>TOPS Teleconnect (DINb or DDB)</td>
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<td>TOPS (file/server/LAN software)</td>
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<td>TOPS Repeater</td>
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<tr>
<td>Denena</td>
<td>NCP</td>
<td>109.00</td>
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<tr>
<td>Canvus—Incorporate object-oriented and bit-mapped graphics in the same layer. Buy now and get a free upgrade to version 2.0 (a $100 value)</td>
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<tr>
<td>Travelling Software</td>
<td>NCP</td>
<td>85.00</td>
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<tr>
<td>LAP-LINK Mac (connect Mac to IBM-PC)</td>
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<tr>
<td>True BASIC</td>
<td>NCP</td>
<td>59.00</td>
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<tr>
<td>LANGUAGE &amp; TOOLKITS</td>
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<tr>
<td>True BASIC (interpreter &amp; compiler)</td>
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<td>EDUCATIONAL SOFTWARE</td>
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<td>Algebra I or II, Pre-Calculus, Trigonometry, Discrete Math, Probability, Calculus, Arithmetic &amp; MacFunction</td>
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<td>TrueSTAT (statistics)</td>
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<tr>
<td>Unicorn</td>
<td>CP</td>
<td>27.00</td>
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<tr>
<td>Animal Kingdom (ages 6-12)</td>
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<tr>
<td>Math Wizard (math games, ages 5-10)</td>
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<td>Read A-Rama (reading, ages 5-8)</td>
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<tr>
<td>William &amp; Macias</td>
<td>NCP</td>
<td>29.00</td>
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<tr>
<td>DiskFinder (DA disk catalog)</td>
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<tr>
<td>myDiskLabeler w/Color (req. ImageWriter II)</td>
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<tr>
<td>WordPerfect Mac (word processor)</td>
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### Games

<table>
<thead>
<tr>
<th>Game Title</th>
<th>Price</th>
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<tbody>
<tr>
<td>Accolade</td>
<td>CP</td>
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<tr>
<td>Hardball (baseball simulation)</td>
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<tr>
<td>Activision</td>
<td>CP</td>
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<tr>
<td>Shanghai (Mah Jongg strategy)</td>
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<tr>
<td>Addison-Wesley</td>
<td>CP</td>
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<tr>
<td>Puppy Love (you and your dog will love it!)</td>
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<td>Avalon Hill</td>
<td>CP</td>
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<tr>
<td>MacPro Football (req. 1 Meg)</td>
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<td>Baudville</td>
<td>CP</td>
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<tr>
<td>Guitar Wizard (learning tool for guitar)</td>
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<tr>
<td>Red Bear's Rainy Day Games</td>
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<tr>
<td>Blue Chip</td>
<td>CP</td>
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<tr>
<td>Millionaire (stock market simulation)</td>
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<tr>
<td>Broderbund Software</td>
<td>CP</td>
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<tr>
<td>Lode Runner or Ultima III</td>
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<tr>
<td>Tool Shop (create working models)</td>
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<tr>
<td>Bullseye</td>
<td>CP</td>
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<tr>
<td>Ferrari Grand Prix or Folker TriPlane</td>
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<tr>
<td>Electronic Arts</td>
<td>CP</td>
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<tr>
<td>Skyloox, Pinball Construction Set</td>
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<tr>
<td>Dr. J vs Larry Bird</td>
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<tr>
<td>Ogre (tank simulation)</td>
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<tr>
<td>Patton vs Rommel or Scrabble</td>
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<td>Chessmaster 2000</td>
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<td>Epyx</td>
<td>CP</td>
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<td>Sub Battle Simulator (NCP)</td>
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<td>Winter Games (Olympic events)</td>
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<tr>
<td>Greene, Inc.</td>
<td>CP</td>
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<tr>
<td>Crystal Quest (top-rated color arcade)</td>
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<tr>
<td>Hayden Software</td>
<td>CP</td>
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<tr>
<td>Sargon III (9 levels of chess)</td>
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<tr>
<td>Infinity Software</td>
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<tr>
<td>Go or Grand Slam Tennis</td>
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<tr>
<td>Infocom</td>
<td>CP</td>
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<tr>
<td>Leather Goddesses, Bureaucracy, Borderzone, Lurking Horror</td>
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<tr>
<td>Beyond Zork</td>
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<tr>
<td>Classic Mystery Library: Moonmisi, Suspect, &amp; Witness</td>
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<tr>
<td>Personal Computer Peripherals</td>
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- Math Wizard (math games, ages 5-10)
- Read A-Rama (reading, ages 5-8)
- William & Macias
- DiskFinder (DA disk catalog)
- myDiskLabeler w/Color (req. ImageWriter II)
- WordPerfect Mac (word processor)
Get it tomorrow.

Lundeen & Associates ... NCP
WorksPlus Spell (spell checker for Works) ... $46.
WorksPlus Command (macros for Works) ... $60.
Macromind ... NCP
Videoworks II (animation tool) ... $118.
Videoworks II Accelerator or Driver for HyperCard ... $61.
MacroPac International ... NCP
101 Macros for Excel ... $44.
Manhattan Graphics ... NCP
Ready Set Show (presentations) ... $269.
MECA ... NCP
Managing Your Money (finance) ... $129.
Microlytics ... NCP
Word Finder (synonym finder) ... $35.
Gopher (text finder) ... $45.
Microseed Publishing ... NCP
Reduce fast & easy backup utility ... $65.
Microsoft ... NCP
Basic Instruction Chart 1.02 (42 chart styles, CP) ... $79.
Microsoft Write 1.0 (wspell checker) ... $113.
Multiplan 1.1 ... $119.
File 1.05 ... $119.

Microlytics ... NCP
Gopher—Where’s that letter? Which memo mentioned coffee breaks? Find them fast!
Gopher quickly searches all your text files for keywords & tells you what’s buried where $45.

Aba Software ... NCP
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Produce color separations or cell animation.
Includes graphic library ... $89.

Miles Computing ... NCP
Orchestra of Fonts Vol. 4 ... $125.
Mac the Ripper Vol. 3 (req. Paint program) ... $27.
Peoples, Places & Things Vol. 5 ... $27.
Mindscape ... NCP
The Perfect Score. SAT (CP) ... $46.
ComicWorks (create your own comics) ... $47.
GraphWorks (newsletters & posters) ... $84.
Monogram ... NCP
Car (home, small business) ... $81.
Business Sense (full-featured) ... $279.
Nantucket ... NCP
McMax (dBASE III compatible) ... $175.

Enzan-Hoshigumi ... NCP
MacCalligraphy—The cultural scripting of the East comes to your Mac. Helps you picture your words in a thousand ways. Includes Japanese clip-art ... $109.

Nashoba Systems ... NCP
FileMaker Plus (feature-packed database) ... $149.
Nolo Press ... NCP
WillMaker 3.0 (create your own will) ... $35.
North Edge Software ... NCP
Timeslips III (time & expense tracking) ... $119.
Odesta ... NCP
GeoQuery (geographical database) ... $299.
Double Helix II (relational, custom menus) ... $339.
Oidual Software ... NCP
DA-Switcher (limited desk accessories) ... $25.
Post ART (clip art, 3 disk set) ... $35.
IconIt! (create custom icon bars) ... $39.
FontShare (share PostScript fonts) ... $149.
Read-It-LS (OCR software for Thunderscan) ... $79.
Read-It-LS (300 dpi OCR software) ... $199.
OWL International ... NCP
Guides 2.0 (hyperlink, free-form info) ... $119.
Palamir ... NCP
MacType (typing instruction) ... $31.
inTalk (communication to emulation) ... $199.
Passport Designs ... CP
Mastertracks Jr. ... $109.
Mastertracks Pro (music editor) ... $259.
Peripherals Computers & Supplies ... NCP
KalediGraph (data analysis & graphics) ... $125.
VersaTerm (terminal emulator/comm.) ... $135.
VersaTerm-PRO (powerful terminal prog.) ... $199.
Personal Computer Peripherals ... NCP
HFS Backup ... $28.
Postcraft International ... NCP
Laser FX (PostScript fonts special effects) ... $115.
ProVUE Development ... NCP
OverVUE (power-packed database) ... $149.
Rubicon Publishing ... CP
Dinner At Eight-Encore Edition Bundle ... $51.
Satori ... NCP
BulkMailer 3.2 (mailing lists) ... $79.
BulkMailer Plus (up to 90,000 names) ... $195.
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Project Billing (architects to engineers) ... $439.
Sensible Software ... NCP
Sensible Grammar ... $55.
Silicon Beach Software ... NCP
Silicon Press (printer utility, 512k) ... $41.
World Builder (program creator) ... $41.
SuperPaint (advanced graphics program) ... $79.
Super3D (3D modeling & animation) ... $159.
Science Fiction Classics: Hitchhiker's, Planetfall, & A Mind Forever Voyaging... $36.
MacroMind ... NCP
MazeWares - (play via modem or network) ... 31.
Microsoft ... CP
Micro Sports ... NCP
Miles Computing ... CP
Mindscape ... CP
Mistaken - The Legacy of Siboot,
Crossword Magic, Balance of Power, Deja Vu,
Shadowgate, Uninvited... $35.
Apache Strike (3D helicopter action) ... $27.
Simon & Schuster ... CP
Star Trek—The Kobayashi Adventure ... 24.
Projenet Prophecy ... 24.
Sir-Tech ... CP
Mac Wizardry (high-rated fantasy) ... 35.
SPHERE, Inc. ... NCP
PT-109 (torpedo boat simulation) ... 26.
GATO ( submarine simulator) ... 26.
Orbin (space shuttle simulation) ... 26.
Falcon (F-16 flight simulation) ... 26.
XOR ... NCP
Pro Challenge (football) ... 30.
NFL Challenge (all-star game) ... 64.

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

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Norton ... lifetime

Abaton ... lifetime

ProPoint ADB for Mac SE or II ... 117.

Aster Engineering ... lifetime

Turbo Trackball (specify Mac)... 79.

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Mac 266 (MS-DOS on your Mac II) ... call

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Curtis Manufacturing ... lifetime

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Dove Computer ... 90 days

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SCSI Interface/Port ... 85.

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MacSnap 524S (512k to 1 Meg) ... 195.

MacSnap 524S (512E to 1 Meg w/SCSI) ... 219.

MacSnap 548E (512E to 2 Meg) ... 389.

MacSnap 548S (512E to 2 Meg w/SCSI) ... 389.

MacSnap 548S (512E to 2 Meg w/SCSI) ... 389.

MacSnap 25 (1 Meg to 2.5 Meg) ... call

MacSnap 25E (Mac SE to 2 Meg) ... 299.

MacSnap 45 (1 Meg to 2 Meg) ... call

MacSnap 85 (for Mac II, 0 to 8 Meg) ... call

MacSnap Plus 2 (MacPlus to 2 Meg) ... call

MacSnap Plus 2H (MacPlus to 2.5 Meg) ... call

MacSnap Plus 4H (Plus/I to 4 Meg) ... call

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Model MSE 2 (MSE 1 w/1 Meg) ... 779.

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Model MSE 4 (MSE 1 w/1 Meg & math co-processor) ... 975.

1024 Option (1 Meg accelerator or Mac II memory expansion) ... 269.

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Smartmodem 1200 ... 299.

Smartmodem 2400 ... 449.

MacPlus/SE 1200 or 2400 Package ... call

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Mousetrack Pocket (ADB) ... 8.

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- Verbatim 3½" DS/DD Disks (box of 10) ..... 19.
- MAXELL 3½" DS/DD Disks (box of 10) ..... 20.

### INFORMATION SERVICES

- Compuserve Information Service ..... 24.
- Grolier's Online Encyclopedia ..... 32.
- Compuserve Navigator ..... 45.

### DISKS

- Sony 3½" DS/DD Disks (box of 10) ..... 18.
- Fuji 3½" DS/DD Disks (box of 10) ..... 19.
- Verbatim 3½" DS/DD Disks (box of 10) ..... 19.
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### ACCESSORIES

- Computer Coverup External 800k Drive Cover ..... 4.
- ImageWriter II Cover ..... 8.
- MacPlus or Mac SE Cover Set ..... 10.
- Goldstein & Blair The Macintosh Bible (incl. 2 free updates) ..... 16.
- I/O Design ImageWare II (ImageWriter II carry case) ..... 49.
- Macinaware SE (Mac SE carry case) ..... 79.
- Kalmar Designs Teakwood Roll-top Case (holds 45 disks) ..... 14.
- Teakwood Roll-top Case (holds 90 disks) ..... 20.
- Teakwood Roll-top Case (holds 150 disks) ..... 27.
- Moustrak Available in a variety of colors. Moustrak Pad (standard 7" x 9") ..... 8.

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Macintosh Masterpieces

by Joe Matazzoni

When we mentioned in the announcement of Macworld's first annual art contest that slides of Mac-designed sculpture and mixed-media pieces would be acceptable, we were just shooting in the dark. We had no idea whether anyone was actually doing such things, we just hoped they were and wanted to let people know we were open to anything.

Well, people seem to have gotten the message. The hundreds of Mac Masters submissions that poured in from around the world showed that both the Macintosh and Mac users are living up to their reputations: the former as a powerful graphics machine, the latter as a creative band of boundary pushers. Not only did we receive mixed-media and sculptural submissions (witness the winning entry on the facing page), we got a number of works that defied even the broad categories we set up for the contest. How, for example, do you judge a giant soft sculpture with a Macintosh inside it? Is that computer art? Or which category does a Mac-machined aluminum time capsule belong in? For a while, every morning at Macworld was like Christmas, as each day's mail revealed a new haul of everything from fabric wall-hangings incorporating Mac graphics to clothes made from Mac-patterned material, handmade books, star charts, and musical scores. Finding new output methods for their graphics was one area where Mac artists displayed particular ingenuity; our collection included etchings, silk screens, digital photographs, lithographs, and other pieces made with completely new, hybrid techniques.

Evaluating this heterogeneous collection required a panel with experience in both the art world and the world of computers. Loren Carpenter, senior scientist at Pixar and a recognized authority on image processing and computer animation, was indispensable when it came to judging the more technically sophisticated submissions. Jack Davis, image editor for the Mac art journal Verbum, lent his knowledge of Macintosh graphics to the effort. On the purely artistic side, expert judgment was supplied by Sidra Stich, senior curator at the University Art Museum in Berkeley, California, and by Robert Johnson, curator of the Achenbach Foundation for Graphic Arts at the California Palace of the Legion of Honor, in San Francisco.

The judges selected winners in six of the eight contest categories. The winners will choose a software prize from a selection of graphics products donated by the contest's sponsors (see below). Two of the category winners also earned top honors. The grand-prize winner will receive a Mac II donated by Apple; a cash award of $2000 goes to the runner-up. We'll announce these two winners at the SIGGRAPH computer graphics conference this month in Atlanta; check Macworld News next month for the story.

This year's Macintosh Masters contest was made possible by support from the following companies: Adobe Systems, Aldus Corporation, Apple Computer, Cricket Software, Letraset USA, Microsoft Corporation, Silicon Beach Software, and SuperMac.
FINE ARTS

First Prize (A) Pacific Wave Sculpture When the Fortuny Museum in Venice, Italy, asked Los Angeles designer April Greiman to produce a sculpture for the museum's Pacific Wave Festival, a celebration of California graphic designers, Greiman turned to her Macintosh. Since she knew no Italian and the Venetian fabricator knew no English, all communication had to be visual. Greiman drew up the plans in MacDraw and FullPaint, digitized a scale model using MacVision, and then faxed the drawings and digitization to Italy. "When I arrived," she remembers, "there it was, waving at me, just as I'd imagined."
FINE ARTS
Honorable Mention (B) 
Boxicopia To create this 3-by-4-foot hang-
ing, Susan Migliore of Laguna Beach, Califor-
nia, used a color-xerox, heat-transfer process to
put MacPaint images onto painted and dyed
linen. To add dimen-
sion, she sewed the fab-
ric onto bent-wire
armatures. (C) Medi-
terranean Discourse
Michael Tidmus of Los
Angeles created this
collage from 4-bit gray-
scale scans that he ma-
nipulated in Image-
Studio, saved as TIFF
files, and then assem-
bled in PageMaker. (D)
Exposition Domin-
ique de Bardonnèche-
Berglund from MORGES,
Switzerland, created
the frames in this
PixelPaint image using
the Shape Burst tool.
(Not Shown) Chair Fac-
ing Blue Ocean Waves
Chiu-ping KU, Hong-
Kong.

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ILLUSTRATION

First Prize (A) Street Except for the Chieftain Safari Wagon, which he drew in Illustrator, Brooklyn's Bert Monroy created the image entirely in PixelPaint. The use of gradations throughout lends the image its richness.

Honorable Mention (B) Oni-men David Hastings of Seattle fashioned this mask in Aldus FreeHand. He based the design on the Kumadori style of makeup used in Kabuki theater. (C) Afternoon on Titan Ron Cobb of Santa Monica, California, painted this hypothetical landscape of Saturn's sixth moon primarily in PixelPaint's FatBits mode, for better control. The monochromatic palette centering on orange depicts Titan's perhaps romantic-looking but certainly lethal methane atmosphere. (D) Lance Jackson of Oakland, California, developed his distinctive style of Mac caricature working for the San Francisco Examiner. He drew this cartoon of Robin Williams in SuperPaint. (Not Shown) Rudolph Scott Baldwin, Los Angeles.
GRAPHIC DESIGN/PUBLISHING

First Prize (A) L'art offensif Alain Côté (creative director) and Yve Bernard (art director, designer, and illustrator) pulled out all the stops on this brochure for their Montreal design studio, Concept-Exclusif. On each page, Mac-typeset line art and type are layered in a complex collage with photography, pencil drawing, airbrush, stamped images, and spot varnishes. Placement and shape of the non-Mac elements were determined on the computer, as these laser-printed thumbnails show.

Honorable Mention (B) The Vessel Project Lyons, Colorado, engineer Dick Hodges describes his solid-aluminum vases/time capsules as “art objects combining sculpture, precision machine work, and Macintosh graphics... artifacts of the early computer age.” Designed in MacDraft and decorated with SuperPaint patterns, the vessels are machined according to instructions from control programs coded on the Mac. The prototype vessel didn’t fit into any of our categories, but the superior design of the documentation won a mention here. (C) Emanuel’s Manual of the Simple Life (Missing Books, London, 1987) Michael Green, who lives in Jerusalem, notes accurately that his laser-printed PageMaker meditation “doesn’t belong in any recognizable literary category.” The book does, however, deliver on the promise desktop publishing has always held out of making possible more experimental, personal works. (D) Two Lyric Pieces (Equinox Music, Manchester, Vermont, 1987) Bruce Hobson of Manchester Center, Vermont, used SuperGlue to transport the Deluxe Music Construction Set file of this original piano solo into Illustrator. There he added his own slurs and customized the stock symbols of Adobe’s Sonata music font. Other programs Hobson used include Fontographer, SuperPaint, Canvas, and PageMaker. (E) The Raven Tom Ahern of Warwick, Rhode Island, assembled scanned imagery with text in PageMaker to create this cover for a handmade book.
Your friend comes round in the middle of the Night. The darkest Night in living memory. And says, Come on Abe, let's go out and do something. So you ask her, Abe, what have you got in mind? I don’t know, she answers. I don’t know, I think I’m lost. Give me something to create and nurture with the sensitivity and the groundwork that Nature has at her command. I want to consider the Questions. I want to have a Coronation. There must be something here for us that nobody can deny. We have all this time behind us on how many forefathers and ancestors have we had in all! And how much have we received to pass on to our children?

- A Pig pen
- A Carrot
- A Silk purse
- A Sow's ear
- A Shin of shot silk
- A Final message

It's a tangled web that we weave.

ANIMATION
First Prize (A) Burnout
David Herrold of Greencastle, Indiana, based much of the action of this black-and-white animation on video sequences. Herrold used a Magic video digitizer to bring video segments frame-by-frame from the TV screen into the Mac, where he embellished them using 3-D and paint software. He then reassembled his work on movie film by shooting the 5½-minute piece's 5000 frames one at a time from the Mac screen.

Honorable Mention (B) Crew Emergency Return Vehicle Presentation
Chipp Walters and a team at Design Edge in Houston prepared this piece to show NASA the space station's escape vehicle in transport, storage, and deployment. The 3-D models were created in Super 3D.
3-D/IMAGE SYNTHESIS
First Prize (A) Southwest Meander Looking South Dan Spence of Fort Mitchell, Kentucky, uses three computers and his own imaging software to produce landscapes. On a graphics tablet he sketches an overhead view of a landscape, marking out any distinctive high and low points. An Apple III reads that drawing off an Inovion screen and translates it into elevation data. That data is then mixed with color information that keys elevations to specific shades, and a Mac II renders the final picture. Honorable Mention (B) Biff Brian E. Pinz rendered this playful image using a ray-trace program developed at the University of California at Santa Barbara. A digitized pattern was applied to Biff's doghouse to create the bark texture. (C) Random Peak Printmaker David C. Dickinson of Mount Morris, New York, used MacFractal to create the basic forms of this landscape. He then took the image into SuperPaint, where he edited it and manually produced four separations. A Canon color copier was used to combine the separations on rag paper. (Not shown) Ralph/chair 22 Young Harvill, Palo Alto, California, and Sean McKenna, San Francisco.

ARCHITECTURE
Honorable Mention Proposal for Transitional Shelter for Albuquerque’s Homeless Christopher Purvis of Santa Fe, New Mexico, completed the initial design work for this proposal in MacDraft. He drew the trees and other details in SuperPaint and made the 3-D views in MacModel. Purvis assembled the images in MacDraft, plotted the final picture, and added LaserWriter titles printed on sticky-back. After having that composite sepia-tone printed, he added color using chalk pastels. (Not Shown) Silvetti Darrell Fields, Arlington, Texas.
TECHNICAL ILLUSTRATION
First Prize (A) High Performance Michael Scaramozzino of Providence, Rhode Island, used Illustrator and a drawing tablet to create this smoothly realistic Lamborghini Countach.
Honorable Mention (B) 1859 Remington Army .44 Caliber Jim Mullen of Battle Creek, Michigan, drew the exploded view of this Civil War pistol to scale in Illustrator. He later created a shaded rendering (not shown) by assembling the visible parts of the gun on screen. (C) Abdominal Hysterectomy Bobby Pitts of Rochester, New York, began this illustration in ImageStudio, painting frehanded with the program's gray-scale editing tools. He saved the ImageStudio file in TIFF, then brought it into LaserPaint to add vector lines and text. (Not Shown) Canon EOS 650 Gunter Dunz-Wolff, Hamburg, West Germany.

INFORMATIONAL GRAPHICS
Honorable Mention World Watching Washington, D.C. USA Today has been a leader in the use of Macintosh news illustrations. Here Bill Baker, of Washington, D.C., has used MacDraw to help a curious nation visualize Reagan and Gorbachev's schedule during the event-filled days of their third summit meeting. (Not Shown) The Soft Benefits of Scanning Roger Sawhill, Atlanta.
“All the pictures which science now draws of nature and which alone seem capable of according with observational fact are mathematical pictures....”
—Sir James Hopwood Jeans, 1930

In the simplest sense, image processing means manipulating a picture—modifying, enhancing, or analyzing it. Adjusting the brightness on a television set is one type of image processing; by changing analog voltages, you alter the brightness of the picture displayed on the screen.

The Macintosh, however, manipulates digital information. To process Mac images, applications like ImageStudio or Digital Darkroom use mathematical formulas to manipulate the individual picture elements or pixels that make up each image.

Image processing differs from computer graphics. Whereas applications such as paint programs allow you to create computer-generated images from scratch, image processing lets you analyze and alter images from real-world sources such as video recorders, satellite cameras, and CAT scanners.

The Rudiments of Image Processing

To enter an image into the Mac, the image must be digitized by an input device, for example a scanner or a video camera. Scanners and digitizers break down a continuous-tone image, such as a photograph, into an array of pixels. With the appropriate scanner, each pixel can include gray-level or color information.

Digitizers take input from a video source like a camera. Pixelogic’s ProViz, Mass Micro’s ColorSpace, and Comtrex’s Imagizer are all examples of digitizers. Frame grabbers capture a single video frame from a camera or a video cassette recorder (VCR) in 1/30 second; video equipment displays data at 30 frames per second. Data Translation’s QuickCapture and ColorCapture and TrueVision’s NuVista board are examples of frame grabbers. Grabbed images can be stored, displayed, and processed on the Mac. Before being processed, the entire digitized image must be loaded into the Mac’s RAM or, if the Mac uses external hardware, into the memory of a dedicated image processor.

To display an image accurately while you work with it, you need a monitor that displays gray levels or color, particularly if you’re working with a continuous-tone image. Some operations manipulate pixels so
Brightness and Contrast
The original Thunderscan image imported into Digital Darkroom (left) is a little light, and there's also not enough contrast. You can adjust the brightness and contrast controls to enhance the image.

Histogram
A histogram map shows the distribution of gray levels in an image. For example, this histogram shows that most of the pixels in the image are medium gray, and that the whole image contains very few dark grays.

Equalized Histogram
By equalizing its histogram, you can expand an image's dynamic range so that it contains more dark gray areas. This enhances the image.

Pseudocolor
When you pseudocolor an image, you assign specific colors to gray values. Here, a gray-scale image on NuVision has been pseudocolored for red, green, and blue.

Posterization
Posterizing restricts the number of gray shades that can appear in an image. This image was posterized at three gray levels to see false contouring and better discrete colors. The original image contained 256 gray levels.

Two Approaches to Image Processing
Image processing is a very computation-intensive job. In fact, it was only recently that personal computers acquired the processing power necessary to perform the operations in seconds rather than minutes, or maybe even hours.

ImageStudio, Digital Darkroom, and MacImage are all examples of software-based image processing. They use the Mac's internal microprocessor, either the 68000 or 68020 chip, to process pixels.

Because the Mac's CPU limits how fast an image can be processed, complicated imaging functions benefit greatly from additional image processing hardware like Perceptics' NuVision.

Hardware-based image processors come in two forms—general purpose and dedicated. NuVision is an example of a general-purpose system (see “NuVision Hardware for Image Processing”). Apple and Pixar are also working on a product that will allow a Mac II running A/UX to control the Pixar Image Computer (PIC). The PIC is a powerful general-purpose image processor capable of three-dimensional or volume imaging. This process creates three-dimensional images from a series of two-dimensional pictures taken from different perspectives (see “3-D Imaging”).

Image Gallery
There are a variety of ways to modify an image—changing the brightness and contrast, enhancing the edges of objects, even removing unwanted visual defects. ImageStudio, Digital Darkroom, MacImage, and NuVision use preprogrammed algorithms, or mathematical formulas, to process images. Knowing what some common algorithms do can help you decide which operations to perform and which application you need (see “What You Can Do with an Image”).

A point-process algorithm operates on every pixel in the image area and uses each pixel's value to compute a new value for the pixel. If you're working with an image that is too dark and lacks contrast, you can lighten it and increase the contrast by applying a simple point process (see “Brightness and Contrast”).

You can also change an image's dynamic range by using a point process called histogram equalization,
NuVision Hardware for Image Processing

Perceptrics' NuVision is the first hardware image processor based on the Macintosh II. Instead of the Mac II's 68020 processor, NuVision uses specially designed image processing hardware to divert processing from the Mac's CPU.

The Mac II acts as the host computer and controls all of NuVision's image processing operations. The NuVision chassis connects to the Mac II and houses up to six add-in boards. NuVision allows these boards to work in parallel, processing images simultaneously.

In its basic configuration, NuVision comes with three boards: the Smart Memory board and the Video Interface board, both of which plug into the NuVision chassis, and a Mac II NuBus interface board, which plugs into the Mac II. The Video Interface board lets NuVision display images at up to 1280 by 1024 pixels and contains a frame grabber.

The Smart Memory board contains a digital signal processor (DSP) dedicated to image processing. Whereas the 68020 is a general-purpose processor, the DSP, a 40-megahertz Texas Instruments 32025, is specifically designed to process bits, or pixels. An optional board, the Pixel Processor, is designed for logic functions, such as the addition and subtraction of images.

Because NuVision operates on images stored in the Smart Memory board and each board contains its own dedicated processor, imaging operations run many times faster than on the Mac. For example, you can use a NuVision system equipped with three Smart Memory boards to process a color image; assigning one Smart Memory board to each color plane (red, green, and blue) reduces the overall processing time for the image.

You can alter an image's appearance, or locate specific information, with an area or spatial process. For example, you can sharpen an image using a filter (see "Sharpening"). Spatial processes change a pixel's original value using a formula based on that value and the values of neighboring pixels.

If you want to locate specific information—perhaps all the edges in an image—you can perform a classic spatial process called convolution (see "Filtering").

Subtraction

A frame process can highlight the differences between two very similar images. The reference image shows a nondefective printed circuit board. Using NuVision to subtract a camera image of the same portion of a "bad" printed circuit board highlights the differences as very light blotches.

Warping

Warping corrects for camera optics and also creates special effects. The balloons in this 24-bit color image have been magnified, rotated, and warped into a parallelogram using Perceptrics' NuVision.
Sharpening

ImageStudio’s Sharpen More filter can sharpen an image repeatedly. The image of a fire truck was sharpened twice.

Filtering

Filtering lets you find all the edges in an image. This image shows what happens when you locate edges of the fire truck. Digital Darkroom lets you choose the width of the line defining the edge; in this case, it’s a thick line.

3-D Imaging

Internal air passages used for cooling a turbine blade appear in blue in this volumetric reconstruction from computer tomography slices.

Convolution

The convolution operation replaces a pixel’s value with the sum of the values of that pixel and its neighbors, each weighted (multiplied) by a certain factor. The weighting factors are called the convolution kernel or filter. By using different weight factors in the filter, you can manipulate an image in many ways such as smoothing it (see “Convolution”) or even isolating all its vertical or horizontal lines.

With some images, convolution will not achieve the desired result. Say, for example, that you have an image of a black object on a dark background. Because there’s not enough contrast between the object and the background, you can’t tell them apart.

Like your eyes, convolution filters work better at discerning obvious contrasts, or spatial frequency changes, within an image. If an object and a background are too similar, a filter must process more pixels to tell them apart—the less difference in contrast, the larger the area the filter must process. The convolution process can, of course, reach the point of diminishing returns as far as processing time is concerned—especially if you’re working with a very large image.

Let’s say you have an image with low overall contrasts, as is the case with X-rays or CAT scans. If you have a dark object on a black background, you can isolate the object using an algorithm called a Fourier transform.

The Fourier transform identifies the actual color frequencies that occur in an image. By isolating an image’s color frequencies, you can perform point processes on selected frequencies. For example, to highlight an object in an X-ray, you can multiply the object’s frequency by a large number. Similarly, you can multi-

Fourier Transform

The 8-bit monochrome image in (a) shows a considerable amount of periodic noise, random aberrations in pixel values. By performing a Fourier transform, you can see the frequencies of the image data. Photo (b) shows the result of that transform. The periodic noise produces a set of frequency peaks in a circle around the center of the spectrum. You can suppress those frequency peaks by performing point processes or by filtering the peaks. After performing an inverse Fourier transform, the periodic noise disappears (c).
### What You Can Do with an Image

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<td>x</td>
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<td>Other features</td>
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</tbody>
</table>

| Exportable file formats | PICT II, TIFF, Digital Darkroom Archive, ThunderScan | RIFF, MacPaint, TIFF, encapsulated PostScript | PICT II, TIFF, MacPaint, RIFF, Datacopy IMG, LaserBits, PageMaker 1.2, encapsulated PostScript | TIFF |

¹Compiled from beta version.
²Extensive mapping capabilities with gamma functions, including edge detection and noise control.
³Add-on module.

*ply a specific frequency by zero to eliminate that frequency from an image (see "Fourier Transform").

To display an image with its modified frequency information, you apply an algorithm called an inverse Fourier transform.

**Everything in the Picture**

The advent of Mac-based image processing systems has brought everyone into the picture. The cost of admission is merely a Mac, a digitizer, and the required software. Even shareware image processing programs are appearing for the Mac II. And you don’t have to know how to program algorithms—just pull down a menu.

Once you start processing images, though, you’ll want to do more. In moving up to the high end, you’ll need a Mac II, more memory, a high-resolution scanner or digitizer that reads color or gray-scale information, and a monitor that displays that information. In some cases, you’ll even need dedicated image processing hardware.

To take full advantage of the Mac’s image processing capabilities, it helps to understand the underlying principles. When you do, you’re in a better position to evaluate the products now available for the Mac. Then you’ll know just what to do when you’re faced with an image.

The author would like to thank Andrew Wilson for his assistance with this article.

See Where to Buy for contact information.
Select a color screen for the Mac II. Compare 12 of the best.

Color Monitors Revisited

As I complete this review, I'm surrounded by more color monitors than I ever expect to see in one place again. Twelve, to be exact. If I plugged them in and turned them on all at the same time, I'd probably get a suntan or something. As it stands, I'm probably going to have to see my chiropractor; most of these monitors are 19-inch RGB models, and they are heavy.

To business. Since I reviewed color monitors for the Mac II last December ("Looking through the Mac II Kaleidoscope"), a number of new or improved ones have come on the market. Likewise, some of the existing video cards...
Comparing Color Monitors

<table>
<thead>
<tr>
<th>Monitor Model</th>
<th>Price</th>
<th>Size</th>
<th>Display Area</th>
<th>Maximum Resolution</th>
<th>Resolution Used</th>
<th>Dots per Inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>AppleColor High-Resolution RGB Monitor</td>
<td>$999</td>
<td>13&quot;</td>
<td>255mm × 176mm</td>
<td>640 × 480</td>
<td>640 × 480</td>
<td>70</td>
</tr>
<tr>
<td>Conrac Model 7250</td>
<td>$2995</td>
<td>19&quot;</td>
<td>360mm × 270mm</td>
<td>1024 × 1024</td>
<td>1024 × 1024</td>
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<tr>
<td>Conrac Model 7351</td>
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<td>19&quot;</td>
<td>396mm × 297mm</td>
<td>1024 × 1024</td>
<td>1024 × 768</td>
<td>69</td>
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<tr>
<td>Electrohome EGM 1910</td>
<td>$2995</td>
<td>19&quot;</td>
<td>350mm × 260mm</td>
<td>n/s</td>
<td>n/s</td>
<td>46</td>
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<tr>
<td>Electrohome EGM 1912</td>
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<td>19&quot;</td>
<td>350mm × 260mm</td>
<td>n/s</td>
<td>n/s</td>
<td>46</td>
</tr>
<tr>
<td>Nanao Flexscan 8060-85</td>
<td>$919</td>
<td>14&quot;</td>
<td>250mm × 167mm</td>
<td>930 × 625</td>
<td>640 × 480</td>
<td>80</td>
</tr>
<tr>
<td>Princeton’s Ultrasync</td>
<td>$849</td>
<td>12&quot;</td>
<td>215mm × 160mm</td>
<td>800 × 600</td>
<td>640 × 480</td>
<td>73</td>
</tr>
<tr>
<td>Sony GDM-1602</td>
<td>$2495</td>
<td>16&quot;</td>
<td>295mm × 221mm</td>
<td>1024 × 768</td>
<td>1024 × 768</td>
<td>84</td>
</tr>
<tr>
<td>Sony GDM-1952</td>
<td>$3695</td>
<td>19&quot;</td>
<td>360mm × 270mm</td>
<td>1024 × 768</td>
<td>1024 × 768</td>
<td>72</td>
</tr>
<tr>
<td>Taxan MultiVision 770 Plus</td>
<td>$915</td>
<td>13&quot;</td>
<td>252mm × 185mm</td>
<td>n/s</td>
<td>640 × 480</td>
<td>69</td>
</tr>
</tbody>
</table>

n/s = not specified

RasterOps price $4395 with Spectrum/8 or PCPC card.

RasterOps price $5795 with Spectrum/8, $5295 with PCPC card.

have been upgraded, and new ones have appeared. Most exciting is the release—well, it’s still in beta as I write this, but it’s beta 0.95—of a 24-bits-per-pixel color video card for the Mac II.

AppleColor Replacements

Several of the monitors I received are intended to replace the AppleColor High-Resolution RGB Monitor. They include the Nanao Flexscan 8060-85, Princeton Graphics Systems’ Ultrasync, and the Taxan MultiVision 770 Plus.

With a sense of déjà vu, I must announce that the AppleColor is the best of the small RGB monitors I looked at. It has the crispest display, the most vivid color, and no distortions. The only apparent flaw (for those bothered by such things) is the almost invisible hairline across the screen two-thirds of the way down, caused by a wire that supports the Trinitron mask. Some folks are bothered by the line and by the rather startling noise the machine makes when you power it up; I’ve long since ceased to notice either.

Second place goes to the Nanao Flexscan. I wasn’t too impressed with its display at first, but with some fine adjustments I was able to center the image and display true circles and squares with equal height and width, an indicator of the monitor’s 1:1 pixel aspect ratio (the ratio of pixel height to width). Also, by measuring on-screen images with a flexible plastic ruler, I determined that the Nanao monitor displays objects at their actual size—that is, an on-screen ruler’s measurements are accurate according to a real-life ruler.

The Nanao’s colors are nice, though a bit paler than the AppleColor’s. Text is crisp and firm. There is some bowing of the image, bending in on the left and out on the right, but nothing critical. The monitor itself comes with plenty of controls and adjustment points.

In the front it has knobs for horizontal size, vertical size, display color, contrast, brightness, and power. In the back are knobs for vertical position and horizontal position. The monitor comes mounted on a tilt/swivel base, and one of the knobs in front lets you switch between amber, monochrome, and color displays. As with all the replacement monitors, you can switch between analog RGB (the standard for Mac II color video cards) and TTL-level inputs, allowing you to use the display with a number of IBM-compatible video cards.

Princeton’s Ultrasync is right up there, too, though I’d probably choose the Nanao over it. The Ultrasync has no visual distortions, however, the Mac desktop background behind an open window appears slightly darker than on the AppleColor. The image isn’t as sharp as on the Nanao monitor, but the colors are brighter. Knobs in the back enable you to adjust vertical and horizontal size and position. You can display true circles and squares, but the image is slightly smaller than real life. The power switch is on the right side; a switch labeled “Text” allows you to switch between regular, blue, amber, and green displays. The monitor itself is compact, light, and comes on a tilt/swivel base.

The Taxan MultiVision 770 Plus comes in right behind the other two. The MultiVision’s display isn’t as crisp; it’s a bit fuzzy and washed out. This seems to be the same model I reviewed in the December article and it has the same video artifact: a green line in the bottom-left corner of the screen. Colors bleed slightly along the top and left edges. The monitor displays objects in perfect proportion, though the images are slightly larger than real life due to its 69-dots-per-inch (dpi) resolution.

19-Inch AppleColor Replacement Monitors

Three of the replacement monitors are actually 19-inch CRTs that plug into the Apple Mac II Video Card. The result is a greatly enlarged display, typically
<table>
<thead>
<tr>
<th>Dot Pitch</th>
<th>Vertical Scan</th>
<th>Horizontal Scan</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25mm</td>
<td>66.7 Hz</td>
<td>35.0 kHz</td>
<td>analog</td>
</tr>
<tr>
<td>0.31mm</td>
<td>48–60 Hz</td>
<td>15.75–37 kHz</td>
<td>TTL/analogue</td>
</tr>
<tr>
<td>0.34mm</td>
<td>47–63 Hz</td>
<td>45–67 kHz</td>
<td>analog</td>
</tr>
<tr>
<td>n/s</td>
<td>47–85 Hz</td>
<td>15–34 kHz</td>
<td>TTL/analogue</td>
</tr>
<tr>
<td>n/s</td>
<td>47–85 Hz</td>
<td>15–34 kHz</td>
<td>TTL/analogue</td>
</tr>
<tr>
<td>0.28mm</td>
<td>50–80 Hz</td>
<td>15.7–35 kHz</td>
<td>TTL/analogue</td>
</tr>
<tr>
<td>0.28mm</td>
<td>45–120 Hz</td>
<td>15–35 kHz</td>
<td>TTL/analogue</td>
</tr>
<tr>
<td>0.26mm</td>
<td>60 Hz</td>
<td>48.8 kHz</td>
<td>analog</td>
</tr>
<tr>
<td>0.31mm</td>
<td>60 Hz</td>
<td>48.8 kHz</td>
<td>analog</td>
</tr>
<tr>
<td>0.31mm</td>
<td>50–90 Hz</td>
<td>15–34 kHz</td>
<td>TTL/analogue</td>
</tr>
</tbody>
</table>

1. The Taxan MultiVision is a bit fuzzier than the other AppleColor replacements. Images are slightly larger than real life.

2. The Nanao Flexscan finished second only to the AppleColor monitor. It displays objects at actual size with a 1:1 pixel aspect ratio.

3. The Princeton UltraSync's colors are brighter than the Nanao's, but the images are not as sharp and are slightly smaller than real life.
1. RasterOps's 19-inch Sony monitor with the ColorBoard 104, the only 24-bit color system available today.

2. The PCPC II card driving a 19-inch Sony monitor provides bold colors and crisp text in a high-resolution 8-bit color display.

3. SuperMac's Spectrum/8 (with 19-inch Sony monitor) supports 2, 4, 16, or 256 colors and is configurable for most monitors.

Two of the monitors come from Electrohome, the 1910 and the 1912. Both are 19-inch RGB monitors that plug into a Mac II Video Card (or equivalent). They have a power switch on the front along with brightness and contrast knobs. In the back are a degaussing switch for clearing the residual magnetic field that builds up, a switch for selecting analog RGB or TTL inputs, and knobs to adjust vertical and horizontal position and size. When the screen is adjusted for proper height and width, it displays objects about 1.5 times larger than real life. The displays are crisp, focused, with no real distortion (though there is some apparent bowing across the top, due to the curvature of the CRT). The Electrohome's display quality is better than half again as large as an AppleColor monitor's.
any of the other 13-inch monitors' above, though the gray background does have a brown tint to it, especially on the 1912.

The difference between the 1910 and 1912 is the phosphor used: a long-persistence phosphor on the 1912, and a short-persistence one on the 1910. I prefer the 1910: the colors are bolder, the phosphor has less of a brown tint, and there's no image persistence during animation. For example, when I ran an animation from Beyond Dark Castle, image tracing was apparent (if not bothersome) on the 1912, but was nonexistent on the 1910. Either monitor would make an excellent choice for trade shows, classrooms, and people with diminished visual acuity.

The third 19-inch monitor, the 7250, came from Conrac. I wasn't terribly impressed with the display at first: it was rather washed out, reminiscent of an overhead projector. After the recommended 30-minute warm-up period, the display improves, but not all that much, and it is never anywhere close to the quality of either Electrohome monitor. The aspect ratio is close to (but not exactly) 1:1, and the monitor displays images about 1.6 times larger than real life. The Conrac 7250 has three controls on the front: contrast, brightness, and a degaussing button. The contrast control can make text look crisp, but usually at the cost of color boldness. The power switch is half-hidden (literally) in the back; the usual control for switching between analog RGB and TTL inputs is back there as well.

Higher-Resolution Monitors
I received only one large screen add-on monitor designed for a video board producing more dots (higher resolution) than the Mac II Video Card. That was the Conrac 7351, a 19-inch analog RGB monitor. Like its cousin above, it has a 30-minute warm-up time that doesn't really improve the display much. It has the same rather washed-out color as the 7250 and doesn't really compare with the other higher-resolution monitors—which were all Sony Trinitrons.

To be exact, I received three Sony GDM 1952 19-inch monitors (with the PCPC, RasterOps, and SuperMac video cards) and one Sony GDM 1602 16-inch monitor (from SuperMac). They are all much better than the Conrac 7351; in fact, they are better than all but the AppleColor monitor (which, of course, only comes in a 13-inch model). The actual visual quality varies somewhat between the video cards—more on that in a minute—but in all cases, the displays are crisp, clean, and steady. Objects displayed on the 16-inch Sony are about 0.8 times their real-life size. The 16-inch Sony has an aspect ratio of 1:1:1, making the text look slightly taller than normal, while the 19-inch monitors all have aspect ratios of 1:1. All four Sony units have five controls on the front: vertical and horizontal convergence, vertical centering, contrast, and power. Finally, all four Sony monitors share two minor visual flaws: two very thin, visible mask wires cross the screen (one-third and two-thirds of the way down); and a faint, dark-and-light vertical banding crosses the standard alternating black-and-white (dithered) desktop background, but the banding doesn't appear over images, windows, text, and so forth.

8-Bit Color Video Cards
Of the four video cards I received, two were repeats from last December: the PCPC II and the SuperMac Spectrum/8. Both come with 19-inch Sony monitors. SuperMac also sent the 16-inch Sony, which it offers as an option.

The PCPC II hasn't changed much since I last reviewed it. It still gives a nice display, with few video problems—just some slight color bleeding along the upper right edge. You can set the board for 2 colors (black and white) or 256 colors. Display resolution is 1024 by 768 pixels, or exactly four times the size of the Macintosh SE display. Colors are bold, text is crisp—it all works just fine.

The SuperMac Spectrum/8 has improved significantly since I last looked at it. Many changes that had then been recently proposed have been implemented.

<table>
<thead>
<tr>
<th>Video Card</th>
<th>Price</th>
<th>Resolution</th>
<th>Colors</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macintosh II 4-bit Video Card</td>
<td>$499</td>
<td>640 x 480</td>
<td>2, 4, 16</td>
<td>can be expanded to 8 bits (256 colors)</td>
</tr>
<tr>
<td>Macintosh II 8-bit Video Card</td>
<td>$648</td>
<td>640 x 480</td>
<td>2, 4, 16, 256</td>
<td></td>
</tr>
<tr>
<td>PCPC II Graphics System</td>
<td>$1795</td>
<td>1024 x 768</td>
<td>256</td>
<td>software control of 24-bit (16 million color) mode</td>
</tr>
<tr>
<td>RasterOps ColorBoard 64</td>
<td>$2395</td>
<td>640 x 480</td>
<td>256, 16 million</td>
<td>software control of 24-bit (16 million color) mode</td>
</tr>
<tr>
<td>RasterOps ColorBoard 104</td>
<td>$3195</td>
<td>1024 x 768</td>
<td>256, 16 million</td>
<td>comes configured for 1024 x 768 display, can support additional resolutions by replacing oscillator chip</td>
</tr>
<tr>
<td>SuperMac Spectrum/8 Video Board</td>
<td>$1595</td>
<td>1024 x 768</td>
<td>2, 4, 16, 256</td>
<td>and selecting resolution via control panel</td>
</tr>
</tbody>
</table>
It supports 2, 4, 16, or 256 colors, in a 1024-by-768-pixel display. By changing the oscillator on the card and reconfiguring the card via the Control Panel, you can drive other monitors, including the AppleColor monitors that synchronize to multiple horizontal scan rates, the NTSC RGB monitors used in the U.S. and Japanese television industry, and the PAL RGB monitors used in Western Europe. (Users interested in video recording will be interested in the last two.) You can even program the card to handle just about any other monitor, if you obtain the proper oscillator and build your own cable. The Spectrum/8 with the Sony 19-inch monitor is the best of the card-monitor combinations I reviewed, except for the Spectrum/8 with the AppleColor monitor, and the Spectrum/8 plus the Sony 16-inch is even crisper and brighter than the Apple. Documentation is also excellent, explaining how to set up a system and how to configure the Spectrum/8 for different monitors. On top of all that, SuperMac throws in a copy of PixelPaint, a nifty paint program that lets you make use of those 256 colors.

16 Million Colors
The other two cards, the RasterOps ColorBoard 64 and ColorBoard 104, are brand new; in fact, I received beta versions (0.95) of the cards and accompanying software. The ColorBoard 64 supports the AppleColor monitor (and replacements), generating a 24-bits-per-pixel display with a 640-by-480-pixel resolution. The ColorBoard 104 supports large-screen monitors such as the Sony 19-inch, Sony 16-inch, and Conrac 7351, generating a 24-bits-per-pixel display with 1024-by-768-pixel resolution. I hooked up all monitors to one card or the other; there were no problems with any of them (for more information on the ColorBoard 104, see Reviews in this issue).

It is, of course, exaggerating to say you can display 16 million colors at once; since the large screen contains only 786,432 pixels, that’s how many colors you can display at a time. Even so, the images that come out of this system are incredible. The folks at RasterOps sent along a demo program that lets you create random images and make color separations of them. They also sent (in Scrapbook form) several 24-bit digitized images that you can paste into the demo program and display.

Even more amazing is the fact that you can run the Finder (and MultiFinder), as well as normal applications, under 24-bit mode. Things slow down a bit, since so much more drawing has to take place, and none of the existing color applications except LaserPaint currently takes advantage of 24-bit color. I tried using existing color software, however, while in 24-bit mode; most of it seemed to work just fine—sometimes perhaps more slowly. The only problem I had was with PixelPaint, but my version of PixelPaint was specific to the SuperMac Spectrum/8 board, so even that was excusable.
3. The Conrac 7250 displays images at about $1/2$ times actual size. The colors are reminiscent of an overhead projector.

4. The Conrac 7351 is a higher-resolution version of the 7250, with many of the same color attributes.

You can use the board as a regular 256-color board; in fact, that's the mode it comes up in whenever you boot or restart. You select the RasterOps option in the Control Panel to invoke 24-bit mode. This was still somewhat inconsistent in the version I got, but version 1.0 should allow you to switch between 8 and 24 bits.

This obviously is not a video board for everyone, but at only $2595 for the ColorBoard 64 and $3195 for the 104, it's pretty cheap for what it does. Of course, you still have to buy a monitor (preferably a Sony), but you end up with a system that a year or two ago would have cost five to ten times as much.

**Color Picks**

My current conclusions sound a lot like the ones I reached the last time I reviewed color monitors: the AppleColor monitor is the best 640 by 480 display; the Sony 19-inch (or, if you don't mind small text, the Sony 16-inch) is the best 1024 by 768 display; and the SuperMac Spectrum is the best 8-bit video card. However, the Electrohome 1910 is a great enlarged display for those of you who need one, and for you power users the RasterOps ColorBoards are definitely worth looking at.

See *Where to Buy* for contact information.

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Staying Alive

Well, you heard the news a few months ago, and you knew it was all over. Apple cut the list price of the Macintosh Plus down to $1799, a clear sign that the Plus's days are numbered. Or are they? It may just be that Apple sees the burgeoning home market for cheap PC clones and wants to get a share of that. In either case, the Mac Plus, once the flagship (and the savior) of the Macintosh product line, has become the low-end product, a poor—or at least inexpensive—cousin to the Mac SE, the Mac II, and whatever else Apple might bring out in the near future.

The Mac Plus is threatened with becoming a dead-end product. The Mac SE has far more in common with the Mac II than with the Plus, and those first two are what developers are focusing on. Many third-party products now divide Macs into two groups: the 128K, 512K, 512KE, and Plus; and the SE and II. And we all know what happened to the 128K and 512K, don't we?

Not to worry. Your Mac Plus isn't going to break down overnight; it's served you just fine up till now, and it's not going to stop working just because of its changing market position. In fact, if Apple lowers the price enough, it may sell very well in some new markets, such as education and home.

Most important, don't think you're stuck with a dead-end system. While the Mac Plus wasn't designed for expansion, it can be expanded nevertheless. And I'm going to show you how to do it. I'm going to take a Mac Plus and give it a face-lift of sorts. And by the end of the article, you won't feel bad at all.

First Things First

Get a hard disk. Seriously. Or, in this case, Cirrus-ly. La Cie sent us not one, but two of their Cirrus hard disk drives, one 40MB and one 60MB. These are small, slick units that sit by the side of a Mac Plus. They're about the same depth as the Plus, half the height, and two inches wide. You can stack them horizontally or vertically, they don't make much noise, and they're fast. If this were a formal review of hard

by Bruce F. Webster
Improving on the Basics

DataDesk's Mac-101 keyboard and MSC's A+ mouse can improve responsiveness tremendously. If you don't already own one, a hard disk drive (like the Cirrus 40MB and 60MB units shown here) is the best investment you can make to revitalize the Plus's performance.

Add on to boost performance and extend the life of the Mac Plus
disks, we'd list two dozen of them, with cost, capacity, features, and access times. But it's not, so we'll just say that the Cirrus is fast enough for all practical purposes, and it beats the heck out of working with floppies.

By the way, you can hook up the two Cirrus hard disks—or, for that matter, any two SCSI drives—to the Mac Plus at the same time. In the case of the Cirrus drives, you must open up the cabinet of one disk, move two jumpers, and then close the cabinet back up. That changes the SCSI ID of that hard disk from 1 to 2. Careful closing the cabinet, though; I had some difficulty stuffing all the wires back inside.

The result is worth it: 100MB of online storage, easily accessible. The Cirrus drives come with volume-management and remote-disk-serving software (called Sil­

verServer) that makes it easy to organize that space into manageable chunks. Or, if you want, you can set up the two drives to look like a single volume. Cost of the drives: $739 for the 40MB Cirrus, $839 for the 60MB.

Expand Memory
Next thing you need is more memory. That way, when your friends start dropping comments about having 2MB or 4MB on their SEs (or even more on their IIs), you can casually yawn and say, "Yeah, I really like having 4MB on my Mac Plus."

Of course, it isn't going to come cheap. Thanks to our government's efforts to protect the American semiconductor industry, RAM prices—after a steady decline for years—are now on the upswing. The strength of the yen doesn't help, either. You can expect to pay anywhere from $1200 to $2400 for 4 Single Inline Memory Modules (SIMMs), each containing 1MB of RAM. They plug into the SIMM sockets on the Mac Plus system board. Instructions for adding RAM to the Mac can be found in the May 1988 issue of Macworld ("Installing Memory"), while a comprehensive listing of companies selling RAM can be found in the February 1988 issue ("New Life for an Old Mac").

In this case, we went with Apple's product. We got two packages, each containing two 1MB SIMMs. Installation required a specialized Mac opener and a bit of caution, but otherwise went well. Cost: $849 per 2MB, or $1698 altogether. Note that if you're getting an accelerator board, however, you may not need (or be able to use) the extra memory on the Mac Plus.
system board. Be sure to check this out with your dealer.

**Trade In Your Keyboard**

After three years of keyboards with no function or cursor keys, Apple came out with not one but two honest-to-goodness professional keyboards. That's the good news. The bad news is that they only work on (you guessed it) the Mac SE and the Mac II. Your Mac Plus is stuck with that plain ol' Macintosh keyboard.

Or is it? One alternative from Olduvai, AdBridge, lets you attach keyboards for the SE and II, or for that matter any Apple Desktop Bus device, to the Plus. Alternatively, the folks at DataDesk International have a keyboard for the Mac Plus that puts either of Apple's new offerings to shame. The Mac-101 Keyboard sports 101 keys, including 15 function keys, a full numeric keypad that looks amazingly like a PC's, a separate set of cursor keys that actually work, and a number of special-purpose keys. It doesn't, however, have a Ctrl key, though one presumes the SE/II model does. (Yes, there is a model for the SE and II.)

The keyboard has a nice feel to it. I always thought I liked my keys a bit bouncier, but I seem to type faster on the Mac-101 than on the regular Mac Plus keyboard. More important, though, is that the Mac-101 supports keyboard macros. It comes with several predefined macro files, including one for Microsoft Word 3.0, and an overlay template for the function keys. The keyboard also has a desk accessory that lets you create your own keyboard macros. In other words, you can map a sequence of characters, as well as window commands, to a single key. The Mac-101 comes with excellent documentation (some 50 pages' worth) telling you how to get the most out of the keyboard. I may get one of these for the Mac II. Cost of the Mac-101 (for all Mac versions): $169.95.

**Get a Faster Mouse**

Here's a way to show up those upper-class-Mac snobs. Throw away your old mechanical Apple mouse and get an optical one. This gadget works by shining light onto a pad containing a grid pattern and reading the reflections. The bad news is that an optical mouse works only on a special precision pad. The good news is that an optical mouse moves and handles a lot smoother than the usual mouse. It's also very easy to make fine movements—especially handy when drawing. And you don't have to open it up and clean the gunk off the rollers every month or so.

The optical mouse I tried is the A+ Mouse from MSC Technologies. No real installation: just plug it into the regular mouse port, put it on its pad, and you're ready to go. Cost of the A+ Mouse: $99. If your SE and II friends get jealous, they can buy one, too, but it'll cost them extra: $129 for the A+ ADB Mouse.

**Add On or Trade Up**

So, here we are with the Mac Plus. It now has 4MB of RAM, somewhere from 40MB to 100MB of hard disk storage, a full-size keyboard (complete with macro facilities), and an optical mouse. This is a system that will stay productive for a long time. Still, you might want something more, something with oompb. And so you opt to get an accelerator board for your Plus.

This is a major upgrade and not without pitfalls. There are significant compatibility problems with 68020-based accelerators—just as there are with the Mac II—though the compatibility problems are slowly being resolved. More important, installing an accelerator means messing around with the Mac Plus system board. Yeah, you had to do that for the memory upgrade, but that was a breeze compared to this. You may want to have a dealer do it, or possibly even the firm that makes the upgrade. (I chose to live dangerously and do it myself.)

This is also the point to stop and ask yourself about buying a Mac II. TEK Computer in San Francisco is currently selling a Mac II with a monochrome monitor, Apple video card, standard keyboard, 1MB of RAM, and a 40MB hard disk, for under $4000. Given the upgrade prices we're
looking at, especially for accelerators, you might be better off selling the Mac Plus and buying a Mac II. However, assuming you want to upgrade the Plus, let’s add an accelerator.

Boost Performance

An accelerator board gives the Mac Plus a new central processing unit (CPU). Typically, it’s a 68020 processor, sometimes with a 68881 math coprocessor, the same duo found in the Mac II. A few accelerators simply offer the same 68000 processor as the Mac Plus, but running at a higher clock speed—sort of like playing LPs at 78 rpm instead of 33⅓. When choosing an accelerator, look carefully at the various features and options: the processor, the clock speed, a math coprocessor, memory expansion, memory usage.

Macworld has covered accelerators in many articles over the past year, including “Beefing Up the SE,” September 1987, and several follow-up reviews. An extensive list (and discussion) appeared in “New Life for an Old Mac” in the February 1988 issue.

For this article, I chose an upgrade that hadn’t been reviewed yet: the TSI-020 accelerator, from Total Systems Integration (TSI). Unfortunately, my experience wasn’t quite representative of what you’re likely to encounter. The problem was I asked TSI to send me an accelerator that had already been installed on a system board, because the installation involves soldering connector pins to the Plus’s existing 68000. The “piggyback board”—a circuit board containing the 68020, 68881, and up to 4MB of RAM—then mounts to the connector pins. TSI was out of Mac Plus system boards, however, and the company sent an accelerator mounted on an old 512K system board. That, of course, caused a couple of major problems. First, the 512K board has no SCSI port, so I couldn’t hook up the hard disks again. Second, the 512K board has a different set of ports on the back, so I couldn’t put the Mac Plus case back on.

TSI had solutions for both problems. First, it sent me a special adapter that runs a SCSI cable out from the piggyback board. That allowed me to hook up the hard disks. Second, TSI sent the back of a Mac 512K case, so I could close up my Mac.

Though TSI recommends that a dealer install the upgrade, I went through the procedure to see what it involves. The upgrade itself is fairly easy to perform, if a bit nerve-racking. I removed the back of the case (being extremely careful not to touch the flyback cable—I value my life), unplugged the power and disk drive cables from the system board, and slid it out of the machine. I installed the auxiliary power supply (from TSI) and hooked the clips to the Mac’s analog board. I pried the Mac Plus ROM chips out of the Mac Plus system board and inserted them in the 512K board from TSI. I then inserted the upgraded system board; it didn’t slide in, so you have to lever it into place from underneath. I connected the necessary wires and cables, put the Mac 512K case on, plugged everything in, and powered up. It worked!

Performance using the TSI-020 is equivalent to and occasionally better than a Mac II’s in most areas. At first the TSI-020 didn’t appear to support automatic access of the 68881 math coprocessor. However, I discovered a utility that routes Standard Apple Numerics Environment (SANE) calls to the 68881, which speeds up floating-point operations.

“Benchmark Suite” shows some simple benchmarks performed on the Mac II (running MultiFinder), the TSI-020 (running its system software), and the Mac Plus (running pre-MultiFinder system software). The document launch involved double-clicking on a 115K Microsoft Word document and timing how long it took for the document to appear, with the cursor at the beginning of the file. All disk benchmarks were done using an internal 800K floppy drive. The benchmarks should be treated as a general indication of relative perfor-

## Accelerator Boards for the Macintosh Plus

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Processor</th>
<th>On-board Memory</th>
<th>Floating-Point Unit</th>
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<tr>
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<td>Prodigy 4</td>
<td>16MHz 68020</td>
<td>4MB RAM</td>
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<td>MacProducts USA</td>
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<td>included</td>
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<td>Network Specialties</td>
<td>Jump 020</td>
<td>16MHz 68020</td>
<td>1MB to 4MB</td>
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</tr>
<tr>
<td>Radius</td>
<td>Radius Accelerator 16</td>
<td>16MHz 68020</td>
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<td>MacEngine GT</td>
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<td>MacEngine Turbo</td>
<td>16MHz 68020</td>
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<tr>
<td>Spectra Micro Development</td>
<td>MacAccelerator</td>
<td>12MHz 68020</td>
<td>none</td>
<td>included</td>
</tr>
<tr>
<td>Total Systems Integration</td>
<td>TSI-020</td>
<td>16MHz 68020</td>
<td>up to 4MB</td>
<td>included</td>
</tr>
</tbody>
</table>
**Benchmark Suite**

The performance tests included the Sieve of Eratosthenes; multiplying two 50-by-50 integer matrices; sorting a list of 2000 seven-character strings; performing 10,000 floating-point multiplications, divisions, additions, and subtractions; drawing 2000 rectangles, each 200-by-200 pixels; drawing 200 circles, each with a radius of 100 pixels; drawing 38,000 ASCII characters; opening and closing a 200-by-300-pixel window 20 times under program control; launching a 115KMS Word document; writing and reading a 128K file to disk as 256 blocks of 512 bytes each.

<table>
<thead>
<tr>
<th>Expansion Port</th>
<th>Other</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>MegaScreen Plus</td>
<td>clip-on board; includes fan, power supply, SCSI port, RAM disk kit; chips not included</td>
<td>$3099</td>
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<td>none</td>
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<td>Stretch Screen and Stretch Projector none</td>
<td>clip-on board; CPU can run at 16MHz or 24MHz</td>
<td>from $1595</td>
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<tr>
<td>none</td>
<td>includes fan, power supply</td>
<td>$995</td>
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<tr>
<td>none</td>
<td>includes fan, power supply</td>
<td>from $595</td>
</tr>
<tr>
<td>The Big Picture none</td>
<td>clip-on board; includes C compiler and assembler</td>
<td>$695</td>
</tr>
<tr>
<td>none</td>
<td>clip-on board; includes fan, power supply</td>
<td>from $1295</td>
</tr>
</tbody>
</table>
Where Are the Clones?

What are these so-called PostScript clones, anyway, and what's taking them so long?

I admit it—when I heard that printer manufacturers were developing laser printers that could print PostScript files without using Adobe Systems' page-description language, I nearly jumped for joy. The companies were promising the output quality of a PostScript printer, better performance, and a lower price. But, more than a year since the printers were first hyped, you and I are still waiting for the first PostScript clones.

Manufacturers know that if they don't ship product, they sow skepticism: How similar can their printers be to printers equipped with Adobe's (and no one else's) PostScript? Can a clone outperform the original? Will the fonts be as good as PostScript fonts? Will the clones really be less expensive than PostScript printers?

You'll have to wait a little longer still for answers to those questions. Developers working on printer controllers that copy the way a PostScript-equipped controller works have discovered how difficult it is to clone PostScript. To be called compatible, a PostScript clone can't just print pages that look as if they were produced by, say, an Apple LaserWriter. A clone must go beyond that and actually duplicate how a PostScript printer handles text, graphics, and special effects. You should be able to connect a clone to a Mac or an AppleTalk network and drive it from Mac applications as if it were a LaserWriter.

Meanwhile, you should consider yourself lucky, because the first PostScript clones are strictly for IBM PC users, who will serve as de facto laboratory mice in the test of PostScript compatibility. But sooner or later you, too, will have to decide to clone or not to clone.

What to Expect

To take advantage of PostScript, a laser printer needs a specific combination of hardware and software (see "The Controller Board"). Without a doubt, two software elements have caused most of the technical headaches for clone developers. One is the PostScript interpreter, which translates PostScript language files into bitmaps that the printer's marking engine can print. The other is the software that scales font outlines to print type in different sizes.

Printer manufacturers are licensing interpreters from companies other than Adobe in hopes of achieving either a price or performance advantage over Adobe-based printers (see "Why Clones?"). Developers of PostScript-compatible interpreters are aiming to compete with the performance—not the price—of printers equipped with Adobe's interpreters, and they're taking several approaches. The first is to improve the speed at which the interpreter creates the bitmap of each page to be printed. This rasterization process involves a lot of computation—at 300 dots per inch (dpi), more than seven million dots have to be mapped in the image of a single 8-by-10-inch page.

Some PostScript-clone interpreters use graphics coprocessors in conjunction with general-purpose processors like the
Motorola 68000 to accelerate PostScript processing. For example, the 720 IQ laser printer from Printware in Saint Paul, Minnesota, uses two 68000 chips and a proprietary coprocessor on its controller. Other clones are employing proprietary chips, such as reduced instruction-set computer (RISC) chips or application-specific integrated circuits (ASICs), specially designed to handle the PostScript language. The interpreter from Raster Image Processing Systems (RIPS) of Boulder, Colorado, is optimized to run on a proprietary RISC chip; Eicon Technology of Montreal, Canada, is working on a printer controller based on transputer technology.

A second approach is to employ a faster marking engine in the laser printer. The LaserWriter IINTX laser printer—even with a 68020 on its controller—can print only 8 pages per minute. Two laser printers from Kentek Information Systems in Andover, New Jersey, the K3 and K4, use the PostScript interpreter clone developed by Phoenix Technologies in Norwood, Massachusetts. The K3 is a 24-page-per-minute printer; the K4 is a 24-side-per-minute printer.

The third way to enhance PostScript clones' performance is to give them printing resolutions higher than the 300-dpi laser printer standard. The PrintWare 720 IQ, for example, prints at 1200 dpi, and other PostScript-clone printers are designed to print at 1600 or more dpi. But all these approaches cost money, so don't expect PostScript clones to offer significant savings over PostScript-equipped laser printers.

Seeking less expensive solutions, some developers are working on software approaches to giving non-PostScript printers PostScript capabilities. General Computer Corporation in Waltham, Massachusetts, for example, offers a "PostScript brain transplant" that adds a clone interpreter to its QuickDraw Personal LaserPrinter and costs about $2000.

How Compatible Is Compatible?

No matter the perks of price or performance, PostScript clones, almost by definition, are only as good as they are compatible with PostScript printers. A developer working on a clone of a PostScript interpreter must produce software and hardware that can take PostScript code generated by an application program and create a bitmap for the printer's marking engine, and that bitmap must be as close as possible to the bitmap produced by an Adobe interpreter using the same code.

For a PostScript clone to be compatible, its interpreter must be able to recognize all PostScript language commands defined in Adobe's PostScript Language Reference Manual (also called the Red Book). The interpreter must be able to execute those commands on the printer according to Red Book definitions. The Red Book, however, is incomplete. Adobe's interpreters have their own undocumented idiosyncrasies. The PostScript operator exec, for example, is not included among Adobe's published definitions. The exec operator enables PostScript programmers to modify existing PostScript commands, add additional commands to the interpreter, and encode and decode font information. It has also been used for patching PostScript bugs to avoid upgrading a laser printer's read-only memory (ROM).

Macintosh system software designed for a specific PostScript printer (Laser Prep for the LaserWriter, for example) complicates matters further. Laser Prep defines some extra PostScript features, not included in the LaserWriter's ROM, written specifically for the LaserWriter. In fact, each

![The Controller Board](image_url)
Why Clones?

PostScript printers are in high demand. Users want to buy them, and printer manufacturers want to sell them. Equipping their printers with PostScript means that manufacturers have to license Adobe's proprietary interpreter and Adobe's proprietary fonts. Because Adobe works closely with each printer manufacturer to develop the right PostScript interpreter for its printer, high demand means long hours for Adobe engineers and a long queue of eager printer manufacturers waiting impatiently for Adobe to get around to them. Developers of PostScript-compatible interpreters have offered those manufacturers another option.

Interpreter developers (see "For More Information") claim that their clones offer significant advantages to printer manufacturers and (by extension) to you. In the first place, they say, manufacturers must wait a year for Adobe to develop a PostScript interpreter specifically for their printers—time that printer companies would rather spend selling their printers.

Second, clone makers claim that Adobe's licensing and royalty fees are excessive—$100,000 down and a $2 million minimum over two years are the figures most often cited. Industry analysts at Datak in Newtonville, Massachusetts, say that 7 percent of each PostScript printer's price tag goes to Adobe.

In addition to charging high fees, say clone makers, Adobe offers a slow interpreter. They claim that graphics coprocessors, reduced instruction-set computer (RISC) chips, and application-specific integrated circuits (ASICs) in printer controllers improve printer performance. All the clone makers currently claim that their printer controllers are faster than Adobe's.

Adobe denies all those allegations. Clinton Nagy, national sales manager, says that generally there is not a year-long wait for an Adobe interpreter. The development time depends on the complexity of the project. If a printer vendor wants a high-speed, high-resolution, color laser printer, it could take a year or so, according to Nagy.

On the other hand, he points out, AST Research was able to deliver finished printers to stores only 90 days after Adobe and AST signed a PostScript contract.

Nagy also disputes the charges of excessive Adobe royalty and licensing fees. He claims that clone developers themselves have acknowledged the high cost of research and development involved in cloning PostScript interpreters, let alone in developing the original itself. Steve Butterfield, vice president of marketing and sales at another clone developer, Bauer Enterprises in San Jose, California, estimates that Bauer's effort to make a PostScript-compatible interpreter is easily a 20-worker-year project.

Meanwhile, Adobe is improving PostScript performance. According to Nagy, much of the high-performance code developed for Display PostScript will be used in Adobe's PostScript interpreters. Adobe is also working with the same graphics coprocessors, ASICs, and RISC chips that many of the clones are using to improve performance.

Adobe PostScript interpreter includes commands specific to the printer for which it was developed. These device-level commands depend on the paper tray, document feeder, and collator features, among others, that a manufacturer would like to include with its printer.

By the end of this year, Adobe expects to have more than 70 implementations of its own PostScript interpreter installed in laser printers. Thus, clone vendors face more compatibility questions. Exactly which PostScript printer do they choose for that printer? And which Adobe interpreter version do they choose for that printer? (Many clone developers have decided to emulate Adobe's implementation of PostScript for the LaserWriter, but there are at least two versions of LaserWriter interpreters. The original LaserWriter included version 38; the most current LaserWriter interpreter, used in the IINT models, is version 47.)

There are also bugs in Adobe's own interpreters. In some cases, software programmers have accommodated those bugs in their applications. Clone makers must decide whether they should implement those Adobe bugs in their interpreters so that such applications print documents as expected on the clones. According to Mike Drewry, technical marketing support manager at Control-C Software in Beaverton, Oregon, Control-C's PostScript interpreter clone includes all the Adobe bugs in version 38; the company is now working on its version 47 clone.

Aside from System prep files and different versions of PostScript, clone makers also have to consider printer drivers. All Mac applications use the Mac's LaserWriter driver to send documents to a laser printer. If a PostScript clone can't work with that driver, applications won't print on the clone. You'd be forced to use only those
For More Information

Interpreter Manufacturers
- Adobe Systems, P.O. Box 7900, Mountain View, CA 94039-7900. 415/961-4400.
- Bauer Enterprises, 1340 Saratoga-Sunnyvale Rd., #201, San Jose, CA 95129. 408/446-4944.
- Eicon Technology Corp., 2196 32nd Ave., La Chine, Quebec, Canada H8T 3H7. 514/631-2592.
- Phoenix Technologies, Ltd., 320 Norwood Park S, Norwood, MA 02062. 617/762-5030.

Font Vendors
- Bitstream Inc., 215 First St., Cambridge, MA 02142. 617/497-6222.
- Compugraphic Corp., 200 Ballardvale St., Wilmington, MA 01887. 617/658-5600.
- URW, via The Company (U.S. marketing arm) 400 World Trade Blvd., Boston, MA 02210. 617/439-5347.

Printer Vendors
- Imagen Corp., 2650 San Tomas Expwy., Santa Clara, CA 95051. 408/986-9400.
- Itek Graphics, 34 Cellu Dr., Nashua, NH 03063. 603/889-1400.
- Kentek Information Systems Inc., 6 Pearl Ct., Box 78, Allendale, NJ 07401. 201/825-8500.

Mac applications that can print through a printer driver specific to that clone. To simplify matters, PostScript printers other than the LaserWriter, like QMS's PS-800 Plus and Texas Instruments' Omnilaser 2108, use the standard LaserWriter printer driver.

Networking is yet another issue. According to Doug Macrae, chair of General Computer, developing a printer that works over AppleTalk is not a simple task. Apple and Adobe worked together to ensure that the LaserWriter could be shared over AppleTalk. General Computer also worked closely with Apple to put its Personal LaserPrinter on AppleTalk networks. Although several printers can be connected to a Mac via the serial port, you can't share those printers. You don't want to buy a clone only to find that you can't use it over AppleTalk.

Is It Type or Is It Hype?
Font quality is the major issue faced by PostScript clone developers, and it will be the major issue that potential customers will be considering. Many of the first clones (Printware's 720 IQ, the Utre Type-setter from Birmy Graphics, and Itek Graphics' IGX 7000) did not print at 300 dpi, but rather at higher resolutions—1200 dpi and up—that allow for smoother edges and better definition in type characters.

Producing well-defined characters in various type sizes—especially small text faces and large display type—at 300 dpi has been Adobe's (and PostScript's) advantage all along. The clone developers' problem lies in the rasterization process that transforms an outline font into bitmapped characters. The outline is scaled to the selected type size and then filled with dots. To maintain its fonts' design and edge definitions, Adobe uses carefully guarded "hints" in its interpreters that clone makers can only approximate, some more successfully than others.

To achieve the same type quality available from PostScript printers, clone manufacturers must either develop their own scaling and rasterization techniques or search for font vendors with comparable technology. Most clone makers are not type experts. Many have gone to established manufacturers of digital type for PostScript-compatible fonts—Bitstream in Cambridge, Massachusetts; Compugraphic in Wilmington, Massachusetts; and URW in Hamburg, West Germany, among others.
These digital type “foundries” have their own techniques for font scaling, and of course each claims that its type is superior to Adobe’s—even in the very large and very small sizes that really put font-scaling techniques to the test.

Print quality aside, compatibility with Adobe fonts means at the very least that third-party fonts match the character widths of the corresponding Adobe fonts. A character’s width defines the amount of space on either side of, above, and below the character. Character widths are part of the information that defines each font, and they influence other typographic elements such as line breaks and the spaces between lines, words, and letters. Without matching character widths, you cannot use an allegedly Postscript-compatible font when you’re proofing a document on a Postscript-clone printer before sending it to a Postscript-equipped typesetting machine (such as the Linotronic 300) for final output. Your proofs just won’t be accurate.

LaserWriter output matches Linotronic output because both Apple and Linotype Corporation use Adobe’s Postscript fonts. On Bitstream’s behalf, director of sales and marketing Bill Andrews says the 35 outline fonts that Bitstream provides to Postscript clone makers match the character widths of Adobe’s 35 built-in LaserWriter fonts. Compugraphic has made a similar announcement.

What to Look For in a Clone
Clone makers, printer manufacturers, type vendors—even everyone agrees that testing is the way to stay out of the incompatibility trap. No one agrees, however, on who should do the testing and what kind of testing is necessary. According to Michael Weiss of Infonetics in Santa Clara, California, which offers a testing service to clone makers, every Postscript clone must be tested to ensure that it works properly with every Postscript application on the market.

Testing application programs is especially vital to Mac users, who have a better-defined standard for Postscript compatibility than do IBM PC users. More than 50 programs with Postscript printing abilities are available on the Mac; only ten or so similar programs currently exist for the IBM PC. Mike Drewry of Control-C Software, however, points out that many applications use less than 25 percent of the available Postscript commands. As a result, tests must be designed to push the clone to its limit with Postscript files that include every Postscript command—the “throw the Red Book at it” approach to testing.

Clone makers as well as printer vendors perform compatibility tests themselves. While you can’t simply take their word for their products’ compatibility, neither can you test clones with every program on the market before you buy. In addition to Infonetics, there’s at least one other company—Desktop Publishing Solutions in Livonia, Michigan—that offers independent Postscript compatibility certification. Frank Lee of Desktop Publishing Solutions says, “A smart user should avoid looking at any printer that hasn’t been independently tested. There will be cases of developers trying to achieve better performance by not doing complete Postscript implementations.” You can bet, though, that no printer vendor will advertise a failing grade if its clone is proven incompatible by an independent testing company.

If you’re thinking about buying a Postscript clone, first you have to be ready to wait for it. The first clones for the Mac probably won’t ship until the end of this year at the earliest. And, if you think clone makers will be able to deliver on their promises of lower price tags compared with Postscript printers, you’ve got another think coming. When the clones do arrive, for however much money, check their claims of compatibility as well. Ask for specific qualifications of phrases like “95 percent compatible”—what does it mean to be 5 percent incompatible? Examine the print quality of graphic special effects and—more important—type in both small (about 6 points) and large sizes (60 points and bigger). Compare the proofs you get from the clone with final output from a typesetter, if you plan to use the clone as a proofing device. Make sure you can share the clone over an AppleTalk network. And test it with all your application programs.

Then consider the usual printer features such as paper handling and ease of installation.

Postscript clones are definitely for the very adventurous and the very patient. Until some standard test of Postscript compatibility is decided upon, it’s going to be difficult to identify a successful clone and ascertain its true value.

See Where to Buy for contact information.
## Reviews

### Heavy-Duty Word Processor

**WordPerfect 1.0**

**Word processor.** Pros: Tremendous depth and breadth of features; includes macro language, newspaper- or screenplay-style columns; sophisticated editing, formatting, and file management; automatic save, automatic hyphenation, spelling checker, thesaurus, outline, facilities for endnotes, footnotes, table of contents, and index; elaborate online help; exhaustive manual; toll-free technical support. Cons: Still contains some bugs, especially with screen refresh and word wrap; some formatting limitations when importing or exporting WordPerfect files from or to WordPerfect running on different computers; some unnecessary variations from the Mac interface. **Company:** WordPerfect. 

**List price:** $395. **Requires:** 512K, two 800K drives; hard disk recommended.

WordPerfect, one of the premier word processors in the MS-DOS world, brings to the Mac power features that are oriented toward the office user. Although those not in the business mainstream will find the product a bit too impersonal, WordPerfect offers more breadth and depth of features than any other word processor on the Mac, and in spite of its MS-DOS heritage, it is distinctly Mac-like. For those writers who need a program as powerful as this, there's no substitute.

### More than a Look-Alike

Initially, WordPerfect seems a lot like MacWrite. For instance, WordPerfect offers only one more choice, Windows, on the main menu bar. But when you start to explore, you’ll find that WordPerfect has 154 menu choices (including 18 hierarchical menus) and 67 F-key options. For those with extended keyboards, there are also 60 F-key combinations. MacWrite, on the other hand, offers only 46 menu choices and 20 F-key options. This is a crude way to compare packages, but you get the idea.

WordPerfect’s and MacWrite’s start-up screens look similar, except for the bottom of the window. MacWrite makes this area part of the writing surface; most other word processors display the page number in the lower left-hand corner and provide a horizontal scroll bar. WordPerfect displays not only the page number, but the line number as well. Although this feature may seem unimportant—especially when you consider that your per-page line count can vary drastically depending on the font you use—users whose work requires a line count will find it a lot more efficient than doing a manual count. Moving the cursor over the page number changes the arrow to the word GO. Enter any number, and the cursor jumps to that page.

Just to the right of the line number is the most un-Mac-like feature in the program: a row of six small buttons for changing style (for instance, boldface or italic). Clicking one of these buttons changes the style of selected text, or lets you begin typing in a new style. (Alternately, you can change style with a F-key combination or via a hierarchical menu.) Next to the buttons is a large space that displays messages that indicate when the program is automatically saving a file or when text is selected, for example.

### Features Galore

If I did nothing but list WordPerfect’s features, I would still exceed the space Macworld has allotted this review. But to mention some of the most important ones: you can open as many windows as your machine’s memory allows; you can use big screens, small screens, or a combination of the two; and you can see your documents in color. The ruler can be up to 22 inches wide. WordPerfect’s macro language handles very sophisticated operations like mail merge, or trivial tasks like reassigning F-key combinations. Making style sheets or customized stationery are excellent ways to use the macro language. Those ten-
tative about writing macros can have the program record a series of mouse and keyboard actions. The File Management feature gives you a level of control found only in utilities such as Disk Tools II. For instance, you can open, print, copy, rename, and delete files, select Get Info for a file, create a new folder, or do a word search.

A real lifesaver, the Auto Save option smoothly and unobtrusively backs up the active file as often as you like—so if the system crashes, your work is safe. You can, however, still close a file without permanently saving any changes made during the work session.

For precision editing, you can make the normally invisible formatting codes visible. The window splits, with the top appearing as normal and the bottom containing WordPerfect's proprietary formatting icons. The icons can be cut, copied, and pasted. The Search and Change window includes a scrollable list of WordPerfect's hundred or so symbols, making global replacement a snap. In addition to the standard Undo feature, the program offers an Undelete command that recovers three levels of deleted material. You can append to, rather than replace, the Clipboard's contents.

WordPerfect is the first Macintosh word processor to include both newspaper-style and screenplay-style columns. In newspaper-style columns, text flows from the bottom of one column to the top of the next column on the same page. With screenplay-style columns, text flows from the bottom of one column to the top of a column in the same position on the next page—a very handy feature when creating tables. Each page can have up to 24 columns of various widths, and you can use different column styles on the same page.

Other features include an outliner, merge, endnotes, footnotes, and the ability to embed PostScript commands in any document. The spelling checker is excellent, with a dictionary fattened to 115,000 words, including several thousand legal and medical terms. Less-important features that are among my favorites include word count, fixed or variable date stamp, dot leader tabs (for example, 229 ...... 327), and vertical page centering.

**Performance**

Although not totally bug free, WordPerfect version 1.0 is many times cleaner than Word 3.0 was when it was released. WordPerfect's screen refresh is still slow,
Soon or later your Macintosh is going to crash. And unless your Mac's been backed up, it'll probably take your data with it. That's why you need the TG-4000 high performance tape backup system from Tallgrass. It features the tape format that Apple endorses, QIC-100. We invented it, and now it's the industry standard.

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Backup's Never Been So Easy. You won't ever have to use the manual. The TG-4000 is icon-interfaced, so you can get the system up and running in no time. From novice to power user, the TG-4000 offers the total flexibility you need and expect from a backup system. Plus, it's compatible with Apple's 40 SC™ AppleShare™ and A/UX™. And since its backup operations are automatic and unattended, you can just set it and forget it.

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Circle 6 on reader service card

Nothing Protects Your Apple Like Tallgrass.
On the Other Hand

For all the effort put into loading WordPerfect with features, the developers seem to have lost sight of the really important points. The program is disturbingly slow when reformatting, say, a paragraph in which I’ve just deleted some text. The word wrap can’t keep up with my typing (40 to 50 words per minute), sometimes getting so far behind that a line becomes temporarily garbled. And, for all the program’s claims of flexibility, the interface is awkward for those who prefer using the mouse for most operations. Nearly 70 percent of the commands must be accessed through sub-menus, including those for such commonly used features as line spacing (the ruler lacks an icon for specifying single or double spacing). In addition, to get a true Macintosh feel, the style buttons at the bottom of the screen should be customizable and the window that displays formatting codes should be resizable. I’d really like to find a substitute for Microsoft Word, but WordPerfect’s major performance and interface problems rule it out as a candidate.

—Cheryl Spencer

and characters sometimes disappear mysteriously at the end of lines in certain word wrap situations, only to reappear miraculously if you change the wrap. Others with different work habits from mine will undoubtedly uncover additional problems.

From PC to Mac

Ideally, WordPerfect would allow users to transfer word processing files transparently between all brands of computers that run the program. Just how much users are going to be disappointed by this implied promise remains to be seen. WordPerfect has stated that it will not currently attempt to transfer all the Mac formatting—such as font size, types, and styles—to the PC version. It will very likely be easier to retain formatting when transferring files among various Mac word processors than when passing Mac WordPerfect files to WordPerfect on the IBM PC or other computers. Currently, the manual recommends that before opening a WordPerfect file from another computer, the user should change the file’s Creator and Type. People whose regular work routine includes such file transfers aren’t going to like this.

The manual is a three-ring binder holding nearly 700 pages. In general, it is well organized and well written. Technical support is toll free and the support technicians are affable and knowledgeable. Ask others who use WordPerfect—the company has a long-standing reputation for quality service.

A Power User Purchase

This is not the ideal word processor for everyone—many users have little need for the high-end features or the high-end price tag. Others will want a different set of features, such as those found in page-layout programs. WordPerfect allows you to import graphics, resize and move them, but it does not offer drawing tools, nor does it even allow you to draw boxes around blocks of text. But, although this product won’t allow everyone to pass files back and forth transparently in an office with more than one brand of computer, WordPerfect is already my word processor of choice for the business environment.

—Scott Beamer

See Where to Buy for contact information.

Apple’s PostScript Pair

LaserWriter IINT


LaserWriter IINTX


Searching for Something Strange

Ever forgotten how to find a foreign or strange character? The Insert Literal menu choice shows you the complete character set currently in use. Just click on the desired character. WordPerfect inserts it at the cursor, and the Insert Literal window disappears.

With its LaserWriter family, Apple introduced the world to the quality of PostScript printing. But Apple’s pioneering printers were quickly upstaged by faster, often less-expensive printers. The LaserWriter IINT and IINTX update Apple’s PostScript printer line and share several commendable traits.

Both printers run version 47 of PostScript, which is faster and uses memory

(continues)
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Circle 196 on reader service card
more efficiently than its predecessors. Both use Canon's new SX print engine, which replaces the CX engine used in earlier LaserWriters. The SX engine feeds paper more reliably and prints darker images, although some people—myself included—prefer the CX engine for its superior rendering of fine details. Unlike other PostScript printers, both the IINT and IINTX contain smoothing routines that can be used to soften the edges of bitmapped graphics and text. (For background on the LaserWriter II family, see "The LaserWriter Lines Up," Macworld, March 1988).

Both printers also offer various upgrade and expansion options. For an additional $2,499, an NT becomes a top-of-the-line NTX. That's $499 more than you'll pay for an NTX to begin with, however. The NTX accepts a variety of memory and hard disk expansion options.

Running on NT
The IINT replaces the LaserWriter Plus as Apple's PostScript printer for the masses (at least the masses who can spend over $2,000 for a printer). Like the Plus, the NT includes 35 fonts. The NT, however, contains 2 megabytes of RAM, versus the Plus's 1.5MB. That, combined with the memory-efficient PostScript version 4.7, means the NT can hold many more downloadable fonts than the Plus. I successfully shoehorned 14 fonts into the NT's memory; the Plus usually choked after 4.

Many of the NT's competitors, however—including QMS's PS 810, AST's TurboLaser/PS, and NEC's SilentWriter LC-890—offer 3MB of RAM, and thus can hold dozens of fonts. Unfortunately, the NT's memory isn't expandable. If you use downloadable fonts by the dozen, consider those other printers first.

The NT retains the LaserWriter Plus's ports and operating modes. There's an AppleTalk port and a 25-pin serial port for use with IBM PCs and other computers lacking AppleTalk interfaces, and there's a Diablo 630 emulation mode. On earlier LaserWriters, you switched between modes using a clearly labeled rotary switch. On the NT, you must wrestle with two tiny DIP switches located next to the printer's serial port—after you've checked the manual to find the right settings. Unlabeled DIP switches aren't what I expect from a company whose claim to fame is simplicity. On the test track, the NT performed well, but far from best (see "PostScript Performance").

These criticisms might lead you to believe that NT stands for "nice try." I wouldn't go that far. The NT is a good performer, and its price is among the lowest in its class. The NT simply lacks features that many of its competitors provide, including a Hewlett-Packard LaserJet Plus emulation mode and a parallel port for fast communication with IBM PCs. If you plan to use a printer with PCs as well as Macs, you'd be better off with the QMS-PS 810. In addition to working better with PCs, the PS 810 is faster. At $4,955, however, the PS 810 lists for $896 more than the NT.

More Power to You
The LaserWriter IINTX is the Mac II of Apple's PostScript printer line: a high-performance model designed for demanding applications. Like the Mac II, the NTX is driven by a 68020 microprocessor running at 16MHz (the 68000 in the NT runs at only 12MHz). Also like the Mac II, the NTX is expandable. You can increase its RAM to a whopping 12MB, and there's space to plug in a font-expansion board. (No boards had been announced at this writing.)

The NTX's biggest asset is its ability to use a SCSI storage device for holding downloadable fonts and as an extension of the printer's font cache—both performance-boosting features. But you can't use just any SCSI drive. Before it can initialize the drive, the NTX software must determine the drive's capacity. Most Mac hard disks can provide this information via a SCSI routine, but some disk makers haven't implemented that routine. At this writing, Apple was preparing a list of drives that do and don't work with the NTX.

(continues)
Meet Marsha Lyon. Marsha coordinates and creates in-house publications for Allergan, Inc., the world's leader in eye-care products. She uses the Microtek MSF-300C Desktop Scanner because it gives her complete control over her desktop publishing.

Instead of sending out images to be halftoned, Marsha can scan photos in up to 64 shades of gray using any one of 8 halftone patterns. Unlike all other scanners, the MSF-300C has 15 independent brightness and contrast settings to compensate for imperfect photos, drawings or logos. And its quick and accurate OCR capability eliminates the tedious re-keying of lengthy documents.

"Now, I get sharp, clear images and text that improve the look of my publications." But don't just take Marsha's word for it. PC Magazine awarded the MSF-300C its Editor's Choice.

So, if you have an Apple Macintosh, an IBM PC or PS/2, find out how to get a Microtek scanner of your own. Call (213) 321-2121 in California, or 1-800-654-4160 for your local authorized Microtek dealer.

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Circle 585 on reader service card
Reviews

The NTX also emulates an HP LaserJet Plus, although it lacks the parallel port so common in the PC world. And my complaints about unlabeled DIP switches apply here, too. The NTX has not two, but six of the beasts, making mode switching that much more complicated.

But it's hard to argue with the NTX's performance. This Porsche of a printer turned in faster times than any PostScript printer I've used, especially when printing complex graphics documents. A 20MB SCSI hard disk boosted performance further.

In most PostScript printers, the engine often waits for the controller. That isn't always the case with the NTX, which can print many documents at its engine's rated speed of eight pages per minute. QMS and Dataproducts have announced NTX competitors that combine similar controllers with faster engines. Users in the market for a high-performance, high-volume PostScript printer should also consider QMS's PS 1500 and Dataproducts' LZR-1260.

The LaserWriter II NT and IINTX are solid, reliable performers, and they're competitively priced. But the NT's mix of performance and features is uninspiring, and the NTX may be outdone by other offerings. In the game of PostScript printer leapfrog, Apple has yet to regain its lead.

—Jim Heid

See Where to Buy for contact information.

A Few Strokes

MacPaint 2.0

Paint software. Pros: Easy to learn and use; Snapshot feature encourages experimentation; autoscrolling; multiple windows and magnification levels; full use of tools in 50 percent view. Cons: No object-oriented drawing layer; poor value compared with some competitors; no 300-dpi editing. Company: Claris. List price: $125. Requires: 512KE.

MacPaint's lack of object-oriented drawing features, however, makes the program easy to learn and use. Some people are confused by graphics programs that mix objects with bitmaps; they try to edit the bitmapped portions of the document with object-drawing tools and vice versa—which, of course, they can't do.

Snapshots and a Magic Eraser

MacPaint's best new feature, the Snapshot, leaves you free to experiment and make mistakes. Taking a snapshot saves the current image in memory (not on disk). You can continue drawing, adding as many modifications as you like. Later, if you decide you don't like the changes you can revert to the original image.

More significant is the ability to restore sections of the document selectively. Using the selection tools with the Revert To Snapshot command lets you reinstate only the selected area. You can also use the Magic Eraser, which erases only those changes made since the last snapshot.

Measuring Strokes

Compared just on the basis of its paint features, MacPaint is roughly equal to its competition. With the exception of the implement MacPaint's major improvements. First of all, if you have a big enough screen you can see the entire 8-by-10-inch drawing area. You can also open up to nine documents at once, depending on available memory. Moving around a document has been improved by the addition of scroll bars and automatic scrolling.

The terms FatBits and Show Page have been retired for a better (if less colorful) world of four magnification levels—of 50, 200, 400, and 800 percent. You can use all tools in all four magnification levels. I especially appreciated the ability to work at the 50 percent magnification. But, unlike most of its competition, MacPaint cannot edit pictures at 300 dots per inch—a useful feature for refining graphic details such as logos.

Much is made of one new feature called tear-off menus. The tools and pattern palettes have been reconstituted as broad, squat menus that you can drag onto the desktop. At first glance this seems to be the best of both worlds. But in practice, you almost never select tools from the menu, an operation that requires extra dexterity and mouse movement. Once on

(continues)
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Is It a Printer or Is It a File?

AnyText 1.12
AnyGraph 1.11
PC printer capture program for text and graphics with translators for use with Apple File Exchange. Pros: Print-capture feature makes it easy to use with many PC programs. Cons: No file-transfer features; limited to MacWrite and MacPaint formats; graphics files use large amounts of disk space on the PC; AnyPC with AnyGraph is slow. Company: Compatible Systems Corporation. List price: $95 each (includes AnyPC). Requires: Mac Plus.

With more and more Macs and IBM PCs and compatibles rubbing shoulders in offices, transferring information between the two types of machines has become all the more important. AnyText and AnyGraph are packages that attempt to translate PC output files into Mac-format files but fail to cover all the bases.

My Printer, Your File
AnyText and AnyGraph are translator files that work with the Apple File Exchange (AFE) program that comes with Apple’s System Software Update 5.0. Included with both packages is a program called AnyPC, which runs on any PC and redirects printer output to a PC file for subsequent transfer to the Mac, where it can be translated.

AnyPC intercepts all output directed to the IBM Graphics Printer or equivalent, when activated, AnyPC pops up on the PC screen and provides options for saving the output to a file or continuing as a normal print job. To use the output on a Mac, you save the output in a PC file, transfer that file to the Mac, and use AFE with either AnyText or AnyGraph to convert the file into a usable format. Neither AnyText nor AnyGraph provides the means for transferring files between a PC and a Mac, so you’ll have to use another utility, such as QuickShare, TOPS, AppleShare PC, or the DaynaFile.

AnyPC translates word processing files fairly quickly on the PC because it has to deal with characters and text styles only (see “A Test of Time”). On the other hand, AnyPC captures graphics output much more slowly because it has to resolve the printed page in a line-by-line, or raster, mode. Files saved by AnyPC for conversion to Mac files with AnyGraph take up a lot of disk space. A simple 5K Lotus .PIC file became a 250K file when I captured it using AnyPC. In fact, the first time I tried saving the file, I ran out of disk space, but the program saved the incomplete file nonetheless. Since AnyPC behaves like a dot matrix printer, saving the image line by line, the program simply closed the file when it ran out of disk space. (AnyGraph had no problem translating the truncated file into a MacPaint file.) The size of the final complete MacPaint file was only 12K.

On the Mac side, you need to know how to use the AFE, which is described in the Macintosh Utilities User’s Guide. AFE is simple to use, partly because of its similarity to Apple’s Font/DA Mover. The only added step is selecting the AnyText or AnyGraph file for use as a translator. Then you select the files to be translated and AFE does the rest.

Lowest Common Denominators
As translators of PC output, AnyText and AnyGraph are fairly versatile despite their apparent simplicity. By emulating a rather common dot matrix printer, AnyPC allows you to create files using any PC-based word processor. However, the resulting MacWrite file may not resemble the original PC word processor file exactly. AnyText preserves bold and italic styles as well as superscripts and subscripts, but doesn’t always handle all of the tabs in a ta-

(continues)
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Circle 122 on reader service card
A Test of Time

To determine what the default 6-inch column, which may change the length of a document. AnyText uses a statistical method to determine what the tabs are and fails to recognize tabs in a table shorter than three lines.

Using AnyPC to capture graphical output from a PC reveals more limitations. Although the IBM Graphics Printer handles resolutions of 60, 120, and 240 dots per inch (dpi), Compatible Systems recommends using the lowest printer resolution so that the translated file in MacPaint format (80 dpi) will more closely resemble the original. As the company admits, the IBM Graphics Printer was chosen as the lowest common denominator, which means that many of the PC’s more powerful graphics programs and spreadsheets are severely restricted by what they can portray when directed to AnyPC. For example, there’s no way to save the color attributes of a PC screen. If you’re looking to transfer EGA-format (Enhanced Graphics Adapter) screen shots in color or gray levels to the Mac, you’re better off using PC programs like HotShot and Hijack to save the screens and convert them to encapsulated PostScript or PICT files.

Too Little for Too Much

Considering that AnyPC forms a common link between AnyText and AnyGraph, I feel that the two translators should be bundled together as one package, rather than sold separately. Especially since AnyText and AnyGraph do not include file-transfer facilities (Compatible Systems would probably like to see you buy its QuickShare product), $190 is a little steep for the privilege of translating both text and graphics files. The combination of AnyText, AnyGraph, and AnyPC performs exactly the same functions as QSPC and PC Transfer, which are part of QuickShare. If your office already has networked Macs and PCs, AnyText is useful for translating word processor files and tables, but if you’re planning on moving beyond low-resolution MacPaint graphics, you’d be better served by other PC-based screen-capture programs.—Dave Kostur

See Where to Buy for contact information.

McSink 4.4

Text-editing and file-management desk accessory. Pros: A wide variety of options augment application operations. Cons: Garbage appears at ends of lines after some operations; capricious system crashes. Company: Signature Software (also available on most online services). List price: Version 4.5 $25 Requires: 512KE, System 4.1, 128K ROM.

Do your favorite applications allow you to check the number of characters, words, or paragraphs in any given text selection? Can you sort; add line numbers; columnize data; or choose to see tab, space, and carriage returns as symbols? Delete files without leaving an open document? Display and edit file info such as Type and Creator codes?

McSink, a very ambitious shareware desk accessory, purports to do all this and more. And with bug fixes and enhancements spawing new versions almost monthly, McSink comes close to matching expectations with performance.

Initially, McSink sported a single window and a hodgepodge menu. Now, the program handles up to 16 concurrent windows and offers nearly 50 text-editing and file-management options. To edit text, however, you must first bring it into the McSink window by copying it from the Clipboard. You can also open files saved in text-only format and previously created McSink files.

Once you place text inside a McSink window, you can set parameters for changing the case of letters or words, for indentations, for converting tabs to spaces and back again, for adding line numbers, and for columnizing information. Prefix and suffix strings can be added to selected lines as can line feeds. Trailing white space can be stripped from selected text.

Version 4.4 seems to fix a bug that made McSink crash when writing to any printer besides an ImageWriter. No matter what printer you use (including laser printers), text appears only in draft mode. A handy new option, Statistics, records

(continues)
Presenting a rich new harvest of Apple® products for TEMPEST environments—from Atlantic Research Corporation.

The TEMPEST LaserWriter® IIINT is a TEMPEST version of the latest breakthrough in desktop publishing. It will network with up to 31 separate CPUs and will support any PostScript® compatible software, including virtually all Macintosh® applications and software for Apple IIIGS, MS-DOS, OS/2 and AT&T Unix. And the LaserWriter IIINT produces near-typeset quality documents in 35 distinct type faces.

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There's more variety still, with the TEMPEST Mac SE, which combines high-powered computing with the compact Macintosh footprint. Like the Mac II, our TEMPEST Mac SE has Appletalk for connection with all ARC Apple products. Our TEMPEST Mac SE also features a removable external 20 MB hard disk and is fully approved for use in all TEMPEST environments. Our SE is also delivered with a TEMPEST Extended Keyboard.

The best of all of the apples are available now from ARC.
Upgrading to SCSI

**HD-20 WSI 1.1**

**Hard disk upgrade.** **Pros:** Substantially improves performance of an Apple Hard Disk 20; easy installation. **Cons:** Can’t format for best performance on Mac SE or Mac II. **Company:** Personal Computer Peripherals Corporation. **List price:** $295. **Requires:** Hard Disk 20; SCSI port.

You don't know how slow a hard disk drive can be unless you've used an Apple Hard Disk 20 connected to the Mac disk port. Nevertheless, Apple sold thousands of Hard Disk 20s because they're solidly built, reliable, reasonably quiet, and for a while were as fast as anything except expensive, exotic, temperamental, internal hard disk drives. A WSI (With SCSI Interface) upgrade improves a Hard Disk 20's performance by exchanging the disk port interface for the much faster SCSI port interface that's standard on all Macs sold today. (A Mac 512K or 512KE can also be retrofitted with a SCSI port.)

The WSI upgrade consists of a circuit board and cable assembly that replace the standard board and cable in a Hard Disk 20. In addition, you get a manual with complete installation instructions, a special tool for opening the Hard Disk 20 cabinet, and two floppies containing utility software. The software includes a test and format utility, a file locator, ImageWriter and LaserWriter spoolers, a quick-copier for floppy copying, and a backup/restore application.

**Installing the Upgrade**

Personal Computers Peripherals Corporation (PCPC) recommends having a technician install the upgrade, but any reasonably handy person can do it in a half-

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Creating printed materials is a lot of work. And Ready, Set, Go! page layout software is the best choice to handle it all. It’s a real workhorse, fine-tuned and balanced for optimum productivity. You get top performance in word processing, type handling and layout without sacrificing ease of learning or use.

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A survey of multiple program owners showed RSG is the easiest page layout program to learn. The secret is the way it visually organizes your work with design aids like standard or custom grids and guides for quick column alignment. Type handling is familiar too. Menu selections and specification boxes easily deliver the type quality you want. It adds up to a fast start.

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Most businesses appreciate effort but they reward productivity. Especially when it’s at a good price. Ready, Set, Go! software delivers both. For a demonstration of the package that Personal Publishing calls “a...powerhouse program” see your authorized Letraset Graphic Design Software Dealer today.
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New! Version 4.1
All purchasers of Ready, Set, Go! software after July 5, 1988 will receive a free Upgrade.
- Fractional type handling
- Supports color
- Grey level image control
Reviews

hour or so using two screwdrivers and the hex wrench that PCPC provides. The installation instructions are detailed, straightforward, and fairly complete. The main danger of installing it yourself is inadvertently zapping the upgrade circuit board with static electricity. Static you can’t see or feel can be strong enough to weaken or destroy electronic components.

You must spend 1 to 6 hours before and after installation testing, backing up, formatting, and restoring the Hard Disk 20, depending on how full your drive is and whether you back up to floppies, tape, or another hard disk. The work isn’t difficult, although I became a bit confused when formatting the drive, because the formatting program offers several options not explained in the instructions. A tech support person explained why the options were irrelevant and assured me that I could rely on the printed instructions.

Using an HD

After surgery, the Hard Disk 20 looks, sounds, and smells the same. But the tortoise has become a hare. The HD-20 WSI’s theoretical performance, as measured by the DiskTimer II tests, is on a par with other 20-megabyte SCSI drives (see “WSI Performance”). Some people criticize these tests as too academic, but the numbers are widely published for many hard disks, and do show some correlation with performance in everyday use. After using an HD-20 WSI for a month, I’d say it performs like an average 20MB hard disk.

The disk space available after formatting is less than the average, however, and also a bit less than before the conversion. Whereas most 20MB hard disks have between 20MB and 21MB, a conventional Hard Disk 20 has just over 19MB and an HD-20 WSI has just under 18MB.

You can chain other SCSI devices to an HD-20 WSI. It has a 25-pin SCSI port where the external floppy port was before the upgrade. Switches inside the drive determine the SCSI priority number. Termination is internal and can be removed by prying out three small electronic parts.

Adequate Software

The bundled software is useful but hardly a compelling reason to buy. The file locator desk accessory and laser printer spooler provide functions and performance similar to Apple’s Find File and Print Monitor. PCPC’s laser spooler interferes less with foreground work but is more trouble-prone than Apple’s. For example, restarting the Mac in the midst of a spooled laser print job can result in a hung Mac. The PCPC ImageWriter spooler has no Apple equivalent, and it works fine.

The included backup application, HFS Backup 2.02, is adequate but not the best available. The software formatter could set up the disk with only a 3-to-1 interleave ratio, making the HD-20 WSI best suited to a Plus. The WSI will work on an SE or Mac II, but won’t have the speed of a drive that can be formatted with a 2-to-1 or 1-to-1 interleave ratio.

Don’t put your venerable Hard Disk 20 out to pasture because it’s too slow. It will deliver contemporary SCSI performance if you install the WSI upgrade. I’d do it if I had a Hard Disk 20. —Lon Poole

See Where to Buy for contact information.

Math without Tears

Calculus 1.0

Calculus is a great educational watershed, upon which it is decided who becomes a scientist or engineer and who doesn’t. Unfortunately, it’s a subject in which students in the United States show the worst test results of any industrial nation.

Sensei has accepted the challenge of producing software that will really help you learn Calculus 1A, as well as pass the course. In succeeding beyond anyone’s most optimistic expectations, Calculus rates as one of the best pieces of educational software ever produced—superior in some respects even to Sensei’s remarkable Physics program. It’s also the only program of its kind available on any computer. If you were a college student having trouble with calculus, it would make good economic sense to buy an old 512K Mac just for the purpose of using this program. It’s that good.

By the Book
The program is keyed to the order of presentation in standard texts, covering limits, derivatives and their applications, integrals and their applications, methods of integration, and a special unit on graphing. The Subject menu lets you jump to any of 11 chapters with a Table of Contents, or to specific topics with an Index. One of my few complaints about the program is that it doesn’t reach into vector calculus, but the treatment of calculus basics is so thorough that advanced topics would require another disk. As it stands, the material will take a freshman calculus student from September to April or May.

There are three parts to a Calculus chapter. First, the program has short tuto-
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Set your imagination free with the power of 3D

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rial introductions to topics, amplified by hypertext insertions (you can click on italicized terms and More buttons for extra explanation) and animated diagrams of concepts. This means—in contrast to textbook presentations—that you view a continuous flow of the “right” material, matched to your own questions and needs. Pedagogically, this is ideal for maintaining interest and motivation.

Second, each chapter has extensive lists of orthodox problems. For solving these, you can call on Reference, Hint, or Solution from the Calculus Help menu—the Options menu also lets you step through the chapters in Problems Only or Tutorial Only mode.

In and exp functions) that are properly part of a pre-calculus course. The topics are included here because deficiencies in background are often the most serious obstacles to learning calculus. Likewise, recognizing that many students in college will be taking physics at the same time, there’s an emphasis on acceleration/velocity problems as applications.

The problem and demonstration set in methods of integration (a topic on which many students fall apart completely) is not only thorough but sympathetic. It presents a carefully graded sequence that works from absolutely simple cases at the beginning, through small steps, up to challenging exam-level problems.

Finally, there are demonstrations of sample problems. These are step-by-step solutions of fancier textbook material, using animation to particularly good effect in showing computational substitutions and simplifications. The demonstration window includes a Why? button to explain each step in the sequence, and Repeat and Start Again buttons to simulate an infinitely patient instructor. For convenience, the File menu features Save Place and Restore Place items (a sort of bookmark function) and a Print Page option. These are standard in all Sensei applications.

Local Maxima
The people who developed this software clearly understand the realities of calculus teaching. The program, for example, offers lots of drill on topics (trigonometry,

Sensei has also evaluated all the ways a graphics screen can go beyond a blackboard or text illustration, and has made every screen count. Assuming that the student has almost no background in graphing, the program also offers a special section on graphing that amounts to a compelling demonstration of the Mac’s powers as an instructional tool.

The Answers
For many students, this program could mean the difference between passing and failing calculus. That’s not bad for a hundred bucks. For other Mac owners, it could be an interesting educational bridge that takes them into a deeper comprehension of the world of science. Let’s hope Sensei brings out programs on advanced calculus and differential equations as well.—Charles Seter

See Where to Buy for contact information.
Some people will try to tell you that one product will fit every Macintosh application.

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Chameleon gives you the conversion factor (see "Quick-Change Artist"). Chameleon is especially convenient for conversions involving derived units; the program forces you to do the conversion correctly (it's always clear what you're converting from, and what you're converting to). To be blunt, you will get the right answer using Chameleon, even if you're not very good at this sort of thing and have only a hazy understanding of dimensional analysis.

Does Not Compute (Partly)

Chameleon is afflicted with a small number of programming infelicities. If you invoke a DA, such as Calculator, you will find a DA-sized hole in the screen when you close the DA. The screen can usually be restored by clicking in Chameleon's scroll bars, but it's an annoying defect, occasionally hanging the program altogether. Also, since the program doesn't offer the standard File and Edit menus, there's no way to cut and paste conversion factors to another program. Instead, you must write down the numbers and rekey them in the other application.

Although Chameleon does run under MultiFinder, nearly everyone who sees it asks, "Why isn't this a DA?" Indeed, a smaller version of the program, with many historical or otherwise curious units omitted, would make a spectacular 25K science/engineering DA. Spectrum Computing, however, defends its approach, saying that its intention is to provide an automated, foolproof replacement for a reference book—one that the user will consult relatively infrequently, but one that will also be well worth the price when the need arises.

Does It Add Up?

Spectrum's claim is valid. The program will pay for itself in a great variety of professional applications, despite its lack of such conveniences as direct export of conversion factors. Perhaps Spectrum will eventually supply the program as both application and DA. In the meanwhile, it's a competent utility tailored to its own niche market.—Charles Seiter

See Where to Buy for contact information.

More than an Upgrade

**MacProject II 1.0**

```markdown
Project planning software. Pros: Quick learning curve; enables you to monitor and plan projects; allows a lot of "what if" operations.
Cons: Uses nonstandard PERT chart, doesn't link resources and tasks closely enough.
Requires: 512KE.
```

Like an automatic transmission, MacProject II provides a way for novices to quickly get up to speed in a complex discipline, but it does so at the expense of some control and fine-tuning ability. Although people with no project-management experience will be pleasantly surprised at how quickly they can lay out and monitor projects, others may be frustrated by the program's non-standard PERT chart and the undisciplined method of creating a plan.

A Quick Study

MacProject II's quick learning curve comes partly from the direct method with which you create the Schedule chart, usually called a PERT (program evaluation review technique) chart. Tasks are represented by boxes that you create as you would in MacDraw. Dependencies between tasks (when one task cannot begin until a previous one has been concluded) are represented by lines connecting the two boxes. You can join tasks as you go, or you can create all the boxes and arrange and connect them later.

Although this is an easy way to create charts, it is not the way most professional project managers work. Normally, you plan tasks and dependencies using an outlining program or paper and pencil. Then you enter them into the project management software, which creates a PERT chart automatically. Also, standard PERT charts look nothing like MacProject II's Schedule chart. In PERT charts, lines represent tasks, and numbered circles (or other shapes) represent the beginning and end of the task. In MacProject II, shapes represent tasks. MacProject II also indicates critical path tasks—those which cannot be delayed without delaying the entire project—by displaying them in bold wherever they occur in the chart. Standard project managers string critical path tasks out along a straight line at the top of the chart.

Project-management practices and standards are not whimsy but have been...
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All this begs an obvious question: how can we offer so much functionality and still charge less for it?

The answer is software—software that enables your Macintosh to use its own resources to do the processing that would otherwise require costly additional hardware.

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Circle 177 on reader service card
developed over the last 30 years as the
clearest and most effective way to create,
depict, and monitor a plan. So while learn-
ing how to create a chart is simple with
MacProject II, actually creating a legible
one that represents a large and complex
project is difficult. Even after rearranging
things a good deal, you may end up with a
tangle of boxes and lines that's hard to fol-
low. But the standard approach demands
not only more training for using software,
but also a higher level of sophistication
with project management in general, since
a great deal of planning takes place before
you begin to use any program.

The problem of chart legibility occurs
only with the Schedule chart—MacProject
II creates all other charts automatically.
The Task Timeline represents tasks as hori-
zontal bars along a time line. It depicts any
slack time—for example, when you expect
to finish a task in one week, but you have two
weeks to complete it—as a gray append-
age to the task bar. The Resource Timeline
depicts resources such as tools or employ-
ees in a similar way, allowing you to see
clearly if a backhoe is scheduled to be used
in two places at once. The Resource Histo-
gram is a bar chart showing the planned
level of activity of a single resource. It will
warn you if, for example, the backhoe is
assigned an impossible 150 percent usage on
December 3.

One serious criticism leveled at the
original MacProject was that it did not al-
low you to monitor ongoing projects. In
MacProject II, you can enter the Actual
Start and/or Finish dates for each task. Mac-
Project II recalculates all other dates to
show new Actual Start and Finish dates.
You can also enter what percentage of each
task has been completed. The Task Tim-
eline depicts the completed portion as a
black bar beneath the task bar.

Project-planning software should en-
able you to experiment with rearranging
tasks and resources to see how changes
affect the project. MacProject II allows a
wide range of these "what-if" operations.
For example, to change two sequential
tasks into parallel ones, simply clear the
dependency line between them and recon-
nect the second task to the same box that
the first task is attached to. You can also de-
lay the start date of a task by dragging its
bar in the Task Timeline. Or, if resources
are overused, you can change the calendar
to include Saturday work or extend the
workday.

The ability to complete a project on
time depends heavily on resources. Mac-
Project II computes the relationship be-
tween resources and completion dates, but
the program doesn't go far enough. Say
you have a single task scheduled to take 5
days, but it requires 80 hours of work from
a key employee who has only 8 hours a day
to spend on the task. The program auto-
matically reports that the task will take 10
days, and changes the Actual Start and Fin-
ish dates of all activities to reflect the delay.
If an employee is scheduled to work on
two parallel tasks for 40 hours each, the
program shows the conflict on the Re-
source Timeline and Histogram, but it does
not reschedule the project. This means you
must add resources or go through the te-
dious process of rescheduling all tasks.

MacProject II versus the Rest

To call MacProject II an upgrade of
MacProject is to do its many new features
an injustice. Here's a short list of things
added to MacProject II: the ability to link
subprojects, the ability to calculate re-
source duration using percentage of effort,
optimal display of 16 attributes around task
boxes, eight different calendars, extensive
search modes, and more keyboard entry
items. Still, people who have already used
MacProject should be able to learn Mac-
Project II very quickly.

At present a Mac user's only other
choice in project-planning software is
Micro Planner Plus from Micro Planning
International. This product uses standard
formats and closely resembles mainframe,
mini, and IBM PC-based project-planning
(continues)
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Circle 82 on reader service card
software. The primary market for Micro Planner Plus has been professional project managers. Because of its nonstandard PERT chart, MacProject II will have difficulty making inroads in that area. If you intend to work with professional project managers who are accustomed to standard methods, and you are considering MacProject II, you'll have to decide if you can live with being a square peg in a round world.

But there are many more projects that need managing than there are professional project managers. More than a few executives find themselves knee deep and sinking fast in a quagmire of a project that has grown out of control. MacProject II can be a ready tree limb that executives use to pull themselves out of the mess and quickly get on top of things.—Lawrence Stevens

See Where to Buy for contact information.

Miles and Miles of Art

ArtRoom 1.0

Clip art and fonts on compact disk. Pros: Large quantity of artwork that doesn't take up space on a hard disk. Cons: User can't add keywords; libraries should be better organized to facilitate fast searches. Company: Image Club Graphics. List price: $99.99. (For information on package deals, call Image Club Graphics.) Requires: Mac with SCSI port; CD-ROM drive.

Kwikkee Inhouse Graphic Services' Art Department 1st and 2nd quarters, 1988


According to an insert in Image Club Graphics' latest catalog, a CD-ROM disk stores data on a spiral track 3 miles long. A single compact disk can store the equivalent of almost 700 double-sided floppy disks. The mind boggles! But lest you become overwhelmed by sheer quantity, take a minute before buying a CD full of graphics to consider other important factors: quality, ease of access, and whether the artwork is appropriate for your needs. I looked at two CD collections of clip art—Image Club's ArtRoom and Multi-Ad Services' Art Department, a component of their Kwikkee Inhouse Graphic Services—and I'm not convinced that CDs are state-of-the-art when it comes to canned art.

What You Get

Let's discuss content first. Image Club's ArtRoom disk contains approximately 1000 images created with Illustrator, MacDraw, and Cricket Draw, and saved in PICT or EPS (encapsulated PostScript) format. The disk also includes 50 PageMaker and ReadySetGo page templates and 100 decorative PostScript fonts. The images fall into standard clip art categories such as business, entertainment, travel, maps, sports, people, food, machines, and dingbats. You can paste a drawing into its parent program for editing, or place drawing directly into a page-layout program.

The images on the ArtRoom disk vary in style and quality. While many are finely crafted, others are simpler and could be drawn by anyone who is reasonably proficient with a graphics program. On the whole, however, I found Image Club's artwork skillfully executed. My main objection is that most of ArtRoom's people and animals are drawn in a cartoon style that, frankly, doesn't appeal to me. But judge for yourself: "ArtRoom Sampler" displays several ArtRoom illustrations.

While Image Club's graphics seem to be aimed at individuals, office art departments, or newsletter publishers, Multi-Ad's artwork is intended mainly for retailers and newspaper art departments. A large percentage of Multi-Ad's Art Department collection depicts brand-name and generic products likely to be found in a supermarket or drugstore; the advertising insert included with your Sunday paper may contain some Multi-Ad images. Subject areas for the more than 1000 Illustrator images include sports, leisure, performing arts, foods, consumer goods, maps, fashion, classified ad headings, and months (holiday and seasonal images are provided for each month). Illustrator is the only format these images are available in. Multi-Ad offers quarterly disks at this time; a $149 generic disk for nonadvertising applications is in the works.

As with Image Club's collection, Multi-Ad's images vary in style. The disk is divided into two folders, Product Art and Theme Art. Most of the food and product images are competently rendered but fairly prosaic—but that's what you'd expect from advertising art. The Theme Art images—fashion, seasons, travel, and so on—include realistic renderings as well as whimsical cartoons. "Art Department Sampler" shows some representative images.

(continues)
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<th>ABATON ProPoint</th>
<th>KENSINGTON Turbo Mouse</th>
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<td>Technology</td>
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Getting the Picture

Assuming one of the CD collections meets your needs, the next order of business is retrieving images. Both manufacturers provide their collections in PictureBase (a popular art cataloging and retrieval program), in addition to the original file formats.

The PictureBase Retriever desk accessory comes with both packages. It allows you to view each picture in a library, search the entire disk to find the image you need. Image Club’s disk allows you to place images displayed by the Retriever into PageMaker, ReadySetGo, XPress, and Scoop. Unfortunately, at this time Multi-Ad’s illustrations can be placed only into InHouse Layout Department, a customized version of XPress distributed by Multi-Ad Services. (Check with Multi-Ad Services if you wish to use another layout program; a future release should be compatible with several.)

So far the procedure for retrieving graphics seems simple: you’re working in a page-layout program and need a certain image; you select the PictureBase Retriever DA, search for the illustration by title or keyword, and place the picture in your document. Unfortunately, once you start looking for images you’ll quickly realize that you’re stuck with the organizational techniques of the disk’s manufacturer.

Users of art-organization programs are accustomed to setting up personalized systems, specifying their own categories, and adding keywords. But with a CD, you can’t add or delete keywords, nor can you organize libraries in a way that suits your work habits; the disk’s contents are etched in stone (well, etched in polycarbonate plastic, anyway). And since PictureBase Retriever doesn’t provide a master list of keywords, it’s up to you to guess what words might be attached to the image you’re seeking.

As I searched miles and miles of disk space, I became more and more frustrated. Image Club, for example, groups its artwork into the following PictureBase libraries: Headings, Humorous, Maps, Symbols, Mortices, and Clip Art. The Clip Art library is a 6000K catch-all for images that don’t fit in the other categories; further division into sublibraries would have been helpful. Fortunately, Multi-Ad Services did a better job of organizing its libraries. However, the image you need isn’t in the library you suspect it’s in, you’re obliged to search all libraries, which can be excruciatingly slow on a packed CD.

As you search, you must wait for each image to appear on the screen. Some of the images—especially Image Club’s—aren’t centered in the PictureBase Retriever window, forcing you to scroll in order to see the entire drawing. Worse yet, when searching by keyword you’re often treated to images totally unrelated to the one you’re looking for; since any keywords containing the word you type will cause the associated picture to display. If you search for car, for example, you’ll have to look at carrots, cartoons, credit cards, cartons, scary monsters, health care products, and so on.

You can always search by title, but the library organization problem applies to this method as well; if you don’t know which library a drawing resides in, you’ll have to search all libraries. Furthermore, the titles listed in Image Club’s printed catalog don’t always match those on the CD. When titles do match, the same title often applies to several drawings. Fortunately, Multi-Ad’s catalog is helpful and well organized.

One final problem: some drawings from each manufacturer contain several separate images. PictureBase Retriever provides no way to select a portion of a drawing, so you must either crop the drawing in your page-layout program or open the drawing with the parent program and separate it.

CD or Not CD?

As you can see, the technology for finding and retrieving clip art from compact disk is far from perfect. The problems I’ve mentioned are not entirely the fault of the clip art distributors—although more care should be taken in organizing material—nor of PictureBase Retriever, which was designed for hard disk-based collections. The problem lies with the medium itself; until users can write to CDs, more efficient methods of searching huge quantities of data must be found. An on-disk index would be a good start. Compact disks full of artwork are, in theory, a godsend for newspapers, art departments, and offices; it’s up to the clip art distributors to make them so in practice.—Effert Fenton

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Circle 147 on reader service card
Focus on Presentations

**PC Viewer** PCV 6488AV

*LCD projector and interface.* **Pros:** High-contrast image is easy to see; compatible with IBM, Apple II, and other PCs. **Cons:** Image deteriorates and clouds on older, hot projectors; requires fine-tuning for optimal image. **Company:** In Focus Systems. **List price:** $1695 for projection unit; $119 for Mac Plus or SE Interface. **Requires:** 128K.

**MacViewFrame**

*LCD projector and interface.* **Pros:** Requires no additional power supply; projects more than can be shown on the original Mac screen; IBM compatible. **Cons:** Image lacks sharp contrast found in the other two units and deteriorates on hot projectors; software INIT must be included in System Folder; not compatible with 512K or 512KE. **Company:** nView Corporation. **List price:** $1495 (includes interface for 512K, Plus, and SE). **Requires:** IMB, Mac Plus or SE.

**Flat-Top 1.02**

*LCD projector and interface.* **Pros:** Requires no additional power supply; projects more than can be shown on the original Mac screen; IBM compatible. **Cons:** Image lacks sharp contrast found in the other two units and deteriorates on hot projectors; software INIT must be included in System Folder; not compatible with 512K or 512KE. **Company:** nView Corporation. **List price:** $1695 for projection unit; $99 for Mac Plus interface, $195 for SE interface. **Requires:** IMB, Mac Plus or SE.

Until recently, the only way to present Mac screen images to large groups was with expensive, bulky, and finicky projectors and monitors. Now there are three new products—PC Viewer (model PCV 6488AV), MacViewFrame, and the Flat-Top—that feature specially designed liquid crystal display (LCD) panels that work with standard overhead projectors so you can display chalkboard-size Macintosh screen images on classroom or boardroom walls.

**Preview**

Since the Macintosh has no standard video-out port, all three viewers require installation of a jack that taps into the computer's video signal. Because of the lack of standards, you can't freely interchange the three viewers with each other or with other projection devices. Installation of any of these units requires that a licensed technician open up the Mac and plug one or more connectors into existing sockets or circuit boards.

After installation of the video port, all three units are simple to connect and operate. With the MacViewFrame and the PC Viewer, you must also connect the viewer to the Mac with a cable, plug the viewer's power supply into a 110-volt outlet, and plug the LCD unit into the Mac.

The Flat-Top draws its power directly from the Mac, so it doesn't require an electrical outlet. But unlike the other two units, the Flat-Top won't display what's on the Mac screen unless the Mac's System Folder includes a special 9K INIT file. When this INIT is installed, you have the option of sending exactly the same thing you see on the 512 by 342 Mac screen to the LCD screen. Or you can take advantage of the LCD panel's 640 by 400 image to display more of your desktop, your spreadsheet, or your tree chart without scrolling.

The Flat-Top has only one hardware control: a contrast wheel that you'll probably never move from the maximum position. The MacViewFrame has a contrast knob and a switch that reverses the dark and the light pixels. The PC Viewer's touch-sensitive panel has buttons to control brightness, inverse video, location on the screen, and sequencing—an adjustment that sometimes needs to be made to eliminate a sparkle effect peculiar to the PC Viewer.

The View from Here

What about the display? None of the three units produces the black-on-white contrast of standard overhead transparency foils; each uses its own shade of blue, green, or yellow. The PC Viewer has the highest contrast, with a display that is crisp and clear when fine-tuned to optimal settings. The MacViewFrame projects an image that isn't quite as high in contrast but doesn't seem to require as much adjustment to keep it sharp. The Flat-Top's contrast ratio pales when compared with the other two, but the lack of contrast is at least partially offset by its wider viewing area. None of the three viewers displays rapid movements without blurring.

I demonstrated the PC Viewer and the MacViewFrame to a local user group on a high-quality overhead projector. Members seated around the 200-seat hall preferred the PC Viewer's image over that of the MacViewFrame by a five-to-one margin.

When I tested all three units on consecutive days in a large classroom, though, the PC Viewer earned just one of about 180 votes; the MacViewFrame was the clear class favorite, earning about twice as many votes as the second-place Flat-Top. The difference in outcome of these two popularity
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Two Pages in One

Radius Two Page Display
19-inch-diagonal monochrome monitor.


Dedicated Mac users are perfectly comfortable with the nose-to-CRT pose encouraged by the Mac's classic 9-inch-diagonal screen. Nonetheless, even before Apple sanctioned the idea of larger screens with the Mac II, manufacturers began addressing the grumblings of a few obviously myopic malcontents by developing monitors readable from more than a foot away. Seriously, there are now many ways to supplement the Mac's screen, and one of the slickest is the Radius Two Page Display (TPD). If you usually work with graphics, engineering drawings, or spreadsheets, you may fall in love with the TPD. Those who work heavily with text may find Radius's Full Page Display (FPD) a better choice.

Seeing the Light
As the name suggests, the TPD is very nearly twice the size of the popular FPD. Whereas the FPD offers SE and Plus versions, the TPD is for the SE only (though there is an $1895 full-gray-scale interface card that allows you to use the TPD with a Mac II). Clarity is excellent at 1152 by 864 pixels, essentially the same density as the Mac screen. The high-contrast phosphor and fast screen-refresh rate do indeed make the large screen look paperlike, with no flicker, just as Radius claims.

Furthermore, the engineering in this product can't be faulted. If you install the TPD card yourself (absolutely not recommended—at these prices let the dealer do it) you will find a well-laid-out card with no hand-wired changes, and as simple an installation as is possible in the crowded SE. The monitor itself is a refreshingly clean design that minimizes weight (it's still 55 pounds) and sits on an adjustable stand.

The TPD system includes Control Panel software that allows you to place the SE and TPD screens next to each other and adjust them so that the cursor tracks without interruption between the two. A tear-off menu scheme lets you park most of the menus for your applications on the SE screen, leaving the TPD screen clear as a working area. A magnification feature displays blown-up sections of screen on the TPD or the SE. Sizing, centering, and zooming of windows can all be optimized through simple settings.

The TPD is compatible with nearly all best-selling software. The limitations are minimal: tear-off menus don't work under MultiFinder; scrolling, hierarchical, and HyperCard menus require special handling for tear-off; and the TPD doesn't support Switcher.

The $2400 Question
So, do you need a display system that costs nearly as much as a discounted SE with hard disk? Under certain circumstances, you might. If you work extensively with spreadsheets, you'll find this system ideal for displaying a year's itemized budget, month by month. The TPD isn't cheap, but it's a bargain compared to 19-inch color monitors for the Mac II. If you work with large graphics, you'll find using the TPD more efficient than using the scroll bars on an SE. In both financial and engineering applications, the use of Radius's $995 Accelerator (others are not TPD-compatible) is strongly recommended—the SE must write over five times the normal display area (SE plus TPD) and scrolling is slow in the stock system.

If your work is mostly text, the benefits of the TPD largely disappear. There is no comfortable desktop viewing distance for two pages of 10-point Helvetica, and screen curvature problems are exaggerated by close viewing. The per-letter pixel density is no better than the standard Mac display, so you can assess the readability issue for yourself. You could, of course, take the text up to 14 points, but then you have spent a lot of money for the privilege of reading your work from four feet away. For word processing applications, the Radius FPD is the better choice.

If you have a task that justifies the cost of a 19-inch monochrome monitor, the Two Page Display is a good choice. It provides a wonderful picture, and Radius offers superior technical support. With a TPD and a Radius Accelerator, the SE does a passable impersonation of a $10,000-plus workstation.—Charles Seiter

See Where to Buy for contact information.
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Circle 112 on reader service card
Low-Cost MIDI Interface Quartet

This review compares four low-cost MIDI interfaces for the Macintosh:

Apple Computer—Apple MIDI Interface.
Opcode Systems—Professional Plus.
Austin Development—MIDIface II.
Passport Designs—Passport MIDI Interface.

Information is provided on the number of MIDI inputs and outputs, external power supply requirements, and inclusion of required cables. All four interfaces require at least a Mac Plus.

By now you’ve probably heard about MIDI (musical instrument digital interface), the standard protocol that allows synthesizers to communicate with computers. There are over 200 Macintosh MIDI software packages in existence (commercial, public domain, and HyperCard MIDI stacks), and with the cost of synthesizers dropping to the $200 range, the MIDI boat is one you shouldn’t miss. There is one catch, though: to convert your synthesizer’s MIDI data into something the Macintosh can understand (and vice versa), you need a MIDI interface.

Variations on a Theme
To connect a Mac to MIDI devices, all you really need is an interface with one MIDI In port, one MIDI Out port, and a single cable (see “Room for Expansion”). Contrary to what you’d expect, this configuration doesn’t limit you to a single sound device. A synthesizer, for instance, has a third MIDI port labeled MIDI Thru that passes information it receives to additional devices in a setup referred to as a daisy chain. Timing delays introduced between each MIDI In and MIDI Thru port limit the size of such MIDI networks to four synthesizers. For larger networks, some interfaces include up to six MIDI Outs, bringing the number of possible devices up to 16 and allowing star systems, in which each device has a dedicated MIDI Out port.

The MIDIface II offers the high-end option of using the Mac’s two serial ports, allowing you to hook up two sets of 16 MIDI channels each. The result is a total of 32 MIDI channels, which can access 32 different sound sources simultaneously. It is possible to achieve the same effect by connecting one single-input interface to the modem port and another to the printer port. Either setup provides two discrete MIDI inputs that aid in synchronization applications.

Synchronizing a Mac with synthesizers, drum machines, tape recorders, and VGRs is a complicated process. Most sequencer and notation software now support the Song Position Pointer MIDI command. This feature permits devices to keep track of the number of elapsed 16th notes so that one device can instruct others to start at specific points on a track. Synchronization is possible using a single MIDI In, although synchronization while recording new data is not possible unless you add a somewhat costly MIDI merger peripheral.

Having two MIDI Ins circumvents this restriction.

Once you’ve dedicated the Mac’s serial port(s) to MIDI, you might wonder how you can access a modem or printer without continually swapping cables. High-end interfaces include built-in function switches, but for the MIDI interfaces reviewed here, you’ll need a switch box or two (add $50 to $100).

Apple MIDI Interface
Apple entered the MIDI world when it introduced its single MIDI Input, single MIDI Output, single port interface last January. If you’re new to MIDI and want to take the plunge with an inexpensive, easy-to-set-up, compact interface that requires no external power, this is the one for you. The $99 price, which includes two MIDI cables, makes it an excellent entry-level buy.

Austin Development’s MIDIface II
Many musicians have not heard of Austin Development’s interface because the company does very little advertising. This is unfortunate; MIDIface II is one of the two low-cost interfaces with two MIDI Inputs each assigned to three MIDI Outputs. (Word of a similarly priced two MIDI In, six MIDI Out interface, from Altech Systems, came too late for us to include the product in this review.) An internal switch (accessible by removing the back panel) can direct the modem port input to all six MIDI Outputs if desired. However, unlike high-end

(continues)

Four MIDI Interfaces

<table>
<thead>
<tr>
<th>Number of MIDI Ins and Outs</th>
<th>Apple MIDI Interface</th>
<th>Opcode Professional Plus</th>
<th>Austin Development MIDIface II</th>
<th>Passport Designs MIDI Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mac connections (printer/modem)</td>
<td>1 In, 1 Out</td>
<td>1 In, 3 Out</td>
<td>2 In, 6 Out</td>
<td>1 In, 1 Out</td>
</tr>
<tr>
<td>Ins assignable to Outs</td>
<td>1 In, 1 Out</td>
<td>1 In, 3 Out</td>
<td>2 In, 6 Out</td>
<td>1 In, 1 Out</td>
</tr>
<tr>
<td>Cables included (MIDI, Mac)</td>
<td>2 MIDI, 1 Mac</td>
<td>1 Mac</td>
<td>none</td>
<td>2 MIDI, 1 Mac</td>
</tr>
<tr>
<td>Power supply required</td>
<td>no</td>
<td>external (included)</td>
<td>internal</td>
<td>no</td>
</tr>
<tr>
<td>Dimensions (in inches)</td>
<td>2.625 x 1.25 x 1</td>
<td>1.25 x 3.875 x 1.575</td>
<td>3 x 5 x 2</td>
<td>1.25 x 4.5 x 2.5</td>
</tr>
<tr>
<td>Price</td>
<td>$99</td>
<td>$150</td>
<td>$119.95</td>
<td>$129.95</td>
</tr>
</tbody>
</table>

When considering MIDI interfaces, be sure to note that not all interfaces include the required cables and that additional cables can be costly. Also, none of the interfaces in this table will fit under the Mac; they must be positioned either alongside or behind it. Both Opcode and Passport offer high-end interfaces for additional cost.
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Circle 155 on reader service card
devices, which also have two MIDI Inputs and six MIDI Outputs, the internally powered MIDIface II cannot be used in place of a MIDI Thru box (a peripheral designed to reroute outgoing MIDI data) while the Mac is doing something else. The $119.95 price seems low, but keep in mind that it does not include the required Macintosh cable (about $30) or any MIDI cables ($18 to $25 per pair).

Opcode Systems’ Professional Plus
The Professional Plus is the descendant of the first Macintosh MIDI interface, Opcode’s MIDI Mac Interface. It has a single In, three Outs, and requires an external power supply (included). Essentially, the Professional Plus is one-half of Opcode’s popular high-end Studio Plus II interface minus the switches and status LEDs, at well over half the price. The Macintosh cable is included, but you will still need a pair of MIDI cables. With this in mind, the $150 price may seem steep. On the other hand, Opcode has a good reputation for quality and reliability. Opcode also markets a synchronization peripheral, the Timecode Machine.

Passport MIDI Interface
Passport’s interface specs out exactly like Apple’s: it’s an entry-level interface with a single MIDI In and MIDI Out, no power supply required, and all cables included. The unit is slightly larger than Apple’s and the price is slightly higher: $129.95. Passport also markets a high-end interface/sync box, the MIDI Transport, which provides many of the features offered by Opcode’s Studio Plus II/Timecode Machine combination. Passport discounts the interface when it’s bundled with Master Tracks Pro Sequencer.

All Shapes and Sizes
Although there are other interfaces with features similar to Opcode’s and Passport’s high-end models (for instance, Southworth’s Jambox series and Sonus’s Macface and SMX 2000), no single product has everything. So the number of Ins and Outs becomes a primary consideration when you are buying an interface. Also keep in mind the additional expense of cables, future expansion to a system with two Ins, and synchronization capabilities. You may even want to look at packages that bundle software and interfaces.
—Christopher Yawelow

See Where to Buy for contact information.

Real Color Now

**ColorBoard 104**
*24-bit color video card.* **Pros:** Provides near-photographic-quality color; eliminates banding. **Cons:** Expensive; slow; no official Apple support for 24-bit color; few input/output devices available; no software yet for developers; can’t revert to 8-bit color without rebooting.

**Company:** RasterOps. **List price:** $3195.
**Requires:** Mac II; color monitor. (ColorBoard 64 available for 13-inch monitor.)

![Standard color on the Mac II looks great, but it could look even better. At 24 bits per pixel, the Mac II is capable of displaying all of the 16.8 million colors into which Apple has divided the color spectrum. Currently, however, Apple supports only 8 bits per pixel, which limits the Mac to displaying 256 colors at a time. While it is difficult to imagine an original work of art with more than 256 colors, photographic-quality images require a much wider spectrum. The subtle shadings of real life quickly exceed Apple’s 256-color limit, and banding (visible transitions within color regions that should blend smoothly) results. Harnessing the Mac II’s 24-bit-per-pixel capacity solves the banding problem and renders images with life-like quality—every pixel on the screen can assume any of over 16 million colors.

But there are severe limitations to using 24-bit color. First, since Apple doesn’t yet officially support 24-bit color, most software companies are delaying development of 24-bit graphics applications. Second, input and output devices for 24-bit color are rare and expensive. Third, screen refresh is very slow because the Mac II draws the screen three times—one for each primary color. The problem will persist until Apple releases a version of ColorQuickDraw that directly supports 24-bit color.

RasterOps’ ColorBoard is one of the first 24-bit color video cards for the Mac II. RasterOps has squeezed three 8-bit primary-color circuits onto two cards, which are bolted together. Although the ColorBoard fits into one NuBus slot, it draws as much power as three normal cards, so you’ll need to be careful how many other..."
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Ask your Macintosh dealer about MacLinkPlus/Wang VS, or call us direct at (203) 866-4944.
cards you install. The board provides standard 72-dots-per-inch resolution (1024 by 768 on a 19-inch screen).

The software consists of a CDEV that you install by dragging its icon into the System Folder. The Mac II then boots up in the 8-bit mode and, as with Apple's standard color card, you switch between grayscale, 8-bit color, and monochrome using the control panel. To shift to 24-bit color, you double-click on the RasterOps icon in the Control Panel. To shift from 24-bit color back to one of the usual modes, however, you must reboot. To make all these changes more convenient, RasterOps includes QuickKeys—a utility that allows you to assign #key combinations to menu choices.

Works Fine, But . . .

In more than a month of using the RasterOps board, I found no serious bugs, nor did the board cause any system crashes. To get the 24-bit mode to work properly, however, you have to modify the System file or use the one supplied by RasterOps. Additionally, the cursor tends to flicker and change colors. But these are minor annoyances. Most software works fine with 24-bit color. (Apple has stated that the implementation of 24-bit color used by RasterOps should work properly with all software that follows Apple's 8-bit-color guidelines.) I pasted 24-bit color images into PageMaker, ReadySetGo, and XPress and resized, moved, and rotated them. Because the screen refresh rate is so slow (just try scrolling text and watching each line draw three times as it moves up the screen), I recommend working in the 8-bit mode when 24-bit color is not required.

Programs designed specifically to take advantage of 8-bit color, however, may have compatibility problems. For instance, when a 24-bit color picture is pasted into Modern Artist or PixelPaint, the entire screen breaks up into random colors, forcing you to reboot to return to normal. On the other hand, LaserPaint Color II can display 24-bit color images and can produce color separations. With LaserPaint, you can import images, such as those from PixelPaint, and display them in 24-bit color. The program also contains the only Mac driver for the Sharp JX 550 color scanner (one of the few ways a 24-bit color image can be imported).

Users hoping to do desktop publishing in color shouldn't expect too much too soon. Spot and line color can be done nicely at 8 bits per pixel. But screen images in 24-bit color look better than the output from 300-dpi printers. To get output as good as the screen image, you must use a 24-bit film recorder or high-quality four-color printing press, neither of which is currently available for the Mac.

How Much?

Price is sure to keep most users from considering 24-bit color. A 19-inch Trinitron monitor with the ColorBoard costs nearly $600. Some people would rather buy a car. A slightly less expensive alternative is RasterOps' ColorBoard 64, which has the same quality 24-bit color at the same resolution but works with a smaller 13-inch monitor. Though the savings on the ColorBoard 64 is only $600, the savings on, say, an Apple Color monitor versus the 19-inch Trinitron is $2700, so you can get a complete video setup for $3300.

Until RasterOps speeds up the performance of its ColorBoard and until more input/output devices and software are available, 24-bit color will remain an unjustifiable expense for most people. In a couple of years or so, however, 24-bit color may well be the affordable standard we wish it were now.—Scott Beamer

See Where to Buy for contact information.

Macintosh Rising

MacAstrologer 1.0


MacAstrologer generates nearly every type of popular astrological chart, as well as some more obscure ones. It was designed for use by people whose everyday chitchat refers to ecliptic coordinates and sidereal zodiacs, and it has been priced likewise—in a way that discourages casual dabblers. Although Macworld is not, of course, endorsing astrology per se, this program produces charts that a refined, artistic Libra would be sure to love, and it provides documentation to satisfy the fussiest Virgo.

Aspects of the Program

From a computing standpoint, astrological charts are the inverse of navigational charts. In celestial navigation, you use the time and the position of heavenly bodies to determine a location; in astrology, you are given the time and location (of a person's birth) and must then determine the position of the sun, moon, and planets. This has traditionally been done using sets of tables called ephemeris, but the tables are difficult to use and require multivolume sets to cover long periods of time.

MacAstrologer simply replaces all those tables with internal formulas for performing chart calculations. You enter birth
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time and place data in an input window; and a finished chart pops up in a second or so (all input/output functions are directed by dialog boxes in separate windows).

What sets this program apart is flexibility in chart presentation—using its design window, you can modify most features of data presentation for aesthetic appeal or interpretational emphasis. Chart types include natal, solar return, lunar return, composite (derived and midpoint), and progressed. MacAstrologer allows you to choose tropical or sidereal zodiacs, based on ecliptic, heliocentric, or right ascension coordinates for calculating those charts; and it displays Placidus, Koch, Porphyry, Equal, or Campanus house systems. All variations of the above may be crammed onto one chart or displayed separately (see “Solar Energy”). Through a series of dialog box choices, any calculable piece of information in the whole system can be presented or suppressed in a particular display.

Planetary Circuits
Although using a 68000 processor in support of this mystical view of man’s fate highlights some curious contradictions in our culture, there’s no denying that the resulting charts, particularly when printed on a LaserWriter, are spectacular and interesting in and of themselves.

Professional astrologers should note that MacAstrologer’s batch mode can store and process up to 50 client files at a time. This means that the program can compress about two weeks worth of chart drawing into a 20-minute automated session—that’s the program’s strongest economic appeal. Another plus is Full Phase Software’s customer support, which is prompt and helpful.

For simple recreational use, Graphic Astrology (version 2.3), a $39.50 program from Time Cycles Research, would be more appropriate. But for serious practitioners, MacAstrologer is a complete and well-designed system.—Charles Seiter

See Where to Buy for contact information.

Getting It Right

MacProof 3.0

Grammar, punctuation, and spelling checker. Pros: Desk accessory; can check part of a document; points out weak paragraph and sentence structure. Cons: Loses text formatting with some applications; can’t mark errors; doesn’t recognize words with curly apostrophes; misses many grammatical errors. Company: AIP Systems. List price: $195. Requires: 1MB; two 800K drives; hard disk recommended.

Sensible Grammar 1.1a

Grammar and punctuation checker. Pros: Suggests alternatives for problem words or phrases; can flag problems for later work. Cons: Can’t be used within a word processor; only checks whole documents; no spelling checker; misses many grammatical errors. Company: Sensible Software. List price: $99.95. Requires: 512K; hard disk recommended.

Even if you can’t tell a split infinitive from a subordinate clause, you’ll probably agree that proper grammar, usage, and punctuation makes writing more effective.

Word processors—even ones with spelling checkers—are fine for entering text, but they’ll accept “its OK” without batting an electronic eyelash. MacProof and Sensible Grammar claim to go a step further by pointing out flaws in wording and punctuation.

MacProofreader

MacProof is a desk accessory that scans text for mistakes in mechanics (including spelling), usage, and style. An easy-to-use checklist lets you pick which types of errors to look for. When it catches a potential problem, MacProof shows the suspect word or phrase in context, along with a short explanation (see “Checking It Out”). You don’t have to leave MacProof to edit the document, but you can revise only one sentence at a time.

The Analyze Structure function is supposed to help you recognize structural weaknesses by letting you look at your writing in different ways. For example, you can highlight the opening and closing sentences of every paragraph or the first words of every sentence. Analysis is minimal, though—it’s up to you to decide if you’re satisfied with what you see.

MacProof only examines selected text, so you can check a single word or an entire chapter. But with some applications (including Microsoft Word) all formatting dis-
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Because if your data means anything to you, acquiring Videotrax protection is a thought you should definitely entertain.
appears if you make changes in MacProof. (Of the programs I tried it with, MacProof worked perfectly only with MacWrite. It wasn't compatible with ReadySetGo 4.0 or a beta version of FullWrite Professional.) Just as annoying is MacProof's inability to recognize words with curly apostrophes like the one in "can't."

### Sensible Choices

Sensible Grammar isn't a desk accessory, so you have to quit the word processor you're working in to use it. (Running both programs under MultiFinder helps, but you still have to save a file before checking it.) Sensible Grammar handles Microsoft Word, PageMaker, MacWrite (version 4.5 or later), and plain text files. Once you've opened a document, there's no turning back—if you stop partway through, you lose any changes you've made. Sensible Grammar doesn't check spelling, and it can't display selected sentences and paragraphs the way MacProof can.

On the other hand, Sensible Grammar is more flexible than MacProof for reviewing manuscripts. I like the way it usually offers a list of suggestions when it finds something that might need correction (see "Suggestions, Anyone?"). Unlike MacProof, Sensible Grammar lets you mark problem areas for later attention; you can then deal with the flagged areas in a word processor. Sensible Grammar keeps track of homophones (like to and two), but it displays them in a separate window: whether you'll consider this a bug or a feature depends on how often you confuse such words.

### Failing Grades

To test Sensible Grammar's and MacProof's ability to verify grammar and punctuation, I ran a simple five-sentence test:

The captain wants to see me today. (I should be replaced by me.) Jack was more smarter than Jill. (More should be omitted.) A flock of birds come to stay every night. (Should read comes.) I feel horribly today. (Substitute horrible for horribly.) He came he saw he conquered. (Missing commas.)

None of these mistakes are especially subtle, yet neither program picked up a single one. (For the record, Doug Clapp's Word Tools, a competing application, couldn't detect any problems either.) On grammar and punctuation, both Sensible Grammar and MacProof rate an E.

The failure to detect those simple errors isn't too surprising when you realize that neither program is intelligent enough to understand what it reads. MacProof and Sensible Grammar work by comparing text against lists of troublesome words and phrases, so they do better at finding specific words that should be avoided because they're corny, pompous, sexist, racist, or just plain dull. MacProof and Sensible Grammar are more adept than most spelling checkers at spotting typos, especially words that aren't capitalized correctly.

It's a sure bet that these programs won't put editors out of business. If grammar and punctuation are your weaknesses, you'd be better off with a good writer's handbook. But if your prose suffers from overworked clichés and typographical errors, I'd recommend Sensible Grammar. Even though it's not as convenient to use as MacProof, in my tests it did a more credible job of pointing out problem words and offering reasonable suggestions for improvement. It's also easier to customize the phrase lists that Sensible Grammar bases its judgments on. At almost a hundred dollars cheaper, it's a better value than MacProof, too.—Franklin Tessler

See Where to Buy for contact information.

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### Machine Slaves

#### QuickShare


#### Lap-Link Mac 1.2


In addition to such networking solutions as AppleShare PC and TOPS, two new programs provide evidence that peaceful coexistence between Macs and IBM PCs is possible. QuickShare uses a PC card to link a Mac to a PC's hard disk, and should solve many file translation problems (although it only works in one direction—to the Mac). Lap-Link Mac is a slower file-transfer aid. It links serial ports but forces you to look elsewhere for file translation.

**QuickShare: Mac as Master**

If your Mac's an orphan with no hard disk, but you've got a PC lying around, you (continues)
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can use QuickShare to link the two and let the Mac use the PC’s hard disk as its own. QuickShare’s PC card provides a SCSI link between the Mac and the PC’s hard disk; the PC card has only one SCSI port so you’ll have to make sure that the PC disk is the last device on the Mac’s chain of SCSI devices. Installing the card in the PC is straightforward, and even though you can change the DIP switches on the card to avoid conflicts with other PC cards, I didn’t find it necessary to do so on two PCs with different configurations. QuickShare doesn’t give you access to all of the PC’s hard disk; it lets you create a special file of any size on the PC (called the virtual disk) that serves as the Mac’s portion of that hard disk. You access the virtual disk via the SCSI port. Setting up the PC with a program titled QUICKSRH.EXE enables you to use the virtual disk.

The Mac recognizes the QuickShare virtual disk as an ordinary Mac hard disk. Once you initialize the virtual disk, you can transfer System files and applications to it and even boot the Mac from that disk.

In addition to letting a Mac and PC share the same hard disk, QuickShare includes PC Transfer, a Mac program for transferring and translating PC files to the virtual disk. PC Transfer lets you transfer files in a byte-for-byte mode; you can transfer Lotus 1-2-3 WKs files for input into Excel, for example. Programs that operate on both Macs and PCs, such as Microsoft Word, PageMaker, and WordPerfect, can make good use of this option. For other programs, you can transfer ASCII files; PC Transfer strips line feeds from the PC file so that a program like MacWrite can read it. QuickShare’s QSPC program lets you capture PC print files in a format that can be translated (by PC Transfer) to MacPaint or MacWrite files for use on the Mac.

Lap-Link Mac: PCs as Master

Lap-Link Mac takes a different approach: it uses an ordinary RS-232 cable to link a Mac and a PC, and the program that controls file transfers resides on the PC. Because the PC side controls Lap-Link Mac, you need some familiarity with PC commands. The Lap-Link manual attempts to provide the necessary information on using PC commands, but some of the program’s structure would be unclear even to people who use PCs daily.

Lap-Link Mac is designed to transfer text-only files and files from programs such as Word, WordPerfect, PageMaker, Excel, and dBase II and III between Macs and PCs. Lap-Link Mac doesn’t attempt any translations between different types of files, it merely allows you to transfer files between both machines. If you plan to use a WordStar file on the Mac, for example, you can transfer the file with Lap-Link Mac, but you’ll have to use another program, such as Apple File Exchange or MacLink Plus, to translate the file. As for the file transfer, you could accomplish the same thing by using terminal emulation programs on both the Mac and the PC.

QuickShare’s file-transfer speed depends greatly on both the PC’s processor speed and the hard disk speed. Even at its slowest speed, QuickShare is still faster than Lap-Link Mac or MacLink Plus. Typical transfer rates with QuickShare are about the same as with Apple’s old non-SCSI HD20; in most instances, a QuickShare file transfer takes two-thirds the time of a transfer using TOPS. Lap-Link Mac takes about ten times as long as QuickShare. Also, although Lap-Link Mac’s raw data rate is 57.6 kilobits per second and MacLink Plus’s rate is 9.6 kilobits per second, Lap-Link Mac transfers files only about two to three times faster than MacLink Plus.

### File Formats

<table>
<thead>
<tr>
<th>Product</th>
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</tr>
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<tr>
<td>QuickShare</td>
<td>Any PC word processor — MacWrite</td>
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<td></td>
<td>PC screen dumps — MacPaint</td>
</tr>
<tr>
<td></td>
<td>ASCII text files (add/delete line feeds)</td>
</tr>
<tr>
<td></td>
<td>MacBinary</td>
</tr>
<tr>
<td></td>
<td>Byte Image (Lotus WKs, PageMaker, dBase III)</td>
</tr>
<tr>
<td>Lap-Link Mac</td>
<td>MacWrite, Microsoft Word, WordPerfect, Excel, PageMaker</td>
</tr>
<tr>
<td></td>
<td>ASCII text files (add/delete line feeds)</td>
</tr>
<tr>
<td></td>
<td>Any PC word processor — ASCII text file</td>
</tr>
</tbody>
</table>

Lap-Link Mac is compatible with MultiFinder, so you don’t have to slave the Mac to a PC. Once you start the Mac program of the Lap-Link Mac package, you can keep it running in the background under MultiFinder and let someone handle the file transfers on the PC.

### How Do They Stack Up?

The proximity of Macs and PCs in your office may be a deciding factor in selecting one of these programs. QuickShare requires that the Mac and PC be no more than 10 feet apart. Lap-Link Mac is a bit more forgiving because, although a Mac and PC must be close together, the Mac can serve as a gateway to a TOPS network whose volumes can be accessed by Lap-Link Mac.

Speed is an important factor if you’re transferring a large number of files. Because it uses the SCSI port, QuickShare is by far the fastest at transferring files. QuickShare and Lap-Link Mac can both handle ordinary text files, as well as file formats common to programs that currently exist on both Macs and PCs. QuickShare has more flexibility in handling the formatted output from PC word processors.

If you’re interested in high-speed transfer of lots of PC files to a Mac, QuickShare makes sense. QuickShare’s QSPC program is a clever way to convert PC word processor files into MacWrite files without special translators such as MacLink Plus’s. But remember, you cannot translate Mac files back to PC formats unless you use an extra program like MacLink Plus.

If you’re familiar with MS-DOS commands, you probably won’t mind using Lap-Link Mac for transferring files, but I can think of dozens of terminal emulation programs on the Mac and PC that can handle the same transfers just as well. Lacking file translation features, Lap-Link Mac isn’t anything special.—Dave Kosar

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

Edited by Eileen Drapiza

This section covers Macintosh products formally announced but not yet evaluated by Macworld. All prices are suggested retail. Please call vendors for information on availability.

SOFTWARE

Bid Analysis  Microsoft Excel template designed for any bidding situation. Features analysis of cost recovery probable on first successful bid, division of bid into components, bid adjustment, ability to integrate last-minute sub-bids, and to forecast risk exposure indicated by percentage of bid components. Allows you to massage the bid. 512K min. memory. $249. Hewpact Ltd., 613/389-3200.

CAD PAC  Desk accessory enhances MacDraw II’s accuracy and performance with four CAD extensions: sizing and reporting, adjacency, extend and clip, and filleting. Extensions have keyboard equivalents for fast activation. Works on rotated objects. 128K min. memory. Price to be announced. Paracomp, 415/543-3848.

CBT Development Stacks  Toolkit for developing and delivering interactive computer-based training. 1MB min. memory; requires second disk drive and HyperCard. $135. First Reference, 212/730-8211.

Chemlntosh  Desk accessory lets you draw chemical structures without quitting your current application. Includes standard application features like Undo, on-screen help, printing, and resizing objects. $295; educational discounts available. SoftShell Company, 716/334-7150.

ChemStack  Facilitates chemical structure construction and indexing. Includes major ring systems, compound types, and a full set of structural building blocks. Online manual explains new structure construction and adds new structures to the library for rapid retrieval and customizing. May be used in conjunction with DrawStructures. 1MB min. memory; requires HyperCard; hard disk recommended. $80; $40 for registered users of DrawStructures; educational discount available. Modern Graphics, 317/253-4317.

Cube and Tess  Cube is a computer-based version of the famous six-color cube puzzle. It can be manipulated by pointing and clicking. Combines single moves into sequences that can be replayed in forward or reverse. Tess is a 4-D version. Can also be used as an instructional aid to illustrate basic concepts of group theory in three and four dimensions. 128K min. memory. $24.95. Atlantic Software, 617/922-4352.

FontMaster ’88  Public domain font editor utility can create a large number of styles from a single font, and create font families. $20. Tauri SoftSystems, 416/690-5886.

Glatt Plagiarism Teaching Program  Tutorial instructs students about what constitutes plagiarism and how to avoid it. Teaches the difference between plagiarizing and paraphrasing, and when and how to provide proper attributions. Includes Self Plagiarism Detection Test for immediate feedback. $250. Glatt Plagiarism Services, Inc., 916/483-8773.

HyperAtlas  Allows access to geographically based data in HyperCard stacks. Comes with basic data for countries, and users can also use the map interface to display their own data. Country names on maps are linked to information stacks containing cards for each country. $99. MicroMaps Software, Inc., 609/397-1611.

HyperBase-Home  Replaces the Home Stack that comes with HyperCard. Features simple stack installation. Lets you launch applications or stacks from HyperBase-Home, and returns to it on quitting. Unlimited number of installed stacks; fully compatible with MultiFinder; built-in text editor, screen saver, and HyperHelp. Lets you Copy, Delete, Rename, Get File, Create New Folder, and open and delete stacks from HyperBase-Home. $20; free 30-day trial version available on CompuServe and GEnie. HyperBase Software, 58 Waverley St., Belmont, MA 02178.

HyperText ’87 Digest  Stand-alone hypertext document containing summaries of more than 100 position papers written by leading authorities. Contributors include Ted Nelson, K. Eric Drexler, Esther Dyson, Frank Halasz, Kirk Kelley, Stephen Weyer, and Nicole Yankelovich. Topics range from storage management for global hypertext libraries to hypertext applications in linguistics, archaeology, and medicine. 512KO min. memory. $10. Eastgate Systems Inc., 617/782-9044.

KeyCap Fonts  Consists of three font sets: KeyCap Ovals, ASCII screen-graphics characters, and gray half-tone boxes. The sets include pictures of computer keys and screen images in document files. 128K min. memory. Requires a PostScript printer. $149.95. Paperback Software International, 415/644-2116.

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Macblasting Communications package comes with standard terminal emulation, including DEC VT100/VT200 and Data General D200. Supports MultiFinder for background file transfers. Includes auto-dialing and auto-log in to remote computers, automated modem support, and scripting. IMB min. memory. $195. Communications Research Group, 504/923-0888.

MacGallery Clip art collection of more than 400 original images covers topics such as holidays, sports, food, special occasions, nature, fantasy, religion, phrases, teddy bears, mortise cuts, and borders. Available as HyperCard stackware or as MacPaint files. Includes reference guide. $49.95 plus $2 s/h. Dream Maker Software, 213/221-6436.

Mac Personal Class Stackware for personal information organization in areas such as family records and investment and insurance data. Features automatic installation on your home card, self registration, and detailed online help screens. IMB min. memory $59 plus $3.50 s/h. Quadimation, Inc., 408-985-8984.

Milo Mathematical problem solver combines WYSIWYG technical word processor, symbolic algebra program, and graphics tool. 512K min. memory. $250. Paracom, 415/543-3848.

The Movie Stack HyperCard stackware features over 400 movie titles available on video or laserdisc. Movies are listed with title, stars, director, year of production, rating, category, and descriptive keywords. IMB min. memory; requires HyperCard. Movie Stack $39.95; set of two $70. Southeastern Software, 504/246-8438.

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PC MacTerm    Works with pcAnywhere III to let users run a PC from a Mac, through a modem or direct cable connection or on a LocalTalk network. Requires System version 4.1 or later. $99. DMA, 212/687-7115.

Printer Interface II    Utility package that serves as printer driver allowing the Mac to communicate with non-Apple printers such as serial typewriters and serial printers. $95. DataPak Software, Inc., 818/905-6419.

QuickMail    E-mail desk accessory offers real-time conferencing, personalization, prioritizing, return receipts, and message management. 512KE min. memory. $300 for ten-user package. CE Software, 602/224-1995.

SongBook Albums    MIDI song files of original arrangements plus pop and soft rock tunes from the '60s, '70s, and '80s, and classical and jazz works. Detailed program notes including biographies, historical highlights, instrumental scoring, and tips on MIDI realization enclosed with each disk. Each album $34.95 plus $3 s/h; all four disk albums $125 plus $6 s/h. SynComp Productions, Inc., 217/351-6478.

Symbol Libraries    Architectural libraries include plan view symbols for residential floor plans, electrical and wiring layout, and office layout. Library of formats for A through E sizes. For use with Snap 2.02. $69 to $150, depending on library. Data Basics, Inc., 803/878-7484.

Techman Vol. 1    Clip art collection of more than 60 images of popular computer systems, including models of IBM and VAX mainframes and workstations, DEC peripherals, and other personal computer workstations. MacDraw and CricketDraw PostScript graphics in PICT format. 512KE min. memory. $79.95. Alsek Productions, Inc., 602/961-3686.

TX802 PRO    Integrated editor/librarian for the Yamaha TX802 synthesizer and the Mac. Simplifies and enhances the operation of the TX802 by presenting user with a full view of the synthesizer's inner workings on a computer screen. Special features include the ability to edit envelopes and scale curves graphically. Provides bands and libraries that can hold hundreds of voices or performances. 1MB min. memory. $395. Digital Music Services, 714/951-1159.

HARDWARE

AminoPath Laboratory System    Pathology lab system for complete information management based on Mac SE or II. Maintains complete information for patients, referring physicians, department staff, staff pathologists, surgical and cytology specimens, and diagnostic texts. Provides instant retrieval of all diagnoses made on any patient. Mac SE $14,225; Mac II $19,995. Small Business Computers of New England, 603/673-0228.

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Attorney at law, Henry Maretz, was asked why he chose Microtech...

A few years ago, while my son was at Harvard, I bought him a Microtech 800k floppy disk drive for his Macintosh. I think I was one of the first to buy one - in fact Microtech had just released the product. I remember they were hard to get at the time. Well, my son's graduated now and working in the computer field, but he's still crazy about his Mac - and his Microtech drive. He even started to convince me that I should have a Macintosh computer and Microtech drive for my law practice. Well believe me, he can be pretty convincing.

I began to do some research. I was already impressed with the Macintosh, but I knew I would need a hard drive. I called Microtech again and was glad to find their selection of internal and external hard drives to be quite extensive. When I heard that Microtech drives were chosen by my alma mater Dartmouth, I was becoming even more convinced. I am familiar with Dartmouth's incredible computer network. Then when I realized that Microtech was offering a 5 year warranty on their hard drives, I needed no further persuading. From personal experience I knew Microtech would be around long enough to give me the service and support I was looking for. Once I was sold on the Mac, I was definitely convinced Microtech had to be the right choice - no, the only choice - for a hard disk drive, just as it had been for my son's 800k drive a few years ago."

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ETAP Nefts, ETAP Atris  72-dpi full- and two-page monitors for Mac SE and II; refresh at 75 Hz, noninterlaced. Paper-white phosphor with high luminance. Includes toggle between standard Mac display and the large screen. Contact company for prices. ETAP Information Technology, Steenovenstraat 1A, B-2150 Malle, Belgium, 0132310411.

Four + One Communications board for the Mac II adds four serial interface ports, plus a 2400-baud, industry-standard modem. Supports Mac operating system and A/UX. $949. Tara Systems Corporation, 619/481-7109.

High Capacity Series I  SCSI hard disk subsystem; 16.5 ms average access time. HCS-mac 150E provides 146MB formatted storage, while HCS-mac 300E provides 299MB. Mac 150E $34.99; Mac 300E $43.99. N/Hance Systems, 617/461-1970.

Newbuilder Editorial Workstation  Mac II-based workstation offers features of traditional systems. Programmable keyboard can combine multiple keystrokes for speed editing. Lets editors flow copy in actual font into multiple columns and jump stories to multiple pages. Dictionary-based hyphenation, spaceband and white space control; manual and table kerning. 4MB min. memory. $9495 to $13,995 depending on hardware and options. Digital Technology International, 801/226-2984.


TeleNode  Device allows remote access to a LocalTalk network, peripherals, and services over regular telephone lines. $595. DataSpace Corporation, 800/387-0492, 416/474-0113 in Ontario.

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ACCESSORIES

Comp-U-Lock One Plus (no drill) CLIPTM Single-lock system requires no drilling or other modifications to equipment for installation. Mastic-coated steel plate attaches to underside of the machine to secure to a mastic plate on the desktop. $48.95; two-lock system $89.95. Versa Lock, Inc., 800/248-5625, 800/642-5625 in California, 818/886-8962.

Mac Cozy Computer covers in loud Hawaiian Hula or Leopard print; 100 percent cotton lining. $10 to $45 depending on configuration. The Chicken Boy Catalog for a Perfect World available. Future Studio, 213/660-0620.

Macintosh Upgrade Book Contains information about various Mac configurations and tips on attaining desired performance. Describes good and bad points of various features found in upgrades. 52 pages. $2.95. Computer Quick, 213/941-7951.

Pro-Tech Laser Labels Self-adhesive, white or clear labels withstand high temperatures of laser printers. 2¾ by 1 inch, formatted three across and ten down on 8½-by-11-inch sheets. Packages of 25 or 100 sheets. $10.95 to $174.95 depending on quantity and type. James River Corporation, 603/636-1154.

STAX Lockable and stackable disk storage units come with 5 color-coded dividers for indexing. $29.95. T.S. Microtech, Inc., 213/644-0859.

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"You do have a right to make a back-up, that's true. But when you start copying programs for your friends and co-workers, that's breaking the law."
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"That's all right, I won't get caught."
"You're missing the point. The issue isn't "What can I get away with?"—it's "who am I hurting?"

Remember, lots of people worked hard to produce every program you use: designers, programmers, distributors, retailers, not to mention all the people who support users. They have a right to be compensated for their efforts, and their major compensation is through software sales."
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Quick Tips

Answers to your questions

by Lon Poole

As I mentioned in a previous column (April 1988), you can prefix folder and document names with spaces or symbols to determine where the names appear in the Open dialog box or the Finder's By Name view. But Andy Hong of Menlo Park, California, notes that the Finder won't let you simply insert a space in front of a name. To fool the Finder, you must type a non-space character-for example, by pressing the Left Arrow key followed by the Backspace (or Delete) key.

Stack Fonts II

In response to a tip in an earlier issue, I said that you could use Font/DA Mover to move fonts into HyperCard stacks. But Bruce Long, who submitted the tip, points out that Font/DA Mover cannot install fonts in stacks or other documents that have no resources. If you try, the utility informs you that the file you're trying to open may be damaged or in use. Because most stacks have no resources, Long suggests using ResEdit to copy fonts into stacks.

Stack Fonts II (continued)

You can't identify a button using the word this. Instead, use the Target function, which identifies the object that first received the current message. You can also use the special object Me, which identifies the owner of the current handler. Try either of these scripts:

on mouseUp
  go stack short name of the target
end mouseUp

or mouseUp
  go stack short name of me
end mouseUp

Enormous Word Documents

While trying out Microsoft Word 3.0 at my local dealer, I decided to find out how many pages Word could handle. So I wrote a sentence, copied it, and pasted it many times. When I tried to save this document on an 800K disk, an alert box said, "Not enough space on disk to save work." In the lower-left corner of the Word window was the cryptic message, "5531201 Cha." My dealer couldn't explain it; can you?

Stefan Johansson
Malmo, Sweden

Although theoretically there's no limit to Word document size, practical limits intrude when a document gets very large. You discovered one such limit, namely that the whole document must fit in the space available on a disk. The document you created would have been over 500K. An empty 800K disk has space for slightly less than one-sixth of that. You might have been able to save your mammoth document on a hard disk, although saving 500K would have taken ages. I've found Word documents over about 200K aren't worth the wait. Word lets you split a long document into manageable pieces and link the pieces together with a special feature of the Page Setup command (described in the Word manual under "Long Documents").

You might think your 5-megabyte document would be too big for your Mac's 1MB memory. Word uses "mirrors" to let you paste together a document larger than the available memory. What you see on screen are reflections of the original text. However, Word doesn't save reflections on disk. It needs space to store real text.

Text Style Changes in Bulk

Is there a way to change text style throughout a document using one command in a word processor such as Microsoft Word, MacWrite, or WriteNow? The grant and research proposals we write at North Texas State University require italicized scientific terms that may each appear as many as 50 times in a 300-page paper.

John F Vickrey
Denton, Texas

A word processor with style sheets at the character level would make your task easy. However, no currently available Mac word processor has them. Word 3 for the Mac has style sheets at the paragraph level only (the IBM PC version of Word has had character-level style sheets for years—growl!). New word processors such as FullWrite Professional, WordPerfect, and the next version of Word may include character style sheets.

In the meantime, you can change the text attributes of a specific word or phrase throughout a Word 3 document using the Change command from the Search menu. First, find an instance of the text you want changed and give it the attributes you want it to have. Select and copy that text to the Clipboard. Click at the beginning of the document and choose the Change command. Type the text you want to find in the Find What box, and type ^c (lowercase c) in the Change To box. This tells Word to replace each instance of the original text with the contents of the Clipboard.

Lon Poole answers readers' questions and offers advice in his monthly Macworld column. Many of the tips he's compiled can be found in his book Mac Insights (Microsoft Press, 1987).
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  Type: Helvetica & Freestyle Script

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Word notes how the Clipboard text deviates from the normal character format of the paragraph from which it came, and applies the same deviations to the normal character format of each instance of the text to be found. This method works best if all the text being changed appears in paragraphs that have similar character formats. Applying a character style to text within a paragraph that’s already in that character style will cancel out your style selection. For example, if you change a word to italic in a paragraph whose normal style is italic, the word will be in plain text rather than italics in that paragraph. For another method, see the Rich Text tip below.

**Q** Those Memory Leftovers
**A** After upgrading my Mac SE’s memory from 1MB to 2.5MB, the dealer gave me back the two 256K SIMMs. What can I do with them?

*Eric R. Krebs
San Francisco, California*

Save your leftover SIMMs for a holiday cheese ball. They can’t be used in a Mac Plus or an SE because of those machines’ memory configuration requirements (see “Installing Memory,” May 1988). Four 256K SIMMs (but not just two) can be added to a 1MB or 4MB Mac II, but a Mac II requires 120-nanosecond memory — and memory from an SE or a Plus is usually rated at 150 nanoseconds. The slower memory may work in a II, but then again it may not. Perhaps the two 256K SIMMs in your Mac will die and you can replace them with the extras.

**Q** Editing Landscape Pictures
**A** We use Adobe Illustrator to create most of our company’s graphics. To get templates, we scan artwork using a Microtek 300A at 72 dots per inch. Some of the artwork is horizontally oriented. Because we must scan it vertically, we need to rotate it in a MacPaint-type program before using it in Illustrator. We can do the rotation in MacDraw, but we can’t edit the scanned image there. Are there any paint programs that handle wide documents?

*Mike Penn
Pittsburgh, Pennsylvania*

_A Macworld contributing editor and resident graphics specialist Erfert Fenton says Canvas ($195 from Deneba Software, 800/622-6827 or 305/594-6965 in Florida) can do what you want. Before pasting the scanned image, use Canvas’s Page Setup command to select Landscape Orientation. After pasting, use the Rotate 90° command from the Effects menu to turn the scanned image.

**Control Panel Order**
**Tip:** By renaming files in the System Folder that correspond to options and devices in the Control Panel — using System 4.1 or higher and Control Panel 3.1 or higher — you can easily rearrange them in any order that suits you. (Normally, General appears first, and all other items appear alphabetically after it.) Another method is to put numbers in front of the original names (see “Order Please”). To rename some files — including General, Color, Keyboard, Monitors, Mouse, Sound, and Startup Device — you have to duplicate them (use the Finder’s Duplicate command), rename the copy, and throw away the original.

*Paul R. Pudlak
Urbana, Illinois*

**Rich Text**
**Tip:** Word 5’s ability to save a document in Rich Text Format, which it calls Interchange (RTF), does far more than facilitate communication between computers. It also lets you easily change text attributes (font, size, and style) and make other formatting changes throughout the document.

(continues)

Order Please
By renaming (or numbering) the appropriate files in the System Folder, you can change the order of the options and devices listed in the Control Panel. Here, Stepping Out II, a screen extender, has been placed at the top of the list.
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**DIGITIZERS/SCANNERS**

<table>
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<tr>
<th>Product</th>
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<tr>
<td>AST Turbo Scan</td>
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<td>Data Copy</td>
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<td>Dateline Interface Kit</td>
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<td>Koala MacVision 300 DPI</td>
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**SOFTWARE**

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<tr>
<td>MIGENT In-House Accountant</td>
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<td>ABA Draw-It-Again Sam</td>
<td>95.00</td>
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<td>Ashton Tate dBase Mac</td>
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<td>CE Software Quick Keys</td>
<td>69.00</td>
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<td>Cricket Software Cricket Draw</td>
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**ACCESSORIES**

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<td>Allsop Disk File 30 Holds 30 3½” Disks</td>
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<td>Allsop Cleaning Kit for 3½” Disks</td>
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<tr>
<td>Curtis 3 Outlet, Duplex/Filter</td>
<td>48.00</td>
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<tr>
<td>6 Outlet, 6’ Cord/Filter</td>
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<td>6 Outlet, 6’ Cord/Duplex</td>
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<td>Mac 101 Keyboard Plus</td>
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<td>Kalmar Designs Teakwood Disk Cabinet for 3½”</td>
<td>13.99</td>
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<tr>
<td>Kensington Turbo Mouse</td>
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<td>Turbo Mouse ADB</td>
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<td>Tilt/Swivel</td>
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<td>Disk Drive Cleaning Kit</td>
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<td>Microcomputer Accessories, Inc. Macintosh Valet</td>
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<td>PTI/Datasheild S-85/Surge Protector</td>
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**DISKS**

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<tr>
<td>Sony 3½” SS/DD</td>
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To convert a document to RTF, use Word's Save As command. In the Save As dialog box, click the File Format button and then select the Interchange (RTF) option. Enter a new document name and click the Save button. You'll then get a new plain-text document with mnemonic codes for every format. For example, the three characters \ul indicate underline style. You can replace one format with another using Word's Change command (changing \ul to \vi converts underline to italics).

When you finish changing formats, save the document and close it. Then open it again, answering yes when Word asks whether it should interpret RTF codes. A little while later, you'll see your document with the formatting changes.

Jan Bruynodenhof
Hove, Belgium

Changing styles and sizes of individual words is easy if you know the RTF codes (see "RTF Character Formats"). Changing fonts of individual words is more complicated. RTF encodes fonts by number and correlates fonts and RTF font numbers in a font table at the beginning of the document. If you want to change a font that's not listed in the font table, temporarily add some text in that font to the regular, non-RTF version of the document and then resave it as an RTF document. Immediately following the font table, RTF encodes all the document's style sheets. You shouldn't need to change any of them in the RTF version. Instead, make the changes in the non-RTF version using the Define Styles command.

Note: During the conversion to and from RTF, Word may lose tab settings you've put in paragraphs' formatting rulers. It doesn't seem to lose tab settings in style sheets, however.

For complete RTF documentation, call Microsoft Customer Service at 206/882-8088 or write to Microsoft Corp., RTF Applications, Box 97017, Redmond, WA 98073-9717.

MultiFinder Compatibility

Tip: A few applications don't work properly with MultiFinder. To avoid accidentally opening an incompatible one, set its application memory size to a number larger than the amount of memory on your Mac, such as 9999. This prevents you from launching the application with MultiFinder active but still allows you to open it when MultiFinder is inactive. To change the application memory size, make sure MultiFinder is active, select the application icon, and choose Get Info from the Finder's File menu.

Christopher Eliot
Leeds, Massachusetts

Multifaceted Excel Macros

Tip: By combining multiple Excel command macros, you can run them in rotation with the same Option-X-character key combination. As a simple example, one macro can cyclically change the alignment of the current worksheet selection (see "Schizoid Macro"). Each time you run the macro, it changes to the next alignment in its cycle: left, center, right, and repeat.

Calvin Walker
Potts Point, NSW, Australia

<table>
<thead>
<tr>
<th>Code</th>
<th>Format</th>
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</thead>
<tbody>
<tr>
<td>\plain</td>
<td>Plain</td>
</tr>
<tr>
<td>\b</td>
<td>Bold*</td>
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<tr>
<td>\i</td>
<td>Italic*</td>
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<tr>
<td>\strike</td>
<td>Strikethru*</td>
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<tr>
<td>\ouit</td>
<td>Outline*</td>
</tr>
<tr>
<td>\shad</td>
<td>Shadow*</td>
</tr>
<tr>
<td>\sycaps</td>
<td>Small caps*</td>
</tr>
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<td>Expand or Compress x quarter-points (negative x compresses)</td>
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<td>Word underline*</td>
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<td>\uld</td>
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<tr>
<td>\dnx</td>
<td>Subscript x half-points</td>
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</tbody>
</table>

*Can be turned off by repeating the format code with a suffix of zero (0).

**A font table at the beginning of the document correlates fonts and font numbers.

RTF Character Formats

To change the attributes of individual words throughout a Word 3 or MacWrite document, change their text attribute codes in the Rich Text Format (RTF) version of the document. Then convert the RTF version back to the regular Word or MacWrite format.

Schizoid Macro

Each time you run this Excel macro, it changes the worksheet selection to the next alignment in this cycle: left, center, right, and repeat. Cell A15 in the macro keeps track of the cycle. You must name cell A3 "left," A7 "center," and A11 "right."

Richard C. Johnson
Baton Rouge, Louisiana

SuperPaint Line Length

Tip: If you need to shorten or lengthen several lines in SuperPaint's drawing layer, select them all and choose Scale Selection from the Edit menu. Select or enter the amount of scaling needed (for example, scaling by 200 percent doubles the line lengths). Then click OK.

Richard C. Johnson
Baton Rouge, Louisiana

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Getting Started with CAD

CAD programs are making life easier for engineers, designers, and architects. Here's how.

by Jim Heid

This is not a good time to be in the T-square manufacturing business. Computers are replacing traditional drafting tools in the same way that word processors are supplanting typewriters. Computer-aided-design (CAD) programs can turn computers into electronic drafting tables that make it easier than ever to create and revise complex drawings.

CAD was born in the sixties, when some automobile and aircraft manufacturers began using mainframe computers and large graphics terminals to design such complex beasts as cars, planes, and missiles. Since these computer systems cost millions of dollars to buy, and hundreds of dollars an hour to run, CAD's benefits were reserved for the few who could afford them.

As the cost of computers shrunk and their capabilities grew, CAD became feasible for smaller firms. Shortly after microcomputers debuted, CAD appeared on desktops, though the Mac, despite its superior graphics, wasn't part of the picture. Using the Mac's 9-inch screen to view blueprint-size CAD drawings would be like viewing the ceiling of the Sistine Chapel through a keyhole. But now with big screens available for nearly every model of Mac, and more important, with the Mac II's increased speed, the Mac is becoming a force in microcomputer CAD.

What is CAD? To answer that question, I had to get started with CAD myself. My guide was David Peltz, a fellow Macworld contributing editor who operates CAD-ventures, a CAD consulting firm in Chatsworth, California. (For more details on Mac CAD software, see Peltz's feature "2-D CAD: A Landscape View," Macworld, July 1988.)

It's Object Oriented

At its foundation, CAD is object-oriented drawing, a system that stores drawings as a series of individual objects—circles, boxes, arcs, lines, and so on—that can be easily resized and otherwise altered. The other common form of Mac drawing is bitmapped drawing—MacPaint-style drawing, where images are stored as a series of on and off bits corresponding to the black and white pixels on the screen (see "Getting Started with Macintosh Graphics," Macworld, August 1987).

CAD's three basic drawing categories are mechanical, architectural, and electrical engineering (see "Three Faces of CAD"). Mechanical CAD is the broadest category. It involves the design of objects: cars, planes, trains, machine parts, lamp shades, thumbtacks—you name it. Most mechanical CAD programs create two-dimensional drawings; only a few can create three-dimensional drawings (see "CAD Variations").

Architectural CAD, as you'd guess, involves the design of buildings. Architects create many kinds of drawings: elevations depicting a building's profile; floor plans showing room dimensions, door locations, and furnishings; and maps of a building's plumbing, heating, and electrical systems. Many CAD programs provide drawing tools for creating parallel lines, making it easy to draw walls. Some architectural CAD programs let you create a 3-D view that you can rotate and examine from different angles.

(continues)
How To/Getting Started

Three Faces of CAD
Examples of the three primary CAD types: an architectural drawing created in PEGASYS (top), a mechanical drawing created in VersaCAD (middle), a schematic diagram created in PEGASYS (bottom).

Life with a CAD

If you suspect software with this kind of power is complex, you're right. Forget diving into a CAD program without opening the manual. You'll need days or weeks of practice to master the hundreds of drawing, measuring, and annotating features that a powerhouse CAD program provides.

If you've used Apple's MacDraw, you have a head start. From the features standpoint, MacDraw is to a CAD program what a tricycle is to a Harley-Davidson, but there are similarities in their basic approaches to electronic drafting. You begin with a blank, untitled document window, and create a drawing by choosing tools from on-screen palettes, using the mouse to draw shapes. (Many CAD devotees shun the mouse in favor of a graphics tablet—a flat surface on which you scrawl with a stylus. A stylus and tablet feel more like a pen on paper, and they provide greater precision than a mouse.)

To help you draw straight lines and position objects accurately, MacDraw and CAD programs provide a snap-to feature that causes the mouse pointer to be drawn to an invisible grid as it moves. But CAD programs offer more ways to snap. For example, most programs let you specify that an object snap to a particular point on another object, or to the point where two objects intersect.

MacDraw provides tools for drawing several different shapes, but a CAD program's palettes bristle with specialized tools that make creating complex drawings easier. Geometric facilities replace compasses and protractors and allow you to quickly draw objects requiring calculations or measurements. Need to measure an angle or calculate the midpoint of a line? Want to draw a line perpendicular to a

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     - Finance, banking, accounting, insurance, real estate
     - Government
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     - Legal services
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     - Transportation, communications, utilities
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     - Computer retail
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     - Manufacturer (computers, software, peripherals)
     - Service bureau
     - VAR/systems house/integrator
     - Other (specify) ____________________________

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   - Project manager/chief/group leader
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   - Engineer/scientist
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   - Microcomputer specialist/manager/analyst
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   - Educator
   - Professional (lawyer, doctor, etc.)
   - Other (specify) ____________________________

3. Department or function (check only one)
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   - Administration/Management/personnel
   - Consulting
   - Education/Training
   - Engineering/Research and Development
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   - Microcomputer center/Office automation
   - MIS/DP
   - Purchasing
   - Sales/Marketing/Distribution
   - Other (specify) ____________________________

4a. Does your company own or lease any mainframe computers at this location? [ ] Yes [ ] No
   - IBM
   - Other (specify) ____________________________

4b. Does your company own or lease any microcomputers at this location? [ ] Yes [ ] No
   - IBM
   - DEC VAX
   - Sun/Apollo
   - 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 [ ] No
   - Macintosh
   - IBM
   - DEC VAX
   - Sun/Apollo
   - Other (specify) ____________________________

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

   - Macintosh
   - Software
   - Networks & Peripherals
     - A. Approve purchase
     - B. Develop/Manufacture
     - C. Evaluate/Select Vendor
     - D. Own one
     - E. Own two or more
     - F. Purchase or acquire
     - G. Establish specifications
     - H. Recommend to others
     - I. Sell
     - J. Train people to use
     - K. Use
     - L. No involvement
     - Z. Other (specify by name and quantity) ____________________________

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

7. Do you recommend, buy, specify or approve microcomputers, software, and/or peripherals? [ ] Yes [ ] No
   If yes, please indicate for how many Macintosh personal computers you have this involvement (check only one)
     - A. 1-3
     - B. 4-9
     - C. 10-19
     - D. 20-49
     - E. 50-99
     - F. 100-499
     - G. 500+
     - H. None of the above

8. 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. Please list below any individuals at this location who also help to recommend, specify, acquire or approve the purchase of computer systems, peripherals, software or services to whom you would like us to send a complimentary subscription of Macintosh Today.

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CAD Variations

CAD doesn’t always mean blueprints and schematics. Computers can aid the design process in other ways.

- **Three-dimensional modeling** Programs such as Silicon Beach Software’s Super 3D, Enabling Technologies’ Pro3D, Abvent’s SpaceEdit, and Visual Information’s Dimensions series let you create drawings that simulate 3-D objects (see “3-D, Take 2,” *Macworld*, May 1987). One 2-D CAD program, MiniCad, also includes 3-D features. A 3-D program lets architects see their latest creations before they’re built. Super 3D and SpaceEdit also provide animation.

- **Finite-element analysis** You’ve designed a bridge and want to know how it will endure rush-hour stress. If you know the steel’s basic properties, you can use this CAD technique to divide the bridge’s surface into a finite number of tiny sections called elements, then electronically apply stress to the elements and see how they fare.

- **Specialized CAD** Independent IBM PC developers have created AutoCAD templates for designing everything from kitchens to piping systems to oil wells. Vertical-market applications—ones tailored to specific professions—are just debuting now for Macs. Some will be template collections for general-purpose programs such as VersaCAD. Others, such as CompServeCo’s $2250 Planit, a 3-D kitchen-design package, are designed from the disk up for specific trades.

Making It Easier

CAD programs also give you more ways to tame complex drawing jobs. One that nearly all CAD programs provide is a layering feature. Engineers and architects often assemble drawings using layers of transparent acetate, each showing a particular component or system. An architect might show a plumbing system on one layer, walls on another, electrical systems on a third, and room dimensions on a fourth. CAD layering features work similarly. You can move objects between layers and selectively show and hide layers, depending on how much detail you want to see. On a Mac II, you can usually assign a color to each layer to color-code parts of a drawing.

(continues)
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Many CAD programs also let you open bit-mapped graphics and place them on one layer, then trace over them using the CAD program's tools. Innovative Data Design's Dreams, due out this summer, will allow you to create or change color patterns for both pen tools and objects (see "Dreams in Color").

Mechanical drawings and architectural blueprints always show the dimensions of their components. CAD programs provide auto-dimensioning features that label those dimensions for you. Simply choose a command or click a palette icon, select the item you're measuring, and the CAD program adds the dimension to the drawing, complete with arrows and extension lines (see "CAD Dimensions").

The kinds of objects you can measure vary between programs. Some programs, such as PowerDraw, provide only linear dimensioning—measuring the distance between two points. Others, including VersaCAD, MGMStation, and MiniCad, also support angular dimensioning—measuring the size of angles. MGMStation also offers radial dimensioning—the ability to measure the radii of circles.

Drawings and schematics often contain multiple copies of the same object, be it a bolt, a sink, or a transistor. Most CAD programs offer symbol libraries that make it easy to create, store, and reuse oft­used symbols of your trade. Some programs come with libraries of common architectural or electronic symbols; with others, libraries are options that cost extra. With many programs, you can assign a name to each symbol, such as "3-inch carriage bolt" or "conference chair." Archi­CAD, an architectural CAD program, can use those names to print parts lists showing how many times a given component appears in a drawing. Other CAD programs will soon offer similar features, which are often called attribute tracking or associativity.

And because even a large-screen monitor can't show an entire blueprint-size drawing at actual size, all CAD programs offer zoom commands that let you move in for a close-up look or zoom out to get the big picture. But redrawing an image containing thousands of objects takes time, even on a Mac II. To eliminate the wait, most programs offer a redrew halting feature that lets you stop the redrawing process at any point. You can use redrew halting to stop further redrawing after the object you've zoomed in to see appears.
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**What size and shape monitor is best?**

Page-size portrait monitors are great for word processing, but impractical for desktop publishing. To avoid constant zooming and scrolling, we recommend a 19-inch landscape monitor, like our Viking 1 for the Mac SE and Mac II. Professionals who want to view two full-size facing pages will need an even larger monitor—our new 24-inch Viking 2400—Moniterm's largest monochrome monitor.

**What resolution is required?**

Optimum publishing resolution for 19-inch or larger monitors is 1280x960 pixels, featured on our Viking 1 and Viking 2400 monitors. At less than 72 dpi (dots per inch), fine print becomes too hard to read. Resolutions more than 95 dpi also make characters hard to read and unfocused. And screen updates are painfully slow.

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We recommend our 19-inch gray-scale monitor for Viking 2400 24" monitor, differentiating objects on the screen. It features 256 shades of gray for near-photorealistic images. And, you'll benefit from sharper text and lower cost.

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Exchanging and Printing

If your company already uses a CAD system—whether a large workstation or an IBM PC—you'll want to investigate the data-exchange options that Mac CAD programs provide. There is no single standard for moving CAD drawings between systems, but there are some established formats. Perhaps the most popular is IGES (Initial Graphics Exchange Specification). You'll find support for IGES files in CAD systems running on micros, minis, and mainframes.

Another popular format is the DXF file, popularized by Autodesk's AutoCAD package for IBM PCs. Only one Mac program, VersaCAD, includes a file-exchange program that lets you translate between its own and other CAD formats. With most other CAD programs, file-translation programs cost extra. Kandu Software's CAD Mover is a translation program that translates between IGES, MiniCad, MacDraw, PICT, DXF, and other formats.

A CAD drawing's final destination is a piece of paper, and some CAD programs can get it there in more ways than others can. In the CAD world, the dominant output device isn't a LaserWriter or an ImageWriter, but a pen plotter, which prints by zipping special pens across a sheet of paper or mylar film. Most plotters can hold between 4 and 12 different colored pens in a turretlike mechanism, switching between them as instructed by the CAD program. Plotters are often described according to their maximum paper size, with each size labeled by a letter: an A-size plotter creates 8½-by-11-inch drawings. B-size drawings measure 11 by 17; C-size, 17 by 22; D-size, 22 by 34; and E-size, 34 by 44. Nearly all Mac CAD programs can print to plotters from such industry leaders as CalComp, Hewlett-Packard, Houston Instrument, and Roland.

Plotters take too long to render the subtle serifs and fine details of Mac fonts, so most CAD programs with plotter support include stroke fonts for their output. Stroke fonts allow the plotter to draw characters quickly using—you guessed it—single strokes of its pens.

Mac CAD programs also support ImageWriters and LaserWriters, but to varying degrees. Some, such as PEGASYS and Pentagon CAD, print in only low-resolution draft modes. Others, including VersaCAD, MGMStation, PowerDraw, and MiniCad, offer both low- and high-resolution ImageWriter and LaserWriter output. Low-resolution output is useful for producing quick proofs of a drawing. High-resolution output requires more time, but takes advantage of a printer's maximum resolution.

CAD's Costs

If you're drooling at the prospect of working CAD into your life, dry up—at least until you check your bank balance. Software with the capabilities I've described doesn't come cheap, and it does come with a voracious appetite for hardware.

Some CAD companies claim their wares run on a 512K, floppy-drive Mac, but the verb stroll might be more accurate.

(continues)
Although this category, unlike spreadsheets and word processors, had a lot of new players this year, one seemed to us to be the clear leader. 4th Dimension, the powerful first product from ACIDS, takes the kudos.

*MacUser*, February 1988

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David Brandt, *MacWEEK*, January 19, 1988

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Most CAD programs provide auto-dimensioning features that add dimensional information to drawings. VersaCAD, shown here, provides linear (point-to-point) and angular (angle size) dimensioning. The dialog box shows the variations of extension lines and arrows that VersaCAD provides.

CAD programs crave memory and CAD drawings devour disk space. For serious, day-in, day-out CAD, you need a hard disk and at least a Mac Plus. Best of all is a Mac II or an SE with an accelerator board such as Radius's Accelerator, General Computer's HyperCharger, or Levco's Prodigy SE (see "Beefing Up the SE," Macworld, September 1987). If you'd prefer to spend your time drawing rather than scrolling, consider a large-screen monitor. If you use MultiFinder, you may also need a memory upgrade.

Then there's the cost of the programs themselves. VersaCAD tops the list at $1995, with PEGASYS II coming in second at $1795. MGMStation is a more palatable $799; PowerDraw costs $795; and MiniCad, which includes three-dimensional drawing features, goes for $495. Dreams is expected to retail for about $500. But many programs in the under-$1000 ballpark lack the plotter support and file-exchange features included with their high-priced brethren. If you need those features, be sure to tally up the total cost with any add-on modules before buying.

The most reasonable CAD program is Lionshead Software's Pentagon CAD for $99. Pentagon CAD can't match the talents of a VersaCAD or MGMStation, but it's the most economical way to explore CAD, and it has some powerful mapping features that civil engineers and surveyors may find useful. Generic Software, which makes Generic CAD for the PC, has announced plans to release a Mac version that will cost between $99.95 and $199.95, depending on options.

Where Mac CAD Fits In
Despite the amazing talents of today's CAD programs, the Mac isn't about to send ultra-expensive CAD workstations to the scrapheap. CAD systems exist that can show animated, three-dimensional views of a jetliner in one window, while you zoom in on single rivets in another. Today's Macs lack the processing speed required for such tasks.

Still, Mac CAD programs can lighten the load on those expensive workstations by handling the simpler jobs that can monopolize a workstation's time—freeing it up to do what it does best. As David Pelz says, "I see a lot of Ferraris on the road, but many of them are only doing 55 miles per hour." The Mac may still be only a CAD Chevy, but even a Chevy beats a horse and buggy. □

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Insights on MacDraw II

Become a quick-draw artist with tips for the Mac's classic drawing program

by Kenneth S. Hulme

When Apple introduced MacDraw in mid-1984, it represented a striking alternative to MacPaint's bitmapped graphics. Because MacDraw treats lines, shapes, and text as objects, it's a better tool than a bitmap program for mixing text with graphics. MacDraw quickly became a hit with people who pushed it beyond drawing and into the realm of desktop publishing, forms design, and even drafting.

MacDraw II, recently released from Claris Corporation, Apple's software spin-off, offers phenomenally fast screen redraw and dozens of new features, like arbitrary font size selection, customizable arrowheads and line widths, greater text-formatting flexibility, and much more. Though there's decidedly more competition for MacDraw than when it first arrived, its relative ease of use and its value suggest it will continue to have a loyal following.

To coincide with the long-awaited debut of MacDraw II, here's a collection of tips and techniques to speed your work at the electronic drawing board. Many of the tips apply to the old version as well; the tips that work only with the new version refer to the program with its full name—MacDraw II.

You need an original program disk (of any of the previous versions) to obtain a new version for the $100 upgrade fee. For complete details about the MacDraw upgrade, call Claris at 800/544-8554.

Working on the Whole Page

In MacDraw you can use all of the tools to create or modify text or objects on any view level. That means MacDraw lets you see the whole page and create both text and graphics while in Fit to Window view (Reduce to Fit in original MacDraw). Rough in a drawing at that view so you can see its position on the page, and then zoom in for detail work by choosing a view you've preset or by clicking the Enlarge tool at the bottom of the tool palette (use Normal Size and Enlarge in the original MacDraw). Even on large drawings that span several pages you can work on the whole composition at once.

To zoom in on part of a drawing, select what you want to see up close before you choose a different view; the desired object will then be centered in the new view.

Aligning Objects

Aligning irregular objects or setting an exact amount of space between parts of a drawing can be a real pain. The easy way to do this is to "pencil in" guidelines, as you would on paper at a drawing board.

The best tool for guidelines in MacDraw II is the line tool, constrained by holding down the Shift key to create a horizontal or vertical line parallel to the edge of your drawing (in the original MacDraw, use the plus-shaped tool). With Show Size on and the Autogrid off, you can create lines of exact sizes, to the nearest ten-thousandth of an inch. Guidelines can help you to establish even spacing between lines in a form, to measure along part of an irregular object, or to help line things up wherever necessary (see "Guide to Alignment").

Don't forget to erase guidelines when they're no longer needed—choose a line style that is easy to pick out when you finish a drawing.

(continues)
Duplicating at Exact Intervals

MacDraw is wonderful for creating forms, questionnaires, or objects in precise arrays if you know the following trick. Create a master line or object. Then create a guideline that's the length of the spacing you want and butt one end against the master. Select the master and choose the Duplicate command. Drag the duplicated object to the other end of the guideline and position it carefully. With the duplicated object still selected (don't deselect, then select again or the technique won't work), use the Duplicate command to make the number of objects you need. New duplicates appear at the interval you set when dragging the first duplicate. If things don't line up exactly horizontally or vertically, select them all and use the Align or Alignment commands (Align Objects in the original) to put them in place.

Patterns

In MacDraw you're stuck with the patterns that the program gives you, but MacDraw II lets you create a pattern you want. Double-click on an existing pattern and a dialog box appears with a pattern editor (see "Custom Patterns"). Modify the pattern, click OK, and the altered pattern appears in place of the original. You can also reorder the pattern bar by selecting a pattern and choosing Move Left or Move Right until the order suits you.

Creating Patterned Lines

In MacDraw II it appears that you can't fill a line or object border with a pattern, as you can in the original version. But you can add a pattern to lines or borders by selecting the object, holding down the Option key, and clicking on a pattern.

Filling Complex Shapes

MacDraw won't fill shapes created with line and arc segments because the program fills only shapes created with object tools. Even if you group a collection of lines or shapes created with various tools, the program doesn't view them as an object, and when you try to fill the group you'll probably find patterns where you don't intend them (see "A Pattern Technique").

To fill such a shape, trace it with the polygon tool and then fill the polygon. Ju-
dicious use of the Reshape and Smooth commands lets you fine-tune almost any shape. Unfortunately, neither MacDraw nor MacDraw II allows you to fill characters with a pattern.

Drawing by Polygon

The polygon tool is the single most useful tool in either version of MacDraw. Every time you click while using the polygon tool, you create a handle that you can grab to manipulate the shape. The more often you click, the more handles you can manipulate. Use the tool to rough in complex shapes, then select Reshape to fine-tune the object. For objects that need true curves, choose Smooth on the Edit menu to convert the curves you approximated with the polygon tool into actual bezier curves—then Reshape. The handles now allow you to change the shape of the curves.

Reshaping Polygons

In MacDraw II, you can easily add or subtract handles to reshape objects created with the pencil or polygon tool. Select an object, choose the Reshape function, then hold down the Option key and click on a point to remove it. Click instead on the line itself to add a point.
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MacDraw II Shortcut Key

Selected keyboard shortcuts, at a glance

Open as Library: ⌘-Shift-0

Save As: ⌘-Shift-S

Rescale when pasting: ⌘-Shift-V

Reshape: ⌘-R

Smooth: ⌘-E

Unsmooth: ⌘-Shift-E

Alignment: ⌘-Shift-K

Select a View (by preset view number): ⌘-1 through ⌘-9

Alignment: ⌘-Shift-K

Rotate: ⌘-T

Group: ⌘-G

Ungroup: ⌘-Shift-G

Fit to Window: ⌘-M

Improved Visibility with Polygons

In MacDraw II, if you press down the Option key and mouse button together as you draw a polygon segment, the segment remains invisible until you release the mouse. That way you see the underlying drawing clearly as you move the cross-hair cursor around to position the next handle.

Shift-⌘ Key

MacDraw II adds a number of ⌘-key equivalents not found in the original. Many functions, such as Ungroup and Unlock, are performed by using Shift-⌘ sequences (see "MacDraw II Shortcut Key").

Mixing Type Styles

MacDraw artists often mix text and graphics in a project. Many times you want to change the style of a word or two in the middle of plain text, but the original MacDraw allows you to type only one text style in a paragraph. In MacDraw II, you can select some text and then change its style, but for subscripts and superscripts you have to use the somewhat laborious method developed to mix styles in the original MacDraw.

Start by making a space for the specially formatted text; leave extra blank spaces for each letter because bold and italic characters are wider than plain text (for subscripts and superscripts choose a size or two smaller than the main text). Go somewhere else on the document and type the special characters in the style you want. Create a guideline at the baseline of the plain text, spanning the gap you left for the special characters. Drag the special text to the space and position it by lining it up with the guideline. Tweak the spacing, if necessary, and erase the guideline. Select the main text, shift-click to select the stylized bit, and then use Group to hold them together.

White Type

Though you can't shade characters in MacDraw, you can make reversed type—white (or in MacDraw II, a contrasting color) lettering against a shaded background. Type the text and choose Outline style. With the text block selected, choose the background pattern you want; the text appears as white letters against the background. For maximum legibility, choose a serif font with wide strokes, such as Bookman.

(continues)
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Reselecting the Last-Used Tool
MacPaint artists who try MacDraw are often frustrated at first because after they use a tool, it automatically reverts to the pointer. To circumvent this in the original MacDraw, you’d hold down the # key and draw again. In MacDraw II, double-click when selecting a tool to draw with it continuously.

Saving Steps with Drawing Tools
When you choose a tool, set its attributes—line width, Pen, Fill, and so on—before you start drawing if you want the custom attributes to stay in effect for every tool. This method saves a lot of time and trouble when you set out to draw a number of objects with attributes that differ from the defaults of a MacDraw document.

What Happened to the Middle Handles?
In the original MacDraw, if you wanted to lengthen a rectangle, you clicked on the middle handle of the top, bottom, or side edge and then dragged in the direction you wanted. MacDraw II shapes lack the middle handles. In MacDraw II, you hold down the Shift key and grab any corner handle of an object; then drag it to widen or lengthen the shape.

Scaling Objects Proportionally
Shrinking or enlarging an object to a particular size is easy. Make a duplicate of the object, so that if you goof you won’t mess up the original. Turn on Show Size and select the copy. Hold the pointer down on one of the corner handles to see the horizontal and vertical dimensions of the object. Then drag the corner handle to resize; when the size bar shows the dimensions you want, release the mouse button.

Text grouped with an object doesn’t scale with the object, so you’ll have to resize text separately.

Saving Custom Setups
Preferences, tool settings, font and line definitions, and other attributes are document specific in MacDraw II, but you can create Stationery to save unusual settings for specific tasks: create a blank document with the settings you want and save it as Stationery. Then instead of opening the program to create a drawing, open the Stationery file to get an Untitled document complete with those settings.

A New World of Color
MacDraw II lets you create and define color patterns; you won’t see them on screen unless you have a color monitor, but even if you don’t you can print color images on an ImageWriter II with color ribbons. To keep both color and standard black-and-white patterns available, add colored versions to the pattern bar. Start by double-clicking a pattern to reach the pattern editor, and then choose New. This creates a duplicate of the pattern, which you can color and otherwise modify. If you plan to do a lot of color work, take the time to create a full palette of colored patterns and save the blank document as Stationery (see "Smooth Sailing in Color"). Then, when you need to create a color drawing, just rip off a piece of the color stationery and start drawing, modifying the colored patterns as necessary.
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Updates

This list brings you the highlights of software updates recently received but not yet tested. The first price is the upgrade cost for registered owners; the second is the current list price.

Cognate and Cognate Developer’s Kit versions 1.5 are significantly faster. They support MultiFinder and execute in the background. The Developer’s Kit now includes C source code to the inference engine, Peridom, Inc., P.O. Box 1812, Bowie, MD 20716, 301/390-9570. Free; Cognate $150, Cognate Developer’s Kit $250 new.


Dial-in Network Access version 1.3 offers Chooser access for password security; as well as greater flexibility in remote connection setup. Improves compatibility with Microcom, Hayes, and Teledot high-speed modems. Shiva Corp., 222 Third St., #1200, Cambridge, MA 02142, 617/661-2026. Dial-in Network Access upgrade alone is free; complete NetSerial upgrade, including hardware, password security, new Dialer, and NetSerial software $50; NetSerial hardware and software $399 new.

Expressionist version 2.0 includes presettable default fonts and pallete symbols, two-way TeX interface, auto-baseline (only with WriteNow 2.0), and improved graphics. Allan Bonadio Associates, 814 Castro St., San Francisco, CA 94114, 415/282-5864. $29.95 with return of original disks; $129.95 new.

Icon-It version 1.1 allows you to design custom icon bars and open two icon bars simultaneously. Maps icons to the function keys of the Apple extended keyboard and includes more templates. MultiFinder compatible. Olduvai Corp., 6900 Mentone, Coral Gables, FL 33146, 305/665-4665. Free with return of disk, otherwise $10; $79.95 new.


MacTran Plus version 3.0 has an integrated environment, an intelligent symbolic debugger, and language extensions for handling large code and data sizes. Supports the Mac II, color, MultiFinder, and inline code generation for the 68020/68881. DCM Data Products, 1710 Two Tandy Center, Fort Worth, TX 76102, 817/870-2202. $99; $399 new. Educational discounts available.

Market Master for the Macintosh version II increases speed. Offers an automated search feature and automatic file updating. Market Master with results analysis (R/A) also available. Breakthrough Productions, 10659 Caminito Cascara, San Diego, CA 92108, 619/281-

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6174. Market Master version II $20, Market Master R/A $100; Market Master version II $295, Market Master R/A $395 new.

MathType version 1.53 improves spacing and fixes bugs. Design Science, Inc., 6475-B E. Pacific Coast Hwy., #392, Long Beach, CA 90803, 213/493-0685. Free if upgrading from 1.50 or 1.51, otherwise $15; $149 new.

MicroPhone II is fully compatible with MultiFinder. Enhances communications performance. Supports Cut, Copy, Paste, Quit, and other menu commands in scripts, and can map them to the keyboard. Allows import and export of scripts as text files. Supports KERMIT, including remote server commands. Supports Ymodem batch and Ymodem-G. Offers modern drivers for complete control of Hayes, non-Hayes, and PBXs. Supports extended keyboard, screen buffer command; Copy Table, Append to File, and Launch; variables and an expression analyzer for string/arithmetic manipulations. Allows you to change baud rates and all other settings in scripts. Allows screen addressing in scripts. Enhances VT100 emulation. Supports host printing commands. Software Ventures Corp., 2907 Claremont Ave., #220, Berkeley, CA 94705, 415/644-3232. $50; $295 new.

Professional Composer version 2.2 corrects playback speed. The Cancel button in the small dialog box that is present during printing now functions. You can specify page range when printing. Beams are thicker. Dots on whole notes and semibreves are spaced correctly. Arrow keys on Mac Plus, SE, and II now function. Several problems with printing parts have been fixed. Check Range functions correctly. Measure numbers at beginning of systems will be correct even if starting measure isn't numbered 1. Endings draw to the end of the bar. After selecting a document and printing from the Finder, you return to the Finder. The intermittent crash when deleting staves no longer occurs. Mark of the Unicorn, Inc., 222 Third St., Cambridge, MA 02142, 617/576-2760. Free; $495 new.


Roundup version 2.0 adds ReadySet-Go version 4.0 files. It also runs in the background under MultiFinder. Virginia Systems Software Services, Inc., 5509 West Bay Ct., Midlothian, VA 23112, 804/739-3200. $10; $49.95 new.

V.I.P. version 2.5 includes C language translators that extend HyperCard by automatically producing external commands. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301, 818/991-6540. $30; $149.95 new.

To have products listed in this section, send upgraded software, an outline of major changes since the previous release, upgrade price, suggested retail price, company name, mailing address, and phone number to Updates, Macworld, 501 Second St., San Francisco, CA 94107.

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Reader Service

706  Apple 2MB Memory Expansion Kit.  Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014, 408/996-1010.
708  Apple MIDI Interface.  Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014, 408/996-1010.
709  Apple PC 5.25 Drive.  Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014, 408/996-1010.
710  AppleColor High-Resolution RGB Monitor.  Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014, 408/996-1010.
711  ArchiCAD.  Abvent, Inc., 23551 El Toro Rd., #209, El Toro, CA 92630, 714/380-2355.


715  Cirrus 40MB Drives.  La Cie, 16285 S.W. 85th, #306, Tigard, OR 97224, 503/684-0143.
716  Cirrus 60MB Drives.  La Cie, 16285 S.W. 85th, #306, Tigard, OR 97224, 503/684-0143.

DaynaFile.  Dayna Communications, Inc., 50 S. Main St., 5th Floor, Salt Lake City, UT 84144, 801/531-0203, 800/531-0600.


725  ImageStudio.  Letraset USA, 40 Eisenhower Dr., Paramus, NJ 07652, 201/845-6100, 800/526-9703.

726  Imagizer.  Conrax, PO. Box 1450, El Toro, CA 92630, 714/855-6600.


731  LaserWriter IIINT.  Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014, 408/996-1010.

732  LaserWriter IIINTX.  Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014, 408/996-1010.

### Where to Buy

**733 Mac-101 Keyboard.** DataDesk Int’l, 7651 Haskell Ave., Van Nuys, CA 91406, 818/780-1673, 800/826-5398.

**734 MacAccelerator.** Spectra Micro Development, P.O. Box 41795, Tucson, AZ 85717, 602/884-7402.

**735 MacAstrologer.** Full Phase Software, P.O. Box 17045, Seattle, WA 98107, 206/325-2113.

**736 MacDraw.** Claris Corp., 440 Clyde Ave., Mountain View, CA 94040, 415/962-8946 (product information), 800/544-8554 (upgrade information), 800/334-3535 (dealer information).

**737 MacDraw II.** Claris Corp., 440 Clyde Ave., Mountain View, CA 94040, 415/962-8946 (product information), 800/544-8554 (upgrade information), 800/334-3535 (dealer information).

**738 MacEngine GT.** Ryad, 2521-F N. Grand Ave., #950, Santa Ana, CA 92701, 714/558-0662.

**739 MacEngine Turbo.** Ryad, 2521-F N. Grand Ave., #950, Santa Ana, CA 92701, 714/558-0662.


**741 MacImage.** Datacopy, Inc., 1215 Terra Bella Ave., Mountain View, CA 94043, 415/965-7900.

**742 MacLink Plus.** DataViz, Inc., 16 Winfield St., Norwalk, CT 06855, 203/866-4944.

**743 MacPaint 2.0.** Claris Corp., 440 Clyde Ave., Mountain View, CA 94040, 415/962-8946 (product information), 800/544-8554 (upgrade information), 800/334-3535 (dealer information).

**744 MacProject II.** Claris Corp., 440 Clyde Ave., Mountain View, CA 94040, 415/962-8946 (product information), 800/544-8554 (upgrade information), 800/334-3535 (dealer information).


**746 MacTablet.** Summographics Corp., 777 Commerce Dr, Fairfield, CT 06430, 203/384-1344, 800/243-9388.

**747 MacViewFrame.** nView Corp., 11835 Canon Blvd., # C-101, Newport News, VA 23606, 804/873-1354.

**748 MacWrite.** Claris Corp., 440 Clyde Ave., Mountain View, CA 94040, 415/962-8946 (product information), 800/544-8554 (upgrade information), 800/334-3535 (dealer information).


**750 MGMStation CAD/CAM.** Micro CAD/CAM, Inc., 5900 Sepulveda Blvd., Van Nuys, CA 91411, 818/376-0008.

**751 Microphone II.** Software Ventures Corp., 2907 Claremont Ave., #220, Berkeley, CA 94705, 415/644-3232.

**752 Microsoft Excel.** Microsoft Corp., 1601 N.E. 36th Way, Box 97017, Redmond, WA 98073-9717, 206/882-8080, 800/426-9400.

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EPD ECI Surge Protector $39
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Kerning System Saver Plus/62 169

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<td>3 MacGolf *Practical Computer App.</td>
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<td>2</td>
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<td>4 Beyond Dark Castle *Silicon Beach Software</td>
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<td>5 Falcon *Spectrum Holobyte</td>
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### Networking/Data Communications

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<td>18</td>
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<td>1 TOPS *TOPS</td>
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<tr>
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<td>3 LocalTalk (formerly AppleTalk) *Apple Computer</td>
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<td>4 PhoneNet *Farallon Computing</td>
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### Hard Disks*

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<td>1 Macintosh Internal 20SC Hard Disk *Apple Computer</td>
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<td>3</td>
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<td>3 Macintosh Internal 40SC Hard Disk *Apple Computer</td>
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<td>4 Rodime 20 Plus *Rodime</td>
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<td>5 Compact SC 40 CMS Enhancements</td>
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### Add-in Boards

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<td>5</td>
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<td>5 MacSnap Plus 2 *Dove Computer</td>
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### Product Watch

Editors' choice:
Other recent products of particular interest.

- **Dreams** Innovative Data Design 2-D color computer-aided-design software
- **FoxBase+/Mac** Fox Software relational database manager compatible with dBase II and dBase III Plus
- **SuperPaint 2.0** Silicon Beach Software color paint/draw program

Source: Exclusive InfoCorp survey of more than 125 Macintosh retailers and selected mail-order suppliers. Covers sales during April 1988.

*Does not include hard disks installed at the factory.*
The WriteNow difference: Ease, Performance, and...
He had a reputation as a power user. But deep down he knew it wasn’t true. Oh, he had the software alright. But the real power, the electrical power that ran his Mac was another story. He lived in fear of its surges and spikes. He lacked the proper outlets. He knew he was out of control...

**Kensington Power Control**

A Kensington power center will get your power under control. We organize and protect your entire system with extra outlets, convenient front-mounted switches, and the best surge suppression and noise filtering available.

1. **Master Piece® Mac II**
   - Starts with five protected outlets.
   - Added modem surge suppression protects against surges and spikes on the phone line. And a built-in swivel lets you adjust your monitor. $159.95

2. **System Saver® SE**
   - Offers two protected outlets and a replacement for your SE’s power cord, a choice of 1 or 2 switches, and modem/phone line surge suppression.
   - $79.95

3. **System Saver Mac**
   - Not only gets your power under control, it keeps your Mac or Mac Plus cool. Two protected outlets, a replacement power cord, a quiet fan, and a choice of 1 or 2 switches. $99.95

For more information, call (800) 535-4242. In NY, call (212) 475-5200. Or write Kensington, 251 Park Ave. S., New York, NY 10010.

See Us at Macworld Expo, Bayside #1636

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