100 Upgrades
SPECIAL REPORT
Fast, Easy, Affordable

New Midrange Workhorses
Centris 650 & 610
Reviewed, Page 128

Plus: Secure Your PowerBook
Microsoft Word 5.1 for the Macintosh is now $14.95.

The path to easier computing just got shorter, with the great 5.1 version of Microsoft Word. Now you can speed through your work with our intuitive Toolbar. It puts all of the functions you use most into short and easy reach. With a click.

This powerful Toolbar features one-step bulleting, automatic envelope addressing and up to 30 custom buttons to shorten the trip through repetitive tasks.

We've especially shaved time off your work on complex documents. Now you can easily create charts and tables or insert and edit your own text annotations. Your ideas look great in no time.
Microsoft Word 5.1 comes with special installation features and a new battery indicator for the Mac "PowerBook." It also has QuickTime support, which allows you to add full-motion video as easily as inserting a simple graphic.

In short, we've made word processing easier than ever before. Thanks to you. Because we got there by listening to your comments and suggestions.

And until June 30, as a special reward to all registered users of version 5.0, you can upgrade to 5.1 for only $14.95. Users of any earlier version of Microsoft Word can upgrade for $129.

Call us at (800) 323-3577, Dept. HY3, for more information. And discover for yourself why new Microsoft Word 5.1 won't be easy to pass up.
If you haven’t seen Silverscanner II, you’re buying your scanner blindfolded.

When it comes to color scanning, talk is cheap. Seeing is believing. That’s why we let Silverscanner II’s brilliant imagery speak for itself. In one eye-opening comparison after another, Silverscanner II gives you visibly truer color and finer detail than its nearest competitors. You can’t tell how good a scanner is by looking at images on a monitor, so don’t be fooled.

The scanner makes the image.

Silverscanner II earned Macworld’s 1992 World Class Award for its perfectly balanced color, shadow detail and crisp curved lines. Now Silverscanner II enhances our award-winning image—with gorgeous color, gray scale and line art right out of the box. Silverscanner II’s independent color controls (RGB) on the gamma/contrast/brightness operate on 9 bits of data before conversion to 8 bits per color. So you get clean, bright scans with excellent detail and tonal range in the highlights and shadows areas.

The software makes the scanner.

People on deadlines don’t have time to waste. Silverscan II makes scanning as quick, painless and productive as possible. With features like dynamic color preview (16 sec.), magnify in preview, proof in preview, savable scan setting, up to 400% scaling in 1% steps and up to 1600 dpi in 1 dpi steps—all in one pass—it’s easy to get great images fast. And with new advanced features like a densitometer, white and black limit, color histogram and auto image adjustment—all interactive in preview—Silverscanner II is unsurpassed. It’s easy for the beginner—yet still has powerful controls for the advanced user.

Qualified, courteous service & support.

When you add our 30-day-money-back satisfaction guarantee, one-year warranty, unlimited toll-free telephone technical support and the confidence that comes with buying direct from a Quantum company, with Fortune 500 resources, it’s easy to see why so many people choose Silverscanner II.
you’d better see ours.

Microtek ScanMaker II—133 line screen, factory default settings.

Silverscanner II—133 line screen, factory default settings.

Scanners from $1599

“La Cie’s Photoshop plug-in is a delight to use.” Macweek

800-999-1457

Circle 244 on reader service card
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A New Expansion Concept So Radical, Nothing Else Stacks Up.

Introducing SmartStack® from Envisio, the world's first modular SCSI expansion system. Connect up to seven interlocking SCSI SmartModules® to the SmartSource™ power base to handle even massive storage needs with ease. • Mix and match modules to suit your needs. Choose hard drive modules from 127 MB to over 1 GB, a 128 MB optical, as well as a 2 GB DAT module. • Envisio's award-winning design team has taken the mystery out of expanding your system. Start with the base and a single drive module; when your needs grow, simply snap on another module and you're ready to go. No additional cables to connect, no additional power cords, and no hassles. • Do the Smart thing; see your authorized Envisio dealer today for your very own SmartStack.

EXPANDABILITY
With 10 modules now, and more to come, SmartStack has an unlimited future. The SmartModules will be able to accommodate network interfaces, display adapters, and disc arrays.

NO CABLE HASSLES
SmartStack's patented connector eliminates SCSI cables between devices with just one SCSI cable and one power cord, even with seven devices connected.

COOL AND EFFICIENT
The patented cooling system protects your data and your sanity with two whisper-quiet fans. SmartStack's small "footprint" is a perfect complement to any Mac.

ENVISIO
2640 PATTON ROAD ST. PAUL MINNESOTA 55113 TELEPHONE 612 628 0200 FAX 612 633 1083 APPLE LINK: ENVISIO

Attention Hardware Developers!
Developer kits are available to aid in the development of SmartStack-compatible products. Contact Mike Evangelist at Envisio.
Circle 204 on reader service card
In the May issue of Macworld magazine, Mirror's PixelView Full-page Display was singled out as Editors' Choice. We'd like to thank Macworld for this acknowledgment of our hard work.

**Number 1 in Customer Loyalty**

Equally important is the feedback we get from our customers. A recent independent survey of monochrome monitor owners ranked Mirror #1 in customer loyalty (beating out Radius, SuperMac and RasterOps).

"Our panel of editors judged the Mirror monitor to be the best, with sharp focus over the entire screen...an excellent value."

Macworld, May 1993

$399

SuperMac (who we think set the standards for great displays). But delivering them without dealer mark-up at savings of up to 40% makes them unquestionably the best value on the market.

All Mirror products come with lifetime technical support and the confidence that comes from dealing with a company that's been in the Macintosh business since 1985. Backed by our risk-free 30-day "love it or return it" satisfaction guarantee.

**See the Future**

The PixelView Two-Page Display lets you view 12 months of your budget or both pages of your newsletter layout. It features 72 dpi resolution—a must for desktop publishers.

**See a Whole Page**

Whether you're writing a letter or working on this month's budget, with the PixelView Full-Page Display you'll be able to see a whole page effortlessly.

**Exclusive Desktop Designer Software**

Our exclusive Desktop Designer software allows you to use the built-in screen on a Classic, SE, or SE/30 as an extension of the large screen, giving you even more workspace.

And adds productivity enhancements like pop-up menus, enlarged cursor and a screen saver.

**No Dealer Mark-up**

It's one thing to design a product every bit as good as Radius and SuperMac (who we think set the standards for great displays). But delivering them without dealer mark-up at savings of up to 40% makes them unquestionably the best value on the market.

All Mirror products come with lifetime technical support and the confidence that comes from dealing with a company that's been in the Macintosh business since 1985. Backed by our risk-free 30-day "love it or return it" satisfaction guarantee.

Order Direct Anytime

800-643-0631

Media: 1048

**PixelView Full-page**

For built-in video

$399

**PixelView Full-page**

With card for Classic, SE, SE/30 or any modular Macintosh

$549

**PixelView Two-page**

With card for Classic, SE, SE/30 or any modular Macintosh

$799

**Need Color?**

Call about our ProView color displays.

Circle 122 on reader service card
Now you can get out of trouble before you get into it.

Owning most utility software is like belonging to the Auto Club. If your system crashes, or if you have an accident with your data, they can come to your rescue. But before you get back up and running, you have to spend a lot of time waiting by the side of the road. Which is why Public Utilities, the ingenious new package from the creators of Suitcase, is the utility every Macintosh has been waiting for. Instead of getting you back up and running, Public Utilities concentrates on keeping you up and running.

How? By automatically finding and fixing potential disk and data problems before they leave you stranded.

You see, Public Utilities quietly performs a detailed diagnostic scan of your disk whenever your Mac is idle. If anything is amiss, it politely lets you know and prompts you to run the appropriate repair program. All you have to do is point, click and carry on with your work.

Now, it doesn't take an MIS type to know that Public Utilities can raise productivity and lower support costs. But if you are an MIS type, you'll be delighted to know that, in addition to protecting your people from disaster, Public Utilities also reminds them to do prudent things like perform back-ups and optimize their hard disks. It even launches the requisite software, at the stroke of a key.

Of course, even Public Utilities can't prevent people from deleting files or reformating their hard disks. But it can bail them out of more difficult situations than any other utility software.

And unlike other programs, it won't let them get into difficult situations in the first place. That's because we left out Sector Editors and other such high end, high risk things. And put in plenty of online, System 7 savvy HELP.

There's more. So pick up the phone. Call 1-800-477-8212.

We'll tell you about our one-year money-back guarantee. And our vaunted 24-hour customer support. Which is what you use to get out trouble after you get into it.

$59 Upgrade!

* Through Sept. 30 you can upgrade to Public Utilities from Norton Utilities, Scan Disk, or 911 for just $59. For details, tell your nearest dealer or order direct, call 800-477-8212 today!
It's the colors. Life is more than black and white. It's magenta, indigo, auburn, and with WordPerfect, 253 other dazzling colors to blend, rainbow, or complement. Enough to make others green with envy.
It's the movies. With WordPerfect and Apple's Quicktime, using video and sound is as natural as using just plain words. So place a color movie in your document, and have yourself the ultimate in show and tell!

It's the layout. Say goodbye to boring, cookie-cutter pages. Because WordPerfect makes it easy to add attention-getting textboxes, callouts, or columns. Choose from 36 borders and 64 border patterns. Create overlays. Watermarks. Even rotate a headline.

It's the compatibility. There are millions of Mac systems in the world today. But hey, there are plenty of systems like Windows, DOS, NeXT, and UNIX too. With WordPerfect, your files will be compatible with them all.

It's the system. As the first word processor to be fully System 7 savvy, WordPerfect brings you features like TrueType, Publish and Subscribe, and more. For the latest in Mac innovations, you can count on WordPerfect.

It's the pictures. WordPerfect makes adding graphics to documents easy. Without even leaving the program, you can import a visual, change it, or just create one of your own. Then drag-and-drop your masterpiece in place, and watch how text flows automatically around it.

It's the people. While its elegance of design embodies all that is Macintosh, WordPerfect also brings you a standard all its own: WordPerfect's dedicated toll-free support staff. Just call (800) 526-7820. Whatever your need, we're always here to help.
THE DILEMMA:

“When I bought my LC, it seemed like just the right combination of price and performance. But now I want more...more speed, more colors and a larger monitor.”

THE EXTREME SOLUTION:

The new IMPACT RGB™ by Extreme Systems® means that LC users can upgrade and have all the performance they want - starting at under $700.

IMPACT RGB is a single board that increases system performance by up to 300%, and provides 24 bit color for 12” to 16” monitors.

That's better video support and higher overall performance than a Mac IIci or even the new LC III.

The latest in the family of Extreme's superior quality accelerator boards, the IMPACT RGB is designed to provide the LC owner with a low cost, high impact solution.

The facts are, at 32Mhz and 32k Cache, the IMPACT RGB is up to threetimes faster than the LC II, and 25% faster than the new LC III. Plus, it supports 8 bit color for up to 21” monitors. It uses existing RAM.

It's simple to install. And there's even a three year warranty.

For $699, you can solve your LC dilemma, and still have money left to solve other problems. (Or for just $439, you can buy the IMPACT 030 - and swap up later.)

ORDER DIRECT:

1-800-995-2334

Extreme Systems designs the industry's most effective accelerators.
Datawatch Citadel with Shredder™ is a Macworld Magazine Editors' Choice among security products because it's a complete, easy-to-use disk and file security solution.

Airtight Disk and File Security

Citadel offers a full array of security features that let you protect your Mac and its data from unauthorized access. Citadel lets you lock hard drives, and lets you lock or completely disable floppy drives. Citadel lets you encrypt individual files and folders, and a feature turns the Macintosh trash can into a secure document shredder. Citadel also lets you lock the Mac screen after a pre-selected period of time to guard your system from browsers and tamperers.

Easy-to-Use

Though Citadel has all the security features you need, you won't find it hard to set up or use. In fact, Macworld magazine called it “Feature packed; easy to use” (Macworld, 6/92), and chose it as its Editors' Choice among security products (Macworld, 2/93).

So to protect your precious data without a lot of hassle, see your favorite retailer for Citadel today. Or call us for your free Citadel Overview at (919)490-1277, ext 320.

Datawatch Corporation
Triangle Software Division
PO Box 51489
Durham, NC 27717
(919) 490-1277 ext. 320
FAX:490-6672
BBS: 419-1662 (8,1,N)

Circle 325 on reader service card
## Conner Drives

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<thead>
<tr>
<th>Model</th>
<th>Internal</th>
<th>External</th>
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<td>$168</td>
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<td>C 85 MB</td>
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<tr>
<td>C 540 MB</td>
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These new Conner drives are so reliable that Conner has been one of Apple's largest hard drive suppliers.

### Fujitsu Drives

<table>
<thead>
<tr>
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<tr>
<td>2.4 Gig</td>
<td>$2448</td>
<td>$2588</td>
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*Mean Time Between Failure is the average life expectancy of a drive.*

### Quantum Drives

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<td>240 MB</td>
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<td>525 MB</td>
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### Toshiba Drives

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<tr>
<td>213 MB</td>
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<td>$798</td>
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### Segate Drives

#### for audio/video editing

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<tr>
<td>3.4 Gig</td>
<td>$3948</td>
<td>$4048</td>
</tr>
</tbody>
</table>
### SAMPO 19" Color System 1298.00

**Sampo 19" 8 Bit Color System** $1298.00  
Mono System $698.00  
Grey Scale System $998.00  
- The SAMPO is a high quality display without the high cost  
- Includes 1 bit, or 8 bit bit Video board and cable  
- Display supports all Mac's.

### Trinitron 20" Color System

8 Bit Quadra compatible $1898.00  
8 Bit System W/8XL $2398.00  
24 Bit System with RasterOps 24Li $2898.00  
- RasterOps 8k board available for all Macs  
- The Trinitron-20 is a 20" monitor incorporating Sony's patented technology and one of our best buys! True Trinitron color at a great price!  
- Includes 8 bit or 24 Bit Video board and cable  
- 2 page display supports all Mac IIsi, the IIi, SE-30, and the LC.

**NuDesign Full Page Grey Scale** $398.00  
- Plug compatible with IIi, IIci, Centra, 610C & 650 and Quadras.  
- Available with 1 Bit interface card for all Mac IIsi, SE-30, SE-30 and LC $488.00.

### Umax UC-630 With Photoshop 1098.00

- **Umax UC-630 With Photoshop** $1098.00  
- **Umax UC-840 With Photoshop** $1298.00  
- **Transparency/Slide Scanner Option** $728.00  
- **Automatic Document Feeder** $498.00  
- Rated four mice by MacUser (Dec '91)  
- Rated fastest by MacUser (Dec '91)  
- "Boasts the highest vertical resolution...umax produced the best images..." excel(s) in speed and color accuracy MacUser

### Umax UC-12005 With Photoshop 3098.00

- **Umax UC-12005 With Photoshop** $3098.00  
- **Transparency/Slide Scanner Option** $798.00  
- Incredible 1200 dpi imaging res., recognizes 1 billion colors internally  
- Single-pass design increases scanning speed  
- Includes Adobe Photoshop

### Umax 600DPI Greyscale With TypeReader OCR Software, Offoto and Publish It 898.00

- **Umax 600DPI Greyscale With TypeReade OCR Software, Offoto and Publish It** $898.00  
- An incredible OCR package with over $1000 in software alone,  
- Specially for Mac Users  
- Approved for use by the IRS, US Treasury, NSA and State of Illinois - use as of 1992 - 100% guaranteed - no cost for returns.

### Samsung 300 Upgradeable to 1200 dpi RISC based PostScript printer

- **Samsung 300 Upgradeable to 1200 dpi** $1298.00  
- **RISC based PostScript printer** $998.00  
- Incredible 1200 dpi upgradeability allows for future growth  
- Samsung is one of the worlds largest electronics companies!  
- Includes PostScript and PCL-5 compatibility  
- Intensely fast Intel i960 RISC processor

### Samsung 300 Upgradeable to 1200 dpi RISC based PostScript Printer

- **Samsung 300 Upgradeable to 1200 dpi RISC based PostScript Printer** $1298.00  
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- **Umax 600DPI Greyscale With TypeReade OCR Software, Offoto and Publish It** $898.00  
- An incredible OCR package with over $1000 in software alone.

### 14" SONY Trinitron 428

- **14" SONY Trinitron** $428  
- SONY 1320 for the Mac LC.

### 20" SONY System 378

- **20" SONY System** $378  
- Plug compatible with the Ilsi, CI, and the LC.

### 16" SONY Trinitron 1098

- **16" SONY Trinitron** $1098  
- Plug compatible with Centris 610 & 650 and Quadras.  
- Plug compatible with the CI, SI and LC at 640x480

### 14" Sampo 378

- **14" Sampo** $378  
- Plug compatible with the Ilsi, CI, and the LC.

---

**Contact Information**

60 East Chestnut - 145, Chicago, IL 60611  
No charge, Visa or Mastercard, Amex accepted CIO, Telecheck  
Approved Checks, Gov., Corp., Bank, P.O.s welcome. All new drives,  
preformatted with latest stable system software, Factory warranty,  
Bracket, cables and software included. 30 Day Money back  
Guarantee covers drive products only. Return Authorization number required for returns.

---

**Technical Service and Guarantee**

Covers drive products only. Return Authorization number required for returns.

---

**Order Tracking**

800-759-2133  
Order Tracking 8:30-5:00

---

**Customer Service**

800-621-8462  
Hours: 8:30 - 8:00 CST  
Saturdays 10:00 - 4:00

---

**Reader Service Card**

Circle 58 on reader service card
Painless Presentations

10:00 Shoot

Ouch!...Film. Processing. Projectors. Trays. Bulbs. All things that can make preparing a presentation a painful experience. The Canon RC-570 Still Video Camera can change all that. It records 25 electronic photos on a reusable 2-inch video floppy disk. No film or processing. No waiting. No waste. The 3X zoom lens and 450-line frame video resolution ensure superior image quality. Speed, portability and ease of use make the RC-570 an ideal tool for creating and delivering presentations.

10:12 Process

Canon's RC-570 Electronic Still Presentation System integrates the electronic photos as a computer graphic file into software, like Persuasion™, allowing you to produce image enhanced presentations quickly and easily. Once the "electronic slides" are complete, record the entire presentation to a video floppy disk. Imagine 25 slides on a single, reusable 2-inch disk, immediately, with no processing!

10:45 Present

Connect the RC-570 camera to any standard TV monitor or video projector to deliver impressive presentations directly from your video floppy disk. Edit presentations right on the spot, add a shot, delete a shot, rearrange and customize. No computers. No slides. No projectors. No hassles. Now...doesn't that feel better.

To learn more, call 1-800-221-3333 ext. 313.

Canon

Circle 110 on reader service card.
Introduction of MacWrite® Pro. The allnew version of the essential Macintosh word processing program.

From memos and letters to newsletters and brochures, MacWrite Pro gives you all the tools you need to create stunning documents that deliver real impact in a matter of minutes.

You can format long documents using sections featuring columns of different sized widths and even their own multiple headers and footers.

Add frames for text, graphics, tables or notes anywhere you like. Resizing margins or columns is as simple as clicking and dragging your mouse.

You can save styles for automatic formatting of both characters and paragraphs. And use floating text, tool and style palettes for one-click access to all the tools you need.

Order today. At a price like this, there's no reason to wait.

MacWrite Pro takes on a new life in MacWrite Pro. Now anyone can create dazzling, impactful documents like this one in a matter of minutes.

Upgrade or Trade Up Today. Call 1-800-544-8554.

$69

Additional Features

<table>
<thead>
<tr>
<th>MacWrite Pro</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-step presentation tables</td>
</tr>
<tr>
<td>Text notes and sound messages</td>
</tr>
<tr>
<td>Character tracking</td>
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<tr>
<td>Multi-lingual spell checking</td>
</tr>
<tr>
<td>Auto-save and auto-backup</td>
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Quadra 800 Problems: Difficulties when using some 8MB and 16MB 72-pin SIMMs have led Apple representatives to recommend not using composite SIMMs in the LC III, Centris 610 and 650, and the Quadra 800. A composite SIMM uses lower-capacity chips in greater numbers; for example, a 16MB SIMM might use four times as many 4-megabit DRAM chips instead of more-expensive 16-megabit chips. Additional circuitry needed to make the more numerous chips work like fewer, higher-capacity DRAMs can slow down the SIMM, leading to timing problems with the memory bus, corruption of data, and crashes. Choosing composite SIMMs with slightly faster RAM than normally needed for your Mac may prevent the timing problem, although Apple does not endorse this approach.

Clone Heads to Market: NuTek U.S.A. (408/973-8799), last heard from in early 1991, says it's shipping the NuTek One, a $1599 Mac clone with a 33MHz processor, three NuBus slots, 1MB of RAM, an 80MB hard drive, a mouse, and a keyboard. The NuTek Duet, a dual-processor Mac-compatible computer that also runs DOS and Windows software, is available directly from NuTek and will be sold through dealers. One drawback: computers using the current NuTek technology can't run some Mac programs, including Excel.

MacWrite Pro Sighted: Claris (408/727-8227) is now shipping MacWrite Pro, originally announced in early summer 1991. The word processor has a frame-based interface with a floating palette, desktop publishing capabilities, a table editor, sticky notes, and style sheets for both paragraph and character formatting. Pro will be $249 for first-time users; $69 for an upgrade.

Making Apps Centris-Friendly: Aly-sis (415/566-2263) has upgraded its Compatibility INIT to version 3.2 with support for the Quadra 800 and the Centris 610 and 650. The $99.95 system extension allows older versions of applications and desk accessories to run on the 68040-based Macs with the high-speed memory cache turned on; the extension recognizes programs that are incompatible with the cache.

Mr. Newton to the Courtesy Phone: Siemens is working on NotePhone, a combination of a telephone and other communications technology that will work with Apple's upcoming Newton PDA. The first NotePhone will accept a Newton as a plug-in device, while future NotePhones may communicate with Newtons wirelessly.

Disinfectant Upgraded: Version 3.0 of Disinfectant, a popular and free antivirus utility, has been updated to block the new T-4C virus. Disinfectant is available from most commercial online systems and user groups.

Apple's PowerCD: This CD ROM drive is compatible with Kodak's Photo CD and displays Photo CD images when hooked up to a Mac or a TV. To list for under $500, the portable PowerCD weighs about 3 pounds, can be battery-operated, and is expected to include an AC adapter, a remote control for Photo CD operations, and a cable for connecting to a TV. The drive is slated to ship this summer; pricing and availability are not set.
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Clone Alone
BY ADRIAN MELLO

The clones are back. Every few years something happens to get the Mac community revved up about the possibility of Mac compatibles. The latest development was the announcement by NuTek U.S.A. that it is finally shipping a "Macintosh work-alike" system that runs most Macintosh software applications. NuTek doesn't consider its system a Mac clone "because the hardware is almost totally different and the operating system software was carefully coded without reference to Apple's Macintosh Operating System," according to G. Gervaise Davis III, NuTek's attorney. This distinction will be lost on most end users, who will continue to call any work-alike a clone.

The NuTek board that goes to third parties, the NuTek One, employs a 33MHz 68030 processor and has three NuBus slots. Third parties can buy the system software and board, then combine them with keyboards, monitors, disk drives, and other peripherals. NuTek itself is offering end users the Duet, a hybrid system that has a 68030 and an 80486 processor, for running Mac and DOS or Windows applications. The Duet also has two NuBus slots for Mac add-in boards, and two ISA slots for boards for DOS machines. Unfortunately, neither the NuTek One nor the NuTek Duet is compatible with ADB devices, so you couldn't swap keyboards or pointing devices between it and your Mac.

No Clones on This Bus
ONE OF THE DEFINING CHARACTERISTICS of the Mac market has been the absence of successful clones. In the world of DOS and Windows PCs, hundreds of vendors offer computers that run the same operating systems and applications. But Apple has repeatedly proven its willingness to take all challengers to court and its ability to win—witness the death of Franklin Computer. The only recent exception is Quorum Software Systems, which does not compete with Apple for hardware systems sales. Quorum, which makes software that lets Mac applications run on Unix machines and other higher-end systems, recently won a suit against Apple. With a relatively large war chest at its disposal, NuTek appears to be reasonably well prepared for the inevitable legal onslaught from Apple. It does seem fated that the two companies will soon disagree in court over whether NuTek is infringing on Apple's intellectual property.

Whatever the outcome of the legal battle between these two companies, it's interesting to consider the potential role of Mac clones. Whether or not NuTek wins in court, it and any other future Macclone companies must compete in the marketplace. When NuTek began its development several years ago, Apple was an overpowered fat cat, charging top dollar for its high-quality technology. At the time, clones were an appealing notion because they would have made the Mac experience available to more people. Since then, Apple has changed its strategy and decided to improve its share of the personal computer market. Over the last couple of years Apple has slashed prices and now offers competitively priced products, including three models powerful enough for business use and priced under $2000 (the LC III, the IIfx, and the Centris 610).

Enter NuTek, quite some time after its cue. The key selling point of a clone is usually price. In the early DOS market a clone had to be about 20 percent cheaper and 20 percent faster to sell against IBM. Dealers and resellers will be able to purchase the NuTek board and system software for $899. A NuTek spokesperson told Macworld that you should be able to purchase a complete, assembled NuTek-based system, comparable to a Mac IIfx in capability, for around $2600 to $2700. If you build the system yourself, it would cost around $1600 to $1700. Most people don't want to build their own computer, so when you compare Apple- and NuTek-assembled systems including a hard drive, monitor, and keyboard, the prices are likely to be within $100 or $200 of each other. Given that the NuTek work-alike won't be Apple labeled and—more important—won't initially support all system software features or all applications, most buyers will not be persuaded unless there is a bigger price difference. NuTek may have room to maneuver on price and operate on lower margins than Apple, given the tremendous overhead that Apple requires to operate and continue to innovate. But Apple has the advantage of economies of scale, and NuTek still has its own research to finish. After all, a Mac clone should be compatible with Microsoft Excel, which, along with HyperCard 2.1 and Aldus FreeHand 3.1, the NuTek work-alike cannot presently run.

Meeting Demand
DESPITE THESE DIFFICULTIES, NUITEK may not have to compete on price alone. Its board and system software will let value-added resellers offer a complete, ready-to-use system specifically configured for vertical markets. More important, there is room in the market for more than one Mac vendor. Over the last year or so, many would-be buyers have discovered that the Macintosh they wanted wasn't always available. Demand has been at its highest ever, Apple has had difficulty delivering parts to its factories on time, and there have been instances of bug-related shortages. Past shortages of the Mac IIfx, the PowerBook 180, and the Quadra 900 and 950 spring to mind.

So, should Apple view clone makers as foes, or could they be possible friends? Apple's market-share strategy indicates the importance of expanding the installed base of Macintoshes in a personal computer galaxy dominated—in quantity if not quality—by Microsoft operating systems. Apple has done a tremendous job of fueling demand by offering an excellent collection of new products at compelling prices. Apple must now meet that demand. A good clone might actually ease the strain on Apple's manufacturing and support. It's true that Apple would not directly harvest as much profit, but Apple would benefit from having a higher number of Mac-like systems out there because that would attract software developers to its bandwagon.
IF APPLE DECIDED TO MAKE MONEY from clones, it could be more liberal about licensing its operating system. Licensing the current Mac OS would also let Apple control the relative positioning of clones made by licensees, depending on how Apple crafted the licenses. For example, Apple could license the operating system to a company that would make and sell a machine equivalent to the Classic II or the LC II at an exceptionally low price. Neither machine directly competes with the more compelling Color Classic or LC III, both of which can command a higher price due to their superior features. Apple could free up manufacturing capacity, boost the installed base of the Mac, and make some money on the licenses. Because Apple is a vendor of hardware and systems software, it could continue to innovate with its own products. And because Apple can always say “We control the hardware, we control the software, do not attempt to adjust your set,” the company could control even licensed clones by making them obsolete with new Macs.

Apple’s recent announcement of Macintosh Application Services for the PowerOpen Environment created by Apple, IBM, and others, shows a commitment to license the Mac OS in the future. This software will let PowerOpen hardware systems run System 7 and its applications. The PowerOpen Environment combines the PowerPC RISC-based hardware architecture with an underlying version of Unix. Since Apple appears ready to migrate the Mac OS to the more powerful PowerPC hardware, why not let companies license the current operating system in the meantime? Precisely because Apple is sometimes “production-constrained,” which means that every sale of a clone could be a sale lost for Apple. Unless Apple decides to go for vastly larger market share—which it should—there’s little motivation in the short term to license the current system.

In any case, NuTek doesn’t offer a short-term threat to Apple. Even if it did, Apple could solve the problem by licensing its operating system, or dropping prices, or hiring a lot of lawyers to all say “Boo” at the same time. Longer-term, Apple must consider the economic ramifications of how its intellectual property is staked out. The bottom line is that clones in some form are certainly coming, but NuTek, as presently constituted, has a tough struggle ahead. Many PC companies have bitten the price-war dust, and the territory under Apple’s prices should be dry indeed for a small outfit like NuTek. So far, it seems that NuTek is a year late and a compatibility short.
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Early Returns on April Macs

The Color Classic—it's April Fools', right? After all, only a fool would design a Classic that resembles 1950s science fiction kitsch ("Color Classic," April 1993). And only a fool would purchase such a mutant when for only a few hundred bucks more he could get an LC II or III. The real Classic line ended with the Classic II.

James Conner
Kalispell, Montana

In response to your criticism of the Color Classic's small screen, I have to say: You don't get it.
The first Macintosh revolutionized graphic design despite its small screen and high price. Critics complained. People bought. Now, a color Classic with a larger screen than ever before—wow, what a country! Apple gets it. Do you?

Kevin Whaley
San Diego, California

Galen Gruman doesn't seem sure of what type of user the new Centris targets. I think Apple is looking East, especially to Japanese offices, whose operating environment, KanjiTalk, typically does not require expansion boards or an FPU, but does require a powerful CPU.
The Centris 610 will be a big hit in the Japanese market if Apple makes its price competitive not only with the PC compatibles but also with the NEC PC9800 series, the longtime champ in the Japanese market.

Ted Yoshimura
Sunnyvale, California

Gotcha!

Three weeks ago, I purchased a Mac IIfx. Today, I read your April issue only to find out that significant information had been lacking in your December issue about Apple's new product marketing and pricing strategy. The lack of this information cost me somewhere between $1100 and $1600. I find it hard to believe that you did not have some inkling of the substantial changes that were about to occur in terms of new products and lower prices.

Gordon Kuster
Orange, Connecticut

I bought a Mac IIfx and in less than 90 days its price dropped over $1000, and its performance was matched by the LC III. Now, for the privilege of upgrading to the new Centris, I could give Apple another $1000. Apple has another unhappy customer.

Ron Davis
Abilene, Texas

The Mac IIfx has been rendered obsolete only four months after its introduction. I happen to be one of the suckers that Apple duped into buying one of these instant relics. I'm so glad I could be part of Apple's prototype testing program. Hey, where's my paycheck for services rendered?

I can hear Apple's response already, "But sir, upgrades happen all the time in the fast-paced computer world. And you can always upgrade your IIfx." Let's say I spend the $1199 to upgrade to a Centris 650. My $500+ RAM investment is suddenly in the toilet, also. So, adding the price of my original machine (bought only months ago) brings me to a grand total of $3400 for a computer now selling for $3400.

Sean Ograivo
San Jose, California

For those of us who carted home a IIfx, the introduction of the Centris line was like watching a magician hand back the wallet we did not know was missing. Apple could set things right by offering a reasonable upgrade to the 040 for those of us who jumped early, but incontinues
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In the March review of the Duo Dock, we incorrectly stated that the Duo Dock supports the SCSI disk mode. Only the MiniDock allows you to use a Duo as a SCSI drive. Also, the Duo Dock review stated that you can add extra memory to the Duo Dock. Only video memory may be added to the Duo Dock.

The March feature "First-Time Authoring" stated that, for MovieWorks from Interactive Solutions, "You still need other software and hardware if you intend to create your own QuickTime movies." The sentence should have read, "You still need other software and hardware if you intend to capture and edit your own video."


MacSchedules F by MacEssentials was incorrectly listed as MacSchedules in the March New Products section.

The correct fax number for Useful Software Corp. is 508/922-0413 (New Products, March 1993).

The correct number for the Macademy bulletin board system is 415/621-0567 (Conspicuous Consumer, March 1993).

In "Quadrant 800" (April 1993) the maximum memory for the Quadra 950 should have been 256MB, not 16MB.

In the entryway diagram of the Centris 610 the NuBus board should have been oriented from back to front instead of from side to side ("Centris 610 and 650," April 1993). Also, the "Who Offers 7-Inch Boards?" sidebar should have included Asante's MacCon Plus for NuBus, MacCon-IHE, and MacCon-IE boards. Finally, Cabletron's E6110, E6112, and E6119 NuBus boards fit into the 7-inch space, while the E6020 does not.


stead we can pay 133 percent of the price of a new Centris to make our brand new iLvs what it should have been to start with.

It was especially gratifying to hear that Apple's first-quarter revenues were at an all-time high.

Patrick Ryan
Farmer City, Illinois

LETTERS

CORRECTIONS

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Circle 243 on reader service card
RECENTLY PURCHASED A IIS1, BUT WITH THE new Centris 610 on the market, what are my chances for a reasonably priced upgrade?

Bryon Henderson
Wilmington, Delaware

(a) Slim; (b) none.—Ed.

LEARN FROM THOSE OF US WHO INNOCENTLY bought the dreaded Mac llx, only to have its value drop three months later when Apple belatedly introduced the real midlevel computers. Don’t ever buy an Apple product for at least six months after introduction. Wait to see what marketing scheme they have in mind.

Joseph Compton
Encino, California

Must say that I am more productive now than when I worked on my typewriter. But I still wonder: am I more productive due to the hardware or due to the need to pay for everything?

P.S. I want to upgrade my RAM. Do you need another free-lance writer?

Michael Labosier
Columbus, Ohio

Are you kidding? We can hardly do enough work to pay for our own stuff.—Ed.

Mail-Order Manifesto

I WORK NIGHTS AS A PHONE-ORDER representative for a large Mac mail-order company. Macworld regularly offers tips for mail-order shoppers. I would like to offer the following suggestions from someone on the other end of the telephone.

Remember that you’re speaking to a human. Don’t bark commands, product names, or stock numbers. When the waiter arrives to take your order, do you shout “Steak!”?

Don’t call in from the road. How do I know? You usually tell me several times, and the road noise makes it hard to hear you. You struggle to retrieve a credit card from your wallet while keeping a hand on the wheel (and, I hope, an eye on the

Productivity Still Missing

I AGREE WITH STEVEN LEVY (THE ICONOCLAST, March 1993). You may have fun putting QuickTime clips in your word processing file, but you’re not the vanguard of a productive new generation.

Tom Seibold
Berrien Springs, Michigan

Five reasons to pick a TI

No matter which Macintosh® computer you have, there are strong reasons why there’s a perfect microLaser printer to go with it. Personal or shared.

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For the value-conscious, take a 9 pages-per-minute laser printer, load it up with 17 scalable outline fonts from the Adobe® PostScript® software library, give it an operating cost of 1.9¢ cents per page and price it at $1,249**. Now you’ve got the best value in the business, for yourself or your business. It’s the microLaser PS17.

2. It’s upgradeable.

Now take the microLaser we just talked about, double the fonts, have the options of Turbo upgrades for fast graphics, price it at $1,399** and you’ve got the microLaser PS35.

3. It’s powerful.

For high-speed PostScript printing with a built-in RISC processor, PostScript Level 2, 35 fonts, and automatic switching between PostScript and HP LaserJet® emulation, try a high-performance microLaser Turbo. Perfect for the power user at $1,699**.

4. It’s shareable.

And if you’re into networking, the 16 ppm microLaser XL Turbo flies through documents...
road). Let's hope those other drivers imagine you're wrangling crucial business deals out of cranky clients, not arranging to have Leisure Suit Larry delivered to your office via overnight express.

Have your credit card in hand. I've waited endlessly while you search for your cards upstairs, downstairs, out in the car. You get angry at me when your card is declined, as if I'm responsible for running up your credit. You have fits when I ask for confirmation data that protect both you and us from fraud. If you're uncomfortable relaying this information over the phone, maybe mail order is not for you.

Don't put me on hold. My pet peeve—I'm expected to make my subsequent calls hold while you take care of other business. We are thinking, feeling humans. We don't deserve your tantrums and rages.

Name and address withheld by request

Finding an Online Home

In response to "Exploring the Online World" (Conspicuous Consumer, March 1993): Recent experience with Prodigy suggests that one important criterion in selecting an online service is the company's philosophy. All I wanted to do was converse with other members in a language other than English. Notes posted in other languages were returned, as well as notes posted to the French subject heading under the Hobbies bulletin board. French movies must be discussed in the Arts BB; French brie and burgundy, in the Food and Wine BB; and so on. Repeated messages to Prodigy membership services were met with form letters.

Sometimes the reactions reached ridiculous proportions. A note I posted asking for information about a kind of slipper (seen in a French movie) that cleans as you walk was returned as off the subject, but not before I received a reply. I wrote to thank the member who enlightened me, saying that the slippers would be useful in my house, where there is a whole warren of dust bunnies. This note was returned to me with a message from Prodigy stating that my note was not compatible with the family orientation of their service.

Maybe I got the wrong form letter, but I certainly got the message: "Your type is not welcome here." I disconnected—permanently—and signed on where I'm wanted.

Jonathan Bailey
Columbus, Ohio

It's in the Stars

While I find the star-rating system to be very helpful, I'm having a slight problem with what I perceive as inconsistencies.

For a case in point, I offer PowerPoint 3.0 and MacGlobe 1.3 reviews in the February 1993 issue. I have no experience with either product (or any competitors), so I do not think I have any inherent bias one way or the other. The PowerPoint review seems negative, while the MacGlobe review seems positive. But in both cases, the stars don't back up the copy. PowerPoint received four stars; MacGlobe, three.

The reviews are invaluable, but these stars carry a lot of psychological weight.

E. Garry Hill
Mountain View, California

It is difficult to distill a one-word evaluation from a review and to maintain consistency among the authors. Macworld's reviewers consider nine factors—design, interface, ease of use, performance, reliability, value, documentation, support, and innovation—when assigning a star rating. A three-star product is considered a good product, while a four-star product is considered very good, while a one-star product is considered very poor, and the

with the high quality you want. Users on AppleTalk™ networks find this to be the smart choice for big-time business, or for those who want to move into the big time without a huge budget. Priced at only $3,749**.

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MacWorld/June
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Microsoft Words

BOY, IS THAT MICROSOFT WORD 5.1 (Reviews, March 1993) a dog! When you install 5.1 on a PowerBook, a battery indicator extends your screen 1 inch to the right, whether you like it or not.

Also, there is no envelope paper option for the StyleWriter, that little-known printer from a virtually unknown manufacturer. According to technical support, they know all about the problem and have no intention of fixing it until the next version, which I can purchase for a mere. . . . But, hey, they pointed out that at least some of the enhancements work. Thank you, Microsoft, for selling me a product that is only partially defective.

Peter English
Austin, Texas

THE MAC PRINTER THAT ISN'T?

EWLETT-PACKARD TOUGHS THE LaserJet 4M as the printer that they built from the ground up for the Mac (Reviews, February 1993). The only problem is that they forgot the manual: it carries very little info for Mac users. Nowhere does it explain choices in the Print dialog box and what they mean.

Plus, the printer itself is not completely software driven. Instead of recognizing that you have chosen Envelope in the Page Setup dialog box and Multi-Purpose tray in the Print dialog box, you must walk over to the printer and punch in changes if you want to do something like print an envelope from the multi-purpose tray.

Norm Rechtman
via America Online

Letters should be sent to Letters, Macworld, 501 Second St., San Francisco, CA 94102; via fax, 415/442-0766; or electronically to CompuServe (70370,702), America Online (Macworld), or AppleLink (Macworld), or via Internet (70370,702@compuserve.com). Include return address and daytime phone number. Due to the high volume of mail received, we can’t respond personally to each letter. We reserve the right to edit all letters. All published letters become the property of Macworld.
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MIROR

The best thing next to your Mac.

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DAVID HERSCHMAN didn’t set out to be a pornographer. It just kind of happened. He and his partner, Hikaru Phillips, were once computer guys, not sleaze merchants. They both were excited by a market on the verge of exploding: multimedia. But established companies—corporations like Voyager, Broderbund, Microsoft, and even Time Warner—seemed to have the major bases already covered. Those bigshots were heavily into multimedia games, education, productivity, and research sources. Was there anything left that a couple of hardworking entrepreneurs could get into without a giant bankroll, and make a profit fairly quickly? What would sell?

Something that always seems to sell. Sex.

"The market is there for it now," explains Herschman. How did he know? "Independent research," he says, though he does not elaborate on his scientific methods. Apparently, the results of his soundings led him and Phillips to the somewhat Faustian decision to form Intererotica, a company devoted to "interactive adult entertainment."

A question left hanging by his research project, apparently, was the precise degree of (what I shall charitably refer to as) eroticism that would be provided by his company’s initial multimedia effort. He first considered a relatively tame version of strip poker. Applying the motion picture rating assignments to such a project, this would be a clear R. But the project did not materialize.

Oddly, Herschman assigns a supporting credit to Macworld for nudging him in this direction. This magazine and others that also survive on advertising revenue from those selling wares to Macintosh users let it be known that they would not welcome advertising for a product featuring images of naked human beings, with the possible exception of familiar reproductions of paintings from the Italian Renaissance. If ads for an R-rated product were to be refused, Herschman and his partner asked themselves what they could lose by doing an X-rated product. "We decided to go all the way," he says.

Even though, as Herschman explains, "we weren’t from the adult world," he and his partner dipped into the demimonde and produced a shoot that was quite firmly centered in the so-called adult world. The result was Night Watch, a disk where the viewer embarks on a voyeuristic journey through the units of a fictional condominium, supposedly with the aid of a hidden camera provided by a strip-teasing security guard. Herschman considers it a reasonable first effort. He seems quite proud of certain aspects of the CD ROM product, which sells for $80.

"It’s one of the first all-digital productions," he boasts. "We edited it digitally using Adobe Premiere. All the sets, though not of course the actors, were rendered in 3-D, as you probably noticed."

To be honest, I did not notice. The striking aspect of Night Watch is not the 3-D rendering but the nature of the product itself. Though Herschman rates it an X, I would have to triple that designation. The activities depicted by the actors hired to make the QuickTime clips in Night Watch—though it is difficult to discern the difference in these things between depicting actions or performing them—are those most often performed in the privacy of a bedroom or bordello, and rarely on a modular Macintosh. The camera does not flap, even when the most rudimentary application of discretion, or aesthetics, cries out for it. The genre forbids flinching. The genre, of course, is hard-core pornography, which has, inevitably, met multimedia.

It is a marriage made not in heaven, but on 42nd Street. And it is selling very well.

Exxxpo AT THE JANUARY MACWORLD Expo, Night Watch and more than a dozen other products were on display at a booth rented to a distributor called Body Cello. To David Herschman’s satisfaction, he sold 400 copies of Night Watch. Don’t bother pulling up the Calculator DA—I’ll do the math for you. Four hundred copies at 80 simoles each is $32,000. In four days.

Body Cello was not alone. In another booth, budding multimedia magnate Joshua D. Gordon was selling a disc called Digital Dancing. This was no arithmetic program. The dancing was done not by digits but by strippers recruited by Gordon. "My background is databases," says Gordon. Like Herschman, he explains, "I was looking for a way to play with multimedia, QuickTime, and the CD ROM technology, and since there are very few things that move people like sex or eroticism, I was pretty sure I could recoup my money." He did.

In addition, a company called Pixis was offering a disk called Adventures of Buttman, which was essentially a QuickTime rendering of a sleazy triple-X flick. (The principals of Pixis were insufficiently proud of their activities to provide me with their names.) Finally, Mike Saenz, the fellow who may lay claim to Virtual Valerie, the first of these adult products, was hyping a sequel—though purists in these matters may complain that Valerie, by virtue of being a comic-book rendering of a sexual object and not a video or photo image of a real-life sexual object, does not qualify as a pornographic icon.

A few Expo-goers complained. Mitch Hallal, the president of Mitch Hall Productions, which produces the Expo, emphasizes that the protests were minimal. However, he concedes that inadequate measures were taken to shield passersby from the empathically intimate activities occurring in full-color RGB display. In the future, he promises, he will require vendors of such products to have enclosed booths, where only those wishing to see unadorned body parts in action will see them. He will also demand guards be posted at the entrances to those booths, to ensure that curious children won’t find their way in. Though some in the Mac community prefer that the companies selling sex be banned from the show, Hallal says that he doesn’t want to get into censorship in any form.

The Q-Word I SHARE HALLAL’S AVersion to censorship. So instead of
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spending the rest of the column deploring the decline of civilization—it's in the dumber, baby—let me marvel that any of these products are successful at all. It seems to me that all media through which to consume pornography, Macintosh QuickTime is one of the least amiable. It is my understanding (not, of course, that I would know personally) that those who are attracted to such things do not often pursue their attraction in the office, where one most often finds color Macintosh computers. I have also been told by worldly acquaintances that a wealth of hard-core products are readily available on VHS at a fraction of the prices charged by those selling CD ROMs with similar images—and that these tapes, unlike QuickTime, offer reasonable resolution and fill up the entire screen of a television set! In addition, it is widely rumored that glossy magazines exist that show extremely revealing photographs—and that these magazines offer a degree of portability unavailable with Quadas and Macintosh Ilvys.

Even David Herschman readily admits that his disc offers far less quality than do similar products in other media. "It's not here yet," says Herschman. "The screen size is small, the frame rate is inadequate." He is understating the case—the video is fuzzy, it jumps like a jackrabbit, and it's smaller than a dialog box. So why is the stuff selling? "The novelty," he explains. "The innate adventurousness that sexuality is part of." In other words, sex sells.

Pet Shop Boys
"CAN IT BE THAT THESE PEOPLE ARE truly ahead of the game, and multimedia indeed offers a ripe market for pornography? My conclusion, offered without enthusiasm, is yes. When the multimedia pornographers tell us that the audience exists, they do not exaggerate. Computer users already spend an unbelievable amount of time and money on digital pictures of naked people. One online activist calculated a year's worth of downloads of the sexually oriented GIF and PICT files on CompuServe and estimated that they totaled a whopping $24 million of connect time. This same audience is apparently predisposed to buy even the crummy multimedia products currently available. It stands to reason that when the technology gets better, and the budgets for the products get bigger, the discs will also appeal to the wider market of pornography consumers. Besides the usual selling points, multimedia offers something new: a sense of interactivity.

By the time you read this, one of those high-budget CD ROMs should be on sale. This is Penthouse Interactive, the first multimedia product officially associated with Penthouse, the magazine published by Bob Guccione. It is produced by a company named ICFX, whose principals are James Ehrlich and David Biedny, both of whom have experience in the Mac market. Like David Herschman and Joshua D. Gordon, these two entrepreneurs see sex as a market opportunity.

"We wanted to get in early and define a better way for this genre," says Ehrlich. "A high-end, attractive—romantic, even—aspect. It's not about subjugation of women, it's about the creative aspect, of allowing people to take pictures of beautiful women. We steer away from lasciviousness—we're on a higher plane." (This defense of his creativity was unprovoked by any question I posed to him.)

As Ehrlich describes it, Penthouse Interactive puts the user in the role of a photographer shooting a Pet of the Month.
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You can move them around, put them in all sorts of positions and poses. And you’re snapping photos—you send frame numbers to the disc and print them later. “When you see your contact sheet with the pictures that you took, you feel great.” Ehrlich believes that what will sell his product is not so much the nudity, but the interactivity. In this case, the interaction is focused on the illusion that one is ordering around a naked woman. So much for the higher plane.

“We have a whole smorgasbord of plans for interactive titles,” says Ehrlich. “As computing power increases, there will be really, really intense sniff.”

Pioneer Days
IN A STRANGE WAY, THOSE WHO PREFER more conventional and less degrading uses of multimedia should take comfort in all of this. The appearance of pornography quite often indicates that a medium is on the cusp of success. At one time more than half of all sales of videocassettes came from titles you would not show to Aunt Emily. It seems that porno, the intruder we disdain in public and consume voraciously when no one is looking, is the ultimate early adopter. Uninvited, pornography constantly pushes forward in sparsely populated new-media frontiers. It may be seedy, but it is a reliable drawing card. Its audience follows wherever it goes, and in the process this audience learns about the new medium. Eventually that medium becomes successful, and porn, though always profitable, becomes less prominent in the mix of things. It looks as if that progression is under way with multimedia.

Meanwhile, David Herschman rides what he considers the cresting wave of hard-core QuickTime. His company is about to release two new products. One is a so-called adult story dubbed The Interactive Adventures of Seymour Butts. (Mr. Butts is, Herschman explains, a well-known figure in the adult cinema; apparently it was a coup to get him.) The other, called The Dream Machine, is more ambitious. A female narrator offers you a choice of sex scenes; your selections allow her to guess your ultimate fantasy and presumably provide it for you. “We’re going to push the envelope of interactivity,” promises Herschman. “I’m really excited.”

But David Herschman is not so excited that he wants to pursue his new career path indefinitely. Eventually, he admits, he hopes to move to the mainstream. In fact, he confesses, “I’m concerned about using my real name.” He does it, he says, because he and his partner stand by what they’ve produced. “Unfortunately,” he complains, “there’s a stigma.

I cannot resist a parting shot. “David,” I ask him, “what does your mother think of this?” A sigh comes over the telephone. “My mother had a little bit of a problem,” says the reluctant multimedia pornographer. Then his voice perks up a bit. “But my father was OK with it.”

I’m no censor, and in any case a discussion of the morality of pornography is beyond the scope of this column. But after seeing Night Watch, I’ve got to say it: David Herschman, you should have listened to Mom.

STEVEN LEVY’s most recent book is Artificial Life: The Quest for a New Creation (Pantheon, 1992).

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18 Great Mac Resources

BY DEBORAH BRANSCUM

LOVE WORKING AT MACWORLD

in part because of all the nifty stuff that makes it into my mailbox. Once a year I devote a column to resources I've found that aid and abet computing. Some of these items are Mac specific; others are broader, but still interesting. This year's crop ranges from a pamphlet on computer-virus management to a MicroPhone tip sheet to an inexpensive collection of digital practical jokes—which may not aid computing, exactly, but does make it entertaining.

Strictly Macintosh

INSIDE MACINTOSH IS THE CLASSIC series of six books that let programmers and other true techies get into the guts of the Mac. New Inside Macintosh (Addison-Wesley) replaces that series with 15 revised and reorganized volumes. An overview is available, along with individual books on files, memory, processes, imaging, text, QuickTime, interapplication communication, and Macintosh Toolbox essentials. Future volumes will cover QuickTime components, operating-system utilities, networking, communications, and devices. The books range in price from $19.95 to $34.95 and can be ordered from APDA, Apple Programmer's and Developer's Association, by calling 716/871-6535 or 800/282-2732.

Of course, if your favorite reading matter is New Inside Macintosh, you are not a beginner. You are a savvy, swinging, Macintosh super power user. That's not the problem. The problem is the people you deal with—a relative, perhaps; less experienced users in the office; or a neighbor down the block. They all want you to explain the Mac to them and you don't have the time. Good news—there are two basic books that are just right for beginners. Actually there are many choices—these happen to be my two favorites.

The Little Mac Book (Peachpit Press, 1993), by Robin Williams, is a classic originally published in 1990 and now in its third edition. This slim, $16 volume covers concepts and jargon, and offers a tutorial at the end. This book is clearly written and elegantly designed; it's a good choice for people who are somewhat familiar with the Macintosh but want to know more.

Macs for Dummies (IDG Books Worldwide, 1992), by Macworld contributing editor David Pogue, is published by a sister company to Macworld, but I'd plug it no matter where it came from or who wrote it. This very funny tutorial assumes utterly no Mac experience on the part of the reader. It begins by explaining how to turn on a Mac and works its way up to "Faking Your Way Through the Top Ten Programs" and troubleshooting. This is the best possible book for anyone who's afraid to touch a mouse.

The quarterly Macintosh Product Registry is a one-volume resource for product listings and contact information. It's $14.95 on newsstands, or $40 for a one-year subscription. Software and hardware companies write their own listings, so it's not impartial, but it is useful. Call 407/231-6904 for subscription info.

All Business

THE WEIGAND REPORT: THE WORKING Newsletter For Macintosh Professionals is targeted to small-business folks, including desktop publishers. A recent issue included articles on QuickKeys Extensions, Word 5.0 tips, and useful utilities. I especially like Data Doctor, a nuts-and-bolts column by Steve Burgess about hard drives. An accounting column is in the works. The 8- to 12-page newsletter comes out 6 times per year and even offers online support via the Macintosh Business Forum in American Online. A subscription is $65 annually; write P.O. Box 690, Cedar Hill, TX 75104, to obtain a sample copy.

Recently I received a letter praising Heizer Software. Christopher Fager wrote to rave about the company's tax templates and other products that "allow me to really take advantage of my nearly ten-year investment in Excel." Heizer Software publishes a catalog of appealing direct-mail offerings for business and education. These include the Excel-based Small Business Accounting System, with automatic posting, for $99. Payroll Partner is also $99, while Project Scheduler is a $15 Excel template. Heizer also offers Microsoft Works templates and HyperCard stacks for business and education. Contact the company at 510/943-7667 or 800/888-7667 to receive a catalog.

Another business resource is In Concert With Excel & Word for the Mac (Hayden Books, 1992), by Dan Shafer. It's a terrible title but a rather good book (except for the dopey grand piano imprinted on every other page). Topics include using Excel as a database for Word mail-merge information, linking information within Word and Excel documents, and scripting Excel from Frontier. A floppy disk includes samples and scripts for the book, which is priced at $34.95.

The 9-to-5 Mac (Hayden Books, 1992), by Steven A. Schwartz, is too broad in many ways; it tries to cover Mac basics such as desktop publishing and telecommunications in addition to more business-specific topics such as forms programs, contact management, and tracking expenses. Still, the $29.95 book just may be saved by its accompanying floppy disk, which contains copies of more than 100 business templates.

Of course, the mighty Mac is a haven for macros as well as for templates. The Complete Guide to Microsoft Excel Macros (Microsoft Press, 1993), by Chris Kinata and Charles W. Kyd, demonstrates how to automate your use of Excel. Spreadsheet heavyweights will appreciate this second edition, which covers Excel 4.0 for both the Macintosh and Windows. Bucking the trend, this $29.95 volume doesn't have a software disk.

To make up for that lapse, Microsoft Press does include a disk with Microsoft Excel Macros: Step by Step, by too many people to mention. This $34.95 book (described as Official Microsoft Courseware; golly) packs a lot of clear, specific information into its 250 pages. It's a better intro than the Complete Guide, above.

Interesting Newsletter

ESTHER DYSON IS AN ESTABLISHED industry guru who writes a regular column for...
Forbes, runs a technology forum every year, and publishes a monthly 20- to 24-page newsletter called Release 1.0 for business types who need to know what future technology may bring. Dyson covers everything she believes will become important, even if it’s esoteric now. That may mean an article on groupware one month and artificial life another. A subscription is $495; call 212/758-3434 during EST business hours for a sample copy.

Macromedia User Journal is an independent, 24-page newsletter from Tony Bove and Cheryl Rhodes that comes out six times annually. The January-February issue included articles on Director tips and tricks; using MIDI sound and synthesizers with Director; and interface guidelines. A subscription is $95; write P.O. Box 1289, Gualala, CA 95445, for a sample issue.

Our Friends the Feds

CONGRESS HAS ASKED THE NATIONAL Technical Information Service (NTIS) to disseminate the technical and scientific information it receives from federal agencies and other sources—something like 1300 reports weekly. NTIS began a pilot project in November to give the public access to some of that information online via the FedWorld bulletin board system. Reports that can’t be accessed online can be ordered online—since NTIS is funded by customers and not Congress.

FedWorld can be accessed at 703/321-8020 (parity, none; data bits, 8; stop bits, 1). Type new at the prompt and you’ll shortly be online. Or call 703/487-4650 and ask for a copy of PR936, a one-page information sheet on the service, which is also a gateway to many other federal BBSs. FedWorld isn’t Macintosh-hostile, but it’s not exactly friendly; you’ll probably need to use MacLink or another file-translation program to actually read the text files you download. There is a lot to access, from items on information technology to weather satellite image files to President Clinton’s daily itinerary.

If you want to take the paper route, and why not, you can order the NTIS Product & Services Catalog (charmingly identified as PR-827/AC1) by calling the NTIS number listed above. One example of an NTIS report is Computer Viruses and Related Threats: A Management Guide. This roughly 40-page guide defines viruses and similar hazards, discusses virus prevention for computer networks, and suggests additional reading. It also includes a contingency plan, a common-sense list of actions that won’t be news to experienced network administrators but should be helpful to small businesses.

Telecommunications

OPENMIKE IS A $10 MONTHLY RESOURCE for MicroPhone II (4.0.2) and MicroPhone Pro users from Paul Celestin, who crafted the Loren module in MicroPhone Pro. OpenMike is a floppy disk with MicroPhone scripts, settings documents, and tips. The January 1993 issue, for example, includes a dozen new full-color icons to use with MicroPhone, part one of a DialogerPro tutorial, and advice on dealing with prompts. Call 800/835-5514 for details.

In the March and April issues of this column, I discussed online bulletin board systems and global networks. Since then I’ve run across two additional books that should be useful to people just beginning to explore the online world.

Yakety Mac: The Telecom Tome (Hayden Books, 1992), by Ross Scott Rubin, and Dr. Macintosh’s Guide to the On-Line Universe (Addison-Wesley, 1992), by Bob LeVitus with Andy Ihnatko, cover roughly the same territory in vastly different ways and at different prices. Yakety Mac, $34.95, is comprehensive, beautifully...
Service Hero

Good dealers are worth their weight in gold (and a good thing too, given how much of our gold they get). Gregory Sloat of Minneapolis writes gratefully of First Tech Computer, where he bought a Macintosh IIci. Sloat didn’t run into problems with his computer, but he did have problems with a LaserWriter ll—bought from another dealer entirely. Although the printing problem wasn’t First Tech’s responsibility, “they replaced our defective toner cartridge (even exchange) with a new one,” writes Sloat. “First Tech truly is a Service Hero!”

Legally Speaking

In 1990 California lawyer Jonathan Rosenoer began writing a column for Stanford University’s Macintosh User Group. Since then the column has grown into monthly reports called “CyberLaw” and “CyberLex,” which cover legal issues that affect the computer industry. “CyberLaw” covers a specific issue, such as privacy and electronic communications, in some depth; “CyberLex” offers a summary of legal developments drawn from major publications. Rosenoer writes these reports as a labor of love; he doesn’t charge for this service, which many other lawyers contribute to without compensation as well. It’s terrific reading for anyone who, like me, is fascinated by the legal issues that sometimes face computer users and the industry. Many user group newsletters reprint these reports; America Online (703/893-6288 or 800/827-6364) and The WELL (415/332-4335) maintain forums for “CyberLaw” and “CyberLex.”

But Wait, There’s More

For more Mac resources, see Conspicuous Consumer, June 1992, July 1991, and June 1990. If I’ve missed something particularly helpful, please drop me a line so I can include it in next year’s column. In the meantime, happy computing.

Send nominees for sainthood to Service Heroes, Macworld, 501 Second St., San Francisco, CA 94107, or via AppleLink (Macworld) or America Online (Branscum). Conversely, drop Conspicuous Consumer a line if a company is ignoring you.

HANGS IN THE BALANCE.

Introducing the KODAK COLORSENSE Color Manager. For true color balance across your entire Macintosh Computer System, in one complete and affordable solution.

To get the colors you want out of your color desktop peripherals, you want the KODAK COLORSENSE Color Manager. It’s a software tool that balances your color desktop peripherals so they all speak the same color language. It’s also a hardware tool that calibrates your monitor for consistent screen display over time.

The result? Balanced, accurate color from start to finish. What you see is what you get. No more guesswork. No more surprises. So now, when you want to present or sell a graphic idea, you’ll have the color you want. Instead of a poor excuse. You’ll also generate fewer reprints as you work. Saving you time, material, and wear and tear on the printer.

Thanks to an easy-to-use interface, the COLORSENSE Color Manager is a cinch to set up and use. Just select the devices (scanners, Photo CD disc, monitors, printers) and the COLORSENSE Color Manager does the rest.

Call 1 800 242-2424, Ext 56 (in Canada: 1 800 465-6325) today for information on the KODAK COLORSENSE Color Manager. And experience accurate color like never before.
Introducing the next generation in the award-winning Project Scheduler series—Project Scheduler 5 for the Macintosh.

Awarded "Editor's Choice" by MACWORLD in April 1992, Project Scheduler 4 has gained greater functionality and enhanced performance in Project Scheduler 5. With Project Scheduler 5, you can meet the challenges of coordinating multiple projects. Now, managing tight schedules, limited resources, and different computing platforms is easier than you ever thought possible.

**Effective communication.**
As a project manager, you know that communication is your most important—and most difficult—task. With Project Scheduler 5, you can convey your scheduling information effectively through customized reports and schedules. And, since Project Scheduler 5 is available in Macintosh, DOS, and OS/2 versions, you can track projects and update schedules easily, even in a multi-platform environment.

**Multi-project management with ease.**
With Project Scheduler 5 you can track resources and status across multiple projects. Integrate multiple projects into groups and establish dependencies that cross project boundaries. Automatically calculate validated group schedules using error-free, cross-project critical path analysis. And automatically update individual projects to accommodate schedule commitments and changes made at the group level.

**A professional product.**
Backed by professional support.
When you have a question, we'll get you the answer fast—without making you waste your time waiting in an electronic queue. Our support program even provides direct access to Project Scheduler 5's designers. And we offer the most comprehensive training and consulting program in the industry.

**The ideal corporate solution.**
Whether you're managing multiple projects in a Fortune 500 corporation, or a single project in a small business, Project Scheduler 5 is the fast, easy, and elegant way to make everything come together—on time, every time.

For more information, call or write:
415/570-7700
393 Vintage Park Drive
Suite 140
Foster City, CA 94404
THE HARDWARE DIAGNOSTIC FOR MACINTOSH

The next time you see a “sad Mac” on your screen or your Mac’s performance isn’t up to par, diagnose from your desk with SNOOPER, the best-selling new standard for Mac diagnostic, testing and performance benchmarking tools. SNOOPER runs over 250 tests, checks all your hardware and identifies any problems. And the same SNOOPER software runs on all Macs.

SNOOPER is easy to use and saves time and money. Complete your Mac utilities with SNOOPER, the hardware diagnostic and get the complete Virex virus protection package FREE.

THE SOFTWARE DIAGNOSTIC FOR MACINTOSH

Maxa’s ALERT! is essential Desktop Diagnostic™ software that lets you find the source of software conflicts and fix them!

ALERT! helps find the cause of system crashes and frozen screens before they happen. ALERT! diagnoses software on your Mac and reports actual and potential conflicts and problems. ALERT! also consults a database of known conflicts to further isolate possible problems. The database is free to ALERT! users and is updated monthly over online services.

ALERT! is fully networkable under System 7.

ALERT! is available at: Egghead Software • CompUSA • Computer City

MAXA

First in desktop diagnostics

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Circle 270 on reader service card.
Creating A Masterpiece
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Now you can print camera-ready copy for all your masterpieces, in-house, for just pennies a page.

LaserMaster's Unity™ 1200XL Plain-Paper Typesetter provides the highest resolution available on plain paper. And even though it's small enough to fit on your desk, it handles up to 11x17-inch paper for all your oversized jobs.

Give us a call for some free sample output from the new Unity 1200XL. You'll see. Creating in-house masterpieces has never been so easy.
Apple Launches Three More Performas

CONTINUING ITS price-war strategy of introducing lots of CPUs with more features and lower prices, Apple has brought out three new Performa models, all of which come with an external fax modem. The fastest system is the Performa 450: it’s identical to the LC III but includes Apple’s 14-inch Performa Plus Display, a 2400-bps data modem (from Global Village) with 9600-bps fax-send capability, and a slew of software programs. The other models are the Performa 405 and the Performa 430. Both are based on the LC II and include fax modems and 14-inch Apple Performa Displays; the 405 has an 80MB hard drive, and the 430 comes with a 120MB hard drive. Because it is based on the LC III, the Performa 450 has about twice the speed of the 405 and 430. Apple is discontinuing the older, LC II–based Performa 400.

The Performa 405 displays 16 colors, expandable to 256 with more video RAM. The 430 supports 256 colors; the 450 also supports 256 colors, but can display up to 32,768 colors with more VRAM. All the systems come with System 7.1P installed and with Best of ClickArt Collection, CheckFree, America Online, Spectre Challenger, Scrabble, American Heritage Dictionary, Correct Grammar, QuickTime, Macintosh PC Exchange, At Ease, and other software, depending on what kind of store you purchase the machine from.

Although Apple does not set suggested retail prices for the Performa line, it expects street prices of about $1799 for the Performa 450, $1499 for the Performa 430, and $1299 for the Performa 405. All were slated to ship in volume on April 19 through consumer electronics stores, department stores, and office products superstores.

Apple has also announced AppleDesign Powered Speakers, the first speakers designed specifically to work with a computer and be focused on a user sitting very close to the speakers. The $179 speaker set has a built-in amplifier, shielding against interference from the monitor, and inputs for sound produced by the Mac and by a CD ROM drive. The speakers were slated to ship at the end of March.—T.M.
If the stories you've heard about Thunder/24™ led you to believe it's the fastest color graphics card, the results of a new, independent lab test will leave you thunderstruck.

In a Hydra QuickDraw® performance test, Ingram Laboratories found PrecisionColor 24X™ was up to 19% faster.

That's surprising, especially since the makers of Thunder/24 want you to pay $1,250 more for their card.

PrecisionColor 24X isn't just faster and less expensive. It's also available in 7" and 9" versions. So it will fit in all of Apple's newly-announced systems, as well as current models.

No wonder MacUser rated PrecisionColor 24X "Best Price/Performance." And both MacWorld and Byte named it their "Readers' Choice."

Hydra QuickDraw Performance Test
Overall Performance
3.50

Call us at 1-800-227-2795 Ext. 2C for your $100 rebate certificate, copies of the benchmarks and the name of your nearest Radius reseller. Or call 1-800-966-7360 to receive faxed information about our products.

Get PrecisionColor 24X. And come to the fastest conclusion.
ONE OF THE HOTTEST NEW TRENDS IN personal computing is distributed processing—dividing up a complex, time-consuming task into smaller chunks and assigning them to a group of networked computers or accelerator boards. Image processing tasks, especially rendering, are well suited to distribution. Not only does distributed rendering save time, it can also maximize computer use during off hours when machines would normally be idle.

In looking at options for “Building the Ultimate Mac,” Macworld Lab reviewed four distributed-rendering packages—Strata’s RenderPro for Strata 3D, Ray Dream’s DreamNet for Ray Dream Designer, Specular International’s BackBurner for Infini-D, and Pixar’s NetRenderMan for modelers that support Pixar’s RIB file format. We used several configurations, some networked and some using accelerator boards (such as the Rocket 33) that fit into a Macintosh’s NuBus slot.

We rendered a 3-D model into an image with each package using a Quadra 950 sending jobs to both three and six additional I/Os over thin Ethernet, and a Quadra 950 sending the job to three Rocket 33’s on its own NuBus. When we distributed the same job over several processors, performance improved dramatically. The Rockets beat the other configurations hands down, accelerating processes to less than a third of the time needed on a plain 950, and half the time needed over a six-node network of I/Os.

Divvying Up the Pieces

EACH PACKAGE USES LOW-LEVEL PROGRAM ROUTINES TO SPLIT UP A RENDERING JOB into many pieces. The computer initiating the job—the host—first sends a message across the network alerting other processors—the clients—that it has a file to render. Once clients have responded (through an extension), the host sends each client a database describing all the objects in the model; then the host splits up the job—a single frame if it’s a still image, one frame at a time if it’s an animation (DreamNet handles only still images)—into pieces, which it sends one at a time to available clients. The host reassembles the completed pieces, which march across its screen, slowly filling in like panes in a window; finally, the full image is saved to disk. Each processor receives an identical set of rendering parameters (settings such as lighting or shading) that apply to the entire image; however, NetRenderMan and BackBurner, unlike the other programs, send texture maps (which apply to specific areas of the image) only to the clients that need them.

Since all the programs work in the background, rendering jobs can continue processing while the client machine is being used for some other task. But users of the client machines have ultimate control; through control panels, they can turn off access or limit access to off hours so they don’t have to put up with sluggish computers. Strata’s RenderPro and Specular’s BackBurner let you suspend a job in progress for later execution. NetRenderMan lets you set a time for the rendering to begin. DreamNet renders immediately, but can be interrupted.

Each program also gives you some control over which computers will join the work force. DreamNet, BackBurner, and NetRenderMan let you designate groups of computers to act as clients. NetRenderMan lets you designate groups of computers to act as clients. NetRender-
Man even lets you specify a minimum number of clients that must be available in each group before a render will start. (According to Pixar, Unix machines running NetRenderMan software can also be used.) Strata, on the other hand, lets you create a list of zones, and RenderPro uses every available machine in the zones that have been configured with its software. With the exception of NetRenderMan, the host can be configured as a client so that it does part of the rendering too.

**When Disaster Strikes**

**OBVIOUSLY, WHEN YOU ARE DOING work on numerous machines, over a network, in the background, or overnight—work unmonitored by human eyes—you need to know how well a rendering job will survive catastrophe. A render might be interrupted by something as simple as a user taking back control of a client machine, or by something more drastic like a network or host-machine crash.**

When a client crashes, it is turned off, or is reclaimed by a user, the host detects an error and redirects that client’s work to the next available client. If the network crashes, the host—if it’s also a client—continues to process the job, redistributing all the pieces to itself. If the host is only an administrator, the job stops—but can be resumed later.

But what if the host computer crashes? Bad news, right? Well, no. In our tests, BackBurner and RenderPro reliably recovered from each of these scenarios. Both programs saved frames as they were completed, so we never lost more than one frame. BackBurner provided an additional benefit, saving each piece as it was completed, so nothing was lost. Connections to clients were reestablished as soon as they were available again, and work continued. Despite Ray Dream’s claim that renders in progress can be recovered 80 percent of the time when the host machine crashes, we could not recover a single job. Ray Dream does handle network crashes reasonably well, but clients that crash while rendering a piece are not available until the next time Ray Dream Designer is run on the host machine. Additionally, we encountered numerous system crashes when we were trying to configure Ray Dream to render over a network. NetRenderMan makes no claims about recovering from network or host crashes, but we also found that when single clients are lost, the final images are incomplete, and therefore unusable. Because NetRenderMan must start at the beginning of the RIB file for each rendering job, you should search for modelers that create separate RIB files for each frame of lengthy animations to reduce the time penalties of rendering failures.

Each company claims that the size of the model being rendered and its final resolution are limited only by available RAM and hard drive space. Since each package loads the whole model into the host’s memory, a large model may require tens of megabytes of RAM on the host. Clients usually need only a few megabytes. When approaching the 16MB limit for a PICS-formatted file (BackBurner sets the limit to 13MB), RenderPro and BackBurner automatically create an additional file for the overflow. QuickTime doesn’t care how big the file gets, so you could conceivably render animations that are hours long.

**How Much Time Can You Save?**

**FROM THE RESULTS OF OUR TESTS we deduced that with all the renderers, four Ilié—or one Rocket accelerator—could perform about as well as one Quadra 950. No renderer limits the number of clients you can use, but eventually you reach the point of diminishing returns. NetRenderMan hosts bog down at about 20 clients; RenderPro prefers only 8; BackBurner usually runs out of pieces to send to clients at 60 nodes; and DreamNet’s speed doesn’t improve much beyond 17 nodes. Our rendering tests found DreamNet and BackBurner the fastest, with RenderPro a bit slower. NetRenderMan crept in at half the speed of its competitors; because the host cannot easily be configured to assist in rendering, our NetRenderMan configurations in our tests did not receive the host Quadra’s help. Additionally, NetRenderMan did not benefit proportionately to others from additional Macs, needing six Ilié’s instead of three to match the processing power of a Quadra 950.**

We also experimented with the YARC NuSprint board, a 25MHz RISC processor designed to accelerate many image processing applications, but of the packages we tested, only NetRenderMan is currently compatible with it. We found the YARC board to be roughly equivalent to four Quadra 950s. Multiple boards can be used in parallel, so you can have several in one machine—if you can afford the $3495 each. Specular has also just announced support for the YARC board.

With systems like the Expanse/NB8 chassis, which expands a 6-slot Mac II’s NuBus to 13 slots, Radius’s rumored multiosl server scheduled to be announced this summer, and specialty boards like the YARC NuSprint, there’s no shortage of alternatives for speeding rendering. You need only figure out how much money you can reasonably spend, and how much time you need to save.
Hot Prices for Thermal Printers

SEIKO INSTRUMENTS USA has cut the list price of its entry-level thermal-image-transfer color printer to just under $3000. The Personal ColorPoint PSE, featuring full PostScript compatibility, is now list-priced at $2999, down from $3999. The revised pricing drops the PSE into the same range as mainstream color ink-jet and bubble-jet printers, including the $3495 HP PaintJet XL300 and the $2349 Apple Color Printer. The PSE, which can support serial, parallel, and LocalTalk Interfaces, prints color images with up to 300-dpi resolution on standard letter- and legal-size paper as well as international sizes. The printer comes standard with 17 Type 1 fonts and 5MB of RAM, expandable to 21MB using standard SIMMs. Seiko has also introduced the Professional ColorPoint PSH, a PostScript-compatible dye-sublimation printer priced at $9999. Seiko Instruments USA, 408/922-5800.
—JONATHAN CASSELL

AppleScript at Last

APPLE IS FINALLY rolling out AppleScript, a scripting language for controlling applications and for making applications work together.

AppleScript-compatible applications, including the already-shipping Finder 7.1, PageMaker 4.2, FileMaker Pro 2.0, and Excel 4.0, store data and issue commands in ways that are easily described with a script. For example, a user could write a script that tells PageMaker to import a range of cells from Excel, or that tells Excel to send data to FileMaker and create new records for each row.

For users, Apple will ship an AppleScript Interface late in 1993 that will watch user actions and record them as scripts. But AppleScript is fundamentally a programming language, so tools for commercial developers and a tool kit for VARs will come first. (Apple says most commercial developers will support coding scripts first, and later support recording scripts.) Some commercial applications will include an AppleScript editor and a run-time version, so the adventurous can start hacking, and some companies are likely to let Apple to market with easy-to-use AppleScript utilities. For details, call the Apple Programmers and Developers Association, 408/ 562-3910.—D.L.

Illustrator 5.0

Challenges FreeHand

Adobe’s Illustrator 5.0 is challenging rival Aldus FreeHand for the high end of the drawing software market with many hot new features, including unlimited layers.

Users can create object groups that span layers and can keep objects on some layers in preview mode while objects on other layers stay in draft mode. Version 5 supports pressure-sensitive pens and add-ons that perform specialized tasks—for example, the Pathfinder tool, which finds path intersections automatically to help with combining shapes or subtracting one shape from another. Illustrator 5.0 has moved many functions previously found in dialog boxes to floating palettes. It has an extensive set of high-end color-management tools and much-improved text features; adds unlimited undos, interruptible redraw, graduated fills, and the ability to draw in preview mode; and has custom views that remember zoom level, visible layers, and so on. Version 5.0 will ship this summer for $595. Adobe Systems, 415/961-4400.—D.L.

Hi Finance

Gets a Face-lift

Aatrix’s personal-finance package Hi Finance is being upgraded to version 5 with a new interface that puts most commands within reach of a button click. For people who want to be reminded daily of their place in the world, the current version of Hi Finance, 4.09, calculates your net worth each time you launch the program, automatically recalculating debts and assets based on interest rates, estimated appreciation of real estate holdings, and so on. Hi Finance isn’t an investment planner like Reality Technologies WealthBuilder, but you can set up annuities, bonds, and other investments as accounts, and download securities information from online services. (For more about personal-finance software, see “Money Matters,” in this issue.)

Version 5.0 will be able to dial up a modem from home and warn you at the office if your favorite stock slips. The new version will add a double-entry bookkeeping option; simple unlinked budget categories and checking accounts will still be available. The price will remain $129. Aatrix, 701/746-7202.—D.L.
Have you ever wondered what your design would look like printed on a grocery bag? Okay, maybe not. But when you're working with a Phaser™ III color printer, your thoughts do tend to go a little wild.

Because you can feed the Phaser III any kind of paper, from 80 lb. bond to acetate. Even paper towels. It also takes sizes up to 12" x 18" for printing tabloid bleeds. And with 16.7 million colors delivered at 300 dpi, you get gorgeous color on any media.

It's driven by a 24 MHz RISC chip with 10 MB RAM. Fast enough for you? And with Adobe's PostScript™ Language Level 2, your message will come out loud and clear.

The only thing you need is a well-fed imagination. Call 1-800-835-6000 Dept. 21C for your free output sample.
DiVA Diversifies

DIVA (DIGITAL VIDEO APPLICATIONS) is upgrading its flagship product, the QuickTime-movie editor and special-effects package VideoShop, to version 2.0 and introducing new video tools to differentiate VideoShop from rival Adobe Premiere.

VideoShop 2.0's new features include audio mixing, titling, and real-time motion control. The product will also support QuickTime 1.5 features including searchable text, Photo CD, and multiple language sound tracks. It will provide multiple-track video effects and an image-compositing canvas. The package no longer requires HyperCard, and should list for between $500 and $700.

The new Sparrow, a simple-to-use, under-$300 QuickTime editor optimized for the LC, and the Digital Delivery Kit, for creating and publishing interactive QuickTime movies, are slated for this spring. Analog Tool Kit, which controls professional video equipment from within VideoShop 2.0 and supports SMPT time code and the creation of edit decision lists, will ship several months after the other products. Prices were not set at press time.

DIVA was recently acquired by Avid, which produces high-end video-editing tools. DIVA says the merger will have no short-term impact on product plans. DIVA, 617/491-4147.

---Evan Cooper

Digital F/X's Latest
Stab at Video Editing

Digital F/X has ripped back the shower curtain on Hitchcock, a $7995 digital video-editing package that bears the name of the late, great director of Psycho. Hitchcock purchasers will drop the NuBus board into their Macs, and then plug in their favorite video deck. The board digitizes and JPEG compresses video footage straight to the hard drive in real time, where it can be edited using the included software. Hitchcock supports up to 640 by 480 resolution at 30 frames per second, according to the company. A minute of video will occupy about 20MB to 40MB of storage space, depending on the desired frame size, speed, and resolution. The editing software features professional tools, such as split edits and an external controller option with a jog-shuttle and dedicated control buttons.

Once the footage has been tweaked, users can either print JPEG-quality video back to tape, or generate an edit decision list (in CMX, GVG, or Sony formats) for assembling the final product using the original materials. Digital F/X says it sees Hitchcock as competing directly with Avid's MediaSuite Pro. Digital F/X, 415/961-2800, 800/955-8273.—Cameron Crotty

DIVA'S SPARROW, AN EASY-TO-USE QUICKTIME EDITOR GEARED FOR LOW-END MACS. TYPES OF MEDIA ARE COLOR-CODED.

B U G R E P O R T

Microsoft Works 3.0 On 68000-based Macs (Plus, SE, Classic) with less than 4MB of RAM, fast typists will overflow Works' keyboard buffer and lose data. Microsoft is not planning to fix this in the near future. Works' database module runs extremely slowly in the early release of 3.0. A patch is available free to registered users who request it.

Microtek ScanMaker II The ScanMaker comes set to SCSI ID 6, and version 2.03 of the ScanMaker's Photoshop plug-in will delete the contents of a disk drive if the drive's ID is also set to 6. This problem is fixed in version 2.04, which is available free on request.

Texas Instruments microLaser Some units are incompatible with Farallon's PhoneNet cable and connectors. The problem does not affect Apple's LocalTalk hardware and is fixed in newer units.

Apple Personal LaserWriter LS The LS can't print margins narrower than 1 inch on legal-size paper. The problem does not affect letter-size paper. Apple says it plans a software fix but does not know when it will be available.

Fidelity Chessmaster 2100 Under System 7, version 1.3 may take your turn and show other aberrant behavior. An upgrade is due this fall.

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

A Forgiving
Disk Array

MASS MICROSYSTEMS has brought out the MassterArray, a Fast SCSI-2 device that holds five hard drives that can be set up in several different RAID (redundant array of inexpensive disks) configurations. The MassterArray comes in two versions: one holds 2GB, the other holds 4GB. Both use drives with average seek times of 10.5ms, but the effective seek time of the array can be as low as 2.25ms due to striping of the data across the disks. The disk-transfer rate of the array can be as high as 10MB per second, according to the company. For added data security, parity information is distributed across all the drives, so if one drive fails, the data on it can most likely be reconstructed.

The 2GB version lists for $20,299; the 4GB for $24,199. Both versions include an internal backup tape drive and are shipping now. Mass Microsystems, 408/522-1200.—T.M.

A Manager's Tool Kit

Over the years, Palo Alto Software has published a series of spreadsheet templates for solving specific business problems, such as writing a business plan or predicting sales performance. Now Palo Alto is addressing the big picture with Business Management Toolkit.

Business Management Toolkit straddles the line between financial management and project management. The program walks the user through planning the tasks that must be completed and writing a task-oriented budget; making sure someone is responsible for each task; and keeping track of whether tasks are completed on time and within budget. Business Management Toolkit is $149.95 and requires Excel or Lotus 1-2-3. Palo Alto Software, 503/683-6162.—D.L.

Mass Micro's MassterArray RAID contains five hard drives and one tape drive.

Mass Micro's MassterArray RAID contains five hard drives and one tape drive.
Get a Mac.
Install some programs.
Do some cool stuff.
Run out of disk space.
Throw away some files.
Get more cool programs.
Run out of disk space, again.

Get Stacker for Macintosh.
Do more cool stuff.

It starts with the tutorials. Then the templates. Pretty soon you're dragging your help files into the trash. Next it's the extra fonts. Finally, the games. And you're still tight for disk space.

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Available now.
Call 1-800-522-STAC, ext. 7306
Or visit your nearest dealer. And get the hottest way to be twice as cool.
The 17-inch NEC MultiSync 5FGe monitor is intended for business and multimedia users.

NEC Enhances Monitors, Lowers Prices

NEC TECHNOLOGIES HAS created three monitors in its popular MultiSync FG series, each of which offers a higher refresh rate at a lower cost. The E series monitors—the MultiSync 3FGe, MultiSync 4FGe, and MultiSync 5FGe—are all intended for general business use, while the 4FGe and the 5FGe are also suited to multimedia and other color-intensive applications, according to NEC.

The NEC MultiSync 3FGe and MultiSync 4FGe, which replace the existing 3FG and the 4FG, are both 15-inch color monitors with slightly higher maximum refresh rates of 76Hz and estimated retail prices about $50 lower than their predecessors; they list for $635 and $755, respectively. The MultiSync 5FGe, a completely new 17-inch color monitor, lists for $1155, about $200 less than the 5FG, which NEC said it will continue to sell for color imaging and other high-end graphics-intensive applications.

All three of the monitors offer resolutions up to 1024 by 768, but at that resolution the 3FGe’s refresh rate drops to 60Hz. The three displays work with a wide variety of graphics boards. The 4FGe also has NEC’s AccuColor color-calibration technology. The 5FGe was slated to be released in early April, with the two 15-inch monitors to follow at the end of April. NEC Technologies, 708/860-9500. —T.M.

Virus Watch

Current viruses, trojan horses, and worms

Type: Virus
First listed in Virus Watch: 6/93
Info: A modified version of T4-A and T4-B
Impact: All three versions of T4 damage system files and applications

CDEF (mutation)

Type: Virus
First listed in Virus Watch: 6/93
Info: A minor modification of an older virus
Impact: Not destructive; can cause crashes

CPro

Type: Trojan Horse
First listed in Virus Watch: 5/93
Info: Claims to be a new version of Compactor Pro, but when launched it attempts to reformat mounted hard drives and floppy disks
Impact: Can delete data; may be more likely to affect floppy disks than hard drives

Mirror Brings Out Hi-Res Scanners

Mirror Technologies has begun selling four flatbed color scanners, including a model priced at less than $1000 and a pair of models with hardware JPEG acceleration. The Mirror 600 Plus Color Scanner, which has a suggested list price of $999, can scan with up to 600-by-600-dpi resolution. The Mirror 800 Plus Color Scanner, list-priced at $1299, offers 800-by-800-dpi resolution. The Mirror 600 Pro Color Scanner and the Mirror 800 Pro Color Scanner include all the same features as the Plus scanners and add hardware JPEG compression, which cuts down on scanning time and can compress images by a ratio of 50:1. The Mirror 600 Pro Color Scanner has a list price of $1399, and the Mirror 800 Pro Color Scanner has a list price of $1699. All four scanners support document scaling from 1:1 to 100 percent and can scan in 3-, 12-, and 24-bit color modes as well as in 8- and 16-bit gray-scale. Mirror Technologies, 617/633-4450.

—Jonathan Cassell

Visual Accounting You Can See

REALWORLD, A GREAT PLAINS competitor in the DOS character-based accounting market, is entering the Mac market with Visual Accounting (VA), a high-end, multiuser modular accounting system that sports a graphical interface and will compete with Great Plains’ recently announced Dynamics (see “Great Plains’ New Plans,” in February’s News).

RealWorld’s first VA module will be a general ledger, which should ship this spring, to be followed by receivables and payables this summer. A report writer with a forms-design front end and support for financial functions, IF-THEN statements, and so on, is scheduled for later. For serious modifications, RealWorld will license its source code (VA is written in C++). Visual Accounting modules start at $795. RealWorld, 603/224-2200.

At least one reseller is already developing a Visual Accounting add-on: Pride Retail Systems, whose ClerkProof point-of-sale software runs on RealWorld’s Unix platform, will write a point-of-sale system for smaller stores that run on Visual Accounting. Pride is at 617/890-1121. —D.L.

Scanning in 3-D

To convert real objects into computer models without drawing them from scratch in a three-dimensional modeler, you need a three-dimensional digitizer like HyperSpace from Mira Imaging.

ERICA WALCZAK OF KLEISER-WALCZAK CONSTRUCTION CONVERTING AN OBJECT INTO A 3-D MODEL FOR AN ANIMATION.

HyperSpace combines software; a digitizing pen that records points, lines, and polygons as you touch its tip onto points on the surface of an object; and a special table that emits an electromagnetic field to track the pen’s location. The software includes such 3-D features as lathing, extruding, and lofting, and it provides four kinds of shading (which help you find digitizing mistakes). It can export files in DXF, Swivel, and numerous other 3-D formats.

HyperSpace can’t digitize metal objects, so most users work from replicas of clay or wood. Mira Imaging may add support for other hardware, including optical devices that can digitize metal, and landscape-surveying devices.

Mira’s systems are $7850 with 1mm resolution at 15 inches from the transmitter, or $12,850 with 0.1mm resolution. Mira Imaging, 801/466-4641. —D.L.
When it comes to friendliness and ease of use, a mainframe is the antithesis of a Macintosh. But with IRMA™ WorkStation for Macintosh, your Mac can become a full partner with your host, creating a powerful synergistic collaboration.

IRMA WorkStation for Macintosh now adds NetWare for SAA* and TN3270 over TCP/IP support to an already impressive list of connectivity options. It includes productivity enhancers like KeyStroke Macros, to automate common tasks; QuickPad™ and QuickHit™ for point-and-click navigation of host applications; and QuickPoints™ to simultaneously resize screen and fonts.

The recent merger with Avatar® has further strengthened DCA's commitment to the Mac marketplace. And now, our combined resources are focused on advancing the most comprehensive suite of Mac connectivity products ever. In fact, we offer the only complete line of Mac-to-host software and token-ring and coax hardware. As well as the only family of micro-to-host solutions for Mac, DOS, Windows™ and OS/2.*

Until June 30, you can trade up to IRMA from an earlier version—or any competitive product—for only $95. (That’s $330 off the suggested retail price. And the price can be even less, when you buy MultiPaks of 10, 50 or 100.) You can also call for free demo disks and our new Mac-to-Mainframe Connectivity Guide.

So stop compromising. Call 1-800-348-3221, ext. 40G®, and become part of a powerful collaboration.

THE FREEDOM TO COMMUNICATE.
Caffeinate Your Color Classic

FOR THOSE WHO already want more speed in their Color Classic or LC II, DayStar Digital has adapted its Universal PowerCache accelerator for those machines. Designed as a general-purpose accelerator, the Universal PowerCache works with most existing Macintoshes using a series of different adapters available from DayStar.

The Universal PowerCache lists for $449 for a 33MHz 68030 to $999 for a 50MHz 68030 with FPU math coprocessor. The adapters for the Color Classic and LC II both list for $49. All the products are available now.

DayStar Digital 404/967-2077, 800/962-2077.—T.M.

Display Boards

Support Centrifs

Two 24-bit display boards from Radius fit in the Centris 610's shorter NuBus slots and also work in existing longer NuBus slots. The $1849 PrecisionColor 24X/1152 offers resolutions up to 1152 by 870 pixels. The $999 PrecisionColor 24X/1024 offers resolutions up to 1024 by 768 pixels. Both provide accelerated 24-bit color and support monitors up to 21 inches in diameter. Radius, 408/434-1010.—T.M.

NEC Supports Multisession Photo CD

NEC Technologies has updated its line of CD ROM drives by improving their average access times and transfer rates and adding multisession support for Kodak's Photo CD photo service. Users can now add more photos to an existing disc. The portable MultiSpin 38 now has a 400ms average access time; the MultiSpin 74 now has a 280ms average access time. Both Mac-compatible drives can transfer data at up to 300 KBps in multisession mode, which spins the disc twice as fast as usual.

Now shipping, the MultiSpin 38 lists for $465; the MultiSpin 74, for $615. Both require a Macintosh Interface Kit that retails for $35. NEC also offers an upgrade program for owners of its CDR series of CD ROM drives. NEC, 708/860-9500. For upgrade info, call 800/388-8888.—T.M.

Watching the Weather

OWNING EQUIPMENT to capture and analyze weather images from satellites might sound like an extravagance. But for commercial fishermen, bush pilots, scientists, and others far from television news, Newcastle Computing's MacSat may be a necessity.

MacSat captures satellite images and imports them to the Mac, where they can be colorized, annotated, and displayed in a series to show atmospheric changes over time.

With satellite dish, antennae, receiver, analog-to-digital converter, other electronics, and software, MacSat systems range from about $4000 to about $8500, depending on the dealer and what kind of satellites you want to track. Contact U.S. Satellite Laboratory, 301/604-6155, or Roffsat, 305/271-9229. For $465, Roffsat sells extra image-analysis and satellite-tracking software and rewritten MacSat documentation.—D.L.

TURKEY SHOOT

DESIGN FLAWS NOTED

Apple File Exchange It's not Apple's fault that DOS whacks off those long, poetic names Mac users tend to give their files. But Apple File Exchange sure could make it prettier. Say your full-size Mac file names have three-letter extensions staring AFE in the face: AFE ignores them and blindly makes an extension out of the first three letters that follow the truncated eight-letter name.

Quark or Tektronix Which is the turkey? You be the judge. Seems QuarkXPress 3.1.1 is missing some PostScript code that was in 3.1, making Tektronix's Phaser unable to print Quark documents. Tektronix has taken to shipping Phaser owners a disk with printer drivers (PDF files) for Quark 3.0, 3.1, and 3.1.1. In fact, Tektronix may need to supply Phaser owners with new PDF files for every upgrade of QuarkXPress. Ah, progress.

Macworld will send you a Turkey Shoot T-shirt if we shoot your turkey in this column. See How to Contact Macworld.

JUSTIN BURKE (LEFT) AND ILAN BERGER OF FAIR LAWN SCHOOL IN NEW JERSEY STUDY THE WEATHER WITH MACSAT.
The new generation HP LaserJet 4M printer.

At last. An HP laser printer built specifically for the Mac—the new LaserJet 4M. A laser printer with everything Mac users need. From built-in PostScript® Level 2 software from Adobe® to standard LocalTalk and optional EtherTalk.

The finest print quality in its class.
Thanks to HP's microfine toner, Resolution Enhancement technology, and advanced engine designed expressly for 600 x 600 dpi, the LaserJet 4M printer delivers the finest print quality of any 600 dpi machine available.

And with a new RISC processor and 6 MB of standard memory accelerating formatting and I/O speeds, complex PostScript and graphics files are rendered faster and more clearly than ever before.

Greater flexibility.

The HP LaserJet 4M printer also sets new standards in versatility, with a wide range of typefaces and two integrated paper trays. As well as the options of a 500-sheet tray and power envelope feeder.

And it's designed to be shared simultaneously by PCs and Macs. Automatic language switching between PCL 5 and PostScript, and 3 hot I/Os give mixed environments greater flexibility. Without compromise to either.

Of course, with the HP LaserJet 4M printer, you'll enjoy HP's renowned quality and reliability. All for only $2,399. So call 1-800-LASERJET (1-800-527-3753) Ext. 7340* for print sample† and comparison disk. Or visit your nearest authorized HP dealer.

©1983 Hewlett-Packard Company PE2354 *Suggested US list price. **In Canada call 1-800-587-2847, Ext. 7169. Adobe and PostScript are trademarks of Adobe Systems Incorporated which may be registered in certain jurisdictions. †To have a LaserJet 4M printer data sheet sent immediately via fax machine, call 1-800-864-1067 from your touch-tone phone.
Microtech Offers Capacious Hard Drive

FOR THOSE WHO hanker after gigabytes, Microtech International has brought out one of the largest hard drives for the Mac: the Nova XL2700, a 2.7GB hard drive with a high-speed SCSI 2 interface. The drive is formatted with two partitions, one 2048MB and the other 730MB, to accommodate the Mac’s limit on the size of partitions. The XL2700 has an 11ms average seek time and a burst data-transmission rate of up to 10MB per second.

Microtech includes Brainchild’s Shortlist personal-information-management software and Norton Utilities 2.0 with the drive. The Nova XL2700 is shipping now at a list price of $9899, or $9599 for the internal version, the XL700. Microtech, 203/468-6223.—T.M.

Hard Drives for the Centris 610

Microtech International has begun offering internal hard drive mechanisms that require less electrical power than many hard drives and can therefore work in the Centris 610. Also compatible with other Macs, the $1329 Europa 400i and the $1469 Europa 500i drives store 400MB and 500MB, respectively. Microtech has also announced price cuts of 25 percent to 46 percent in its Nova hard drives. Microtech International, 203/468-6223.—T.M.

Galactic Mac

IF CITY LIGHTS BLOCK all but the moon from your night sky, take a look at Carina Software’s recently upgraded Voyager II. Voyager generates star charts and can simulate a planetarium display. Besides showing the celestial sphere from Earth, Voyager can simulate a view from anywhere within the Solar System—for example, you can see what Earth looks like from the Moon. The program’s database includes more than 50,000 stars, galaxies, binary and variable stars, planets, moons, comets, and other objects.

Voyager II retails for $159.95. Extended star catalogs, deep sky objects, and variable and double stars are available as add-ons ranging in price from $20 to $45. Carina, 510/352-7328.—PHILIP CHIEN

HiQ Tackles Engineering Problems

Several products provide symbolic mathematical manipulation, but Bimillennium’s HiQ lets engineers and scientists apply high-powered math directly to raw data for real-world problem solving. HiQ uses a project worksheet interface combining library functions, preprogrammed problem solvers, and graph-drawing tools. You can turn one of ten supplied problem solvers loose on tasks like solving ordinary differential equations or polynomial roots. Or write your own scripts in HiQ’s object-based scripting language, choosing from 600 functions including transcendental, matrix, and Fourier analysis. Then graph results in 2-D or 3-D with optional animation. Bimillennium is upgrading HiQ to version 2.0, with a reorganized interface, on-page text editing, and expanded math functions. HiQ lists for $995. Bimillennium, 408/354-7511.—MEL BECKMAN

MicroNet Offers Storage for New Macs

MicroNet Technology is now shipping a broad line of storage devices for Apple’s recently introduced Macintosh Quadra 800, Centris 650, Centris 610, and LC III computers. The storage devices feature a set of internal 3½-inch hard drives for the Quadra 800, a set of medium-performance drives for the Centris models, and a set of low-end drives for the LC III. For external storage, MicroNet is offering a dozen 3½-inch drives for all four new Macs. The company is also shipping internal and external versions of a 3½-inch Sony 128MB optical drive, a Photo CD ROM drive, 44MB and 88MB SyQuest removable-cartridge drives, and an 8GB 4mm digital audiotape (DAT) drive. Lastly, MicroNet is offering six versions of the Raven 030 two-drive disk-array system for the Quadra 800 and Centris 650, with capacities ranging from 642MB to 4060MB. MicroNet Technology, 714/581-1540.—JONATHAN CASSELL

Epson Unveils Color Scanners

Epson America has brought out two 24-bit color scanners: the ES-600C for office administration applications and the ES-800C for desktop publishing. The ES-600C has a resolution of 600 dpi, while the ES-800C’s resolution is 800 dpi. Both scanners normally take one pass to capture an image, but they can take three passes if necessary for color separations.

The ES-600C lists for $1129 and the ES-800C lists for $1499 without an interface kit. The Mac interface kit is $399, including the complete version of Adobe Photoshop 2.0, the necessary SCSI cable, the desk accessory, Caere OmniPage DirectTypePack OCR software, and driver software. The company has begun shipping both scanners and the interface kit. Epson will also offer a document feeder and transparency handler. Epson, 310/782-4000.—T.M.

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Conference participants install a conference application, a QuickTime movie- and-slide player, and the whiteboard program along with presentation files (which must be distributed before each conference takes place). A conference server on a separate computer manages and broadcasts the presentation and can be controlled by any participant.

The Virtual Meeting System requires System 7 and costs $3500 for the first ten users and $300 for each additional user. RTZ Software, 408/252-2946.—CAROLYN BICKFORD

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That Helps You Get Down To Business
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Top Quality—Low Price
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Quality Performantz hard drives set the new standard for performance and value. Utilizing top-quality mechanisms from the leaders in hard drive technology, Performantz series drives allow you to enjoy the benefits of speed and reliability at a price that can’t be beat. Each drive is thoroughly tested and preformatted for reliability and ease of installation. Available in a variety of popular capacities, the Performantz series offers a drive to fill every need.

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Performantz 44/88MB Read/Write Removable
5110C Drive*
+ Limitless storage potential on SyQuest cartridges! Does not format 4MB cartridges

Item # | Description | Price
---|---|---
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#06733 | Performantz 170MB INT | $398
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$1,698
#06760

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Performantz 170MB INT
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Performantz 520MB INT
$1,248
#06735

Performantz 1.2GB INT
$1,888
#06736

Performantz 44MB REM w/Cartridge
$498
#06330

Performantz 88MB REM w/Cartridge
$598
#06329

Performantz cx/cj/Q700 Mount Kit INT
$15
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Performantz LC/SI INT Mount Kit
$15
#06226

Performantz II INT Mount Kit
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Performantz Q 900/950 INT Mount Kit
$29
#06229

* Requires Internal Mounting Kit

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Performantz 105MB External
Required mounting bracket sold separately

$699
#06539

Performantz 44/88MB Read/Write Removable
5110C Drive*
+ Limitless storage potential on SyQuest cartridges! Does not format 4MB cartridges

Item # | Description | Price
---|---|---
#06225 | Performantz 85MB EXT | $368
#06728 | Performantz 170MB EXT | $498
#06216 | Performantz 210MB EXT | $628
#06730 | Performantz 520MB EXT | $1,338
#06731 | Performantz 1.2GB EXT | $1,978
#06759 | Performantz 2.0GB DAT w/Retrospect | $1,548
#06760 | Performantz 8.0GB DAT w/Retrospect | $1,698
#06732 | Performantz 85MB INT | $278
#06733 | Performantz 170MB INT | $398
#06223 | Performantz 210MB INT | $528
#06735 | Performantz 520MB INT | $1,248
#06736 | Performantz 1.2GB INT | $1,888
#06330 | Performantz 44MB REM w/Cartridge | $498
#06329 | Performantz 88MB REM w/Cartridge | $598
#06227 | Performantz cx/cj/Q700 Mount Kit INT | $15
#06226 | Performantz LC/SI INT Mount Kit | $15
#06228 | Performantz II INT Mount Kit | $20
#06229 | Performantz Q 900/950 INT Mount Kit | $29

* Requires Internal Mounting Kit

Aldus IntelliDraw
Competitive Upgrade

$94 
#06666

+ An exciting new drawing program that gives you an easy new way to visually experiment, refine and draw your ideas.
+ Share files seamlessly between Mac and Windows versions!
Take Off With System 7.

Take $5 to $20 Off
The Newest Mac Software When You Upgrade to System 7.

3 Super Reasons to Switch to System 7.1

Keep it up-to-date!
With Publish and Subscribe you can create and control live links between imported data and the original documents, so you can create files that are updated automatically to reflect changes made elsewhere.

Work, smarter, faster than ever!
Organizing and accessing files is much easier with the powerful new tools provided in the Finder windows of System 7.1. Click on a folder and the contents of that folder drop down from it instantly. Now you don't have to open a new window every time you wish to check the contents of a folder.

Share information easily!
If you're part of a network, you can share any folder or volume on your hard disk with other users—without using a dedicated server! Before System 7, you had to purchase hundreds of dollars of software and hardware to do this. Now it's built right in.

Apple Partner Products

<table>
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When you buy System 7 and a participating Apple Product you get:

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#05433

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Circle 106 on reader service card
Spyglass Upgrades Visualization Tools

SPYGLASS IS upgrading its scientific visualization tool, Spyglass Transform, to version 3.0, and its Spyglass Dicer to version 2.0. Transform is for looking at 2-D data sets, while Dicer is for looking at 3-D data. Neither program creates graphs; instead, they display arrays of numbers as colors. Transform creates colored surface contours (it can also import bitmaps), and Dicer creates colored cubes that can be carved up to reveal what's inside. Both applications provide great control over colors, useful for narrowing in on a certain range of numbers.

New to Transform are scientific labeling and tick marks, improved import capability, ties to Mathematica through MathLink, an interpolation technique called Krieging, and an improved macro language. Transform is $595. New to Dicer is the ability to draw isosurfaces, make oblique slices through data, and annotate and label images. Dicer is $695. Spyglass, 217/355-6000.—D.L.

THE AMCO EX INDEX OF USED MAC PRICES

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<tr>
<th>Machine/RAM/Hard Drive</th>
<th>Average Sale Price</th>
<th>Monthly Change</th>
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<td>Mac Portable/1MB/40MB</td>
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Index provided by the American Computer Exchange of Atlanta, Georgia (800/376-0717). It reflects sales during week of March 23. Configurations include keyboard and exclude monitor and display board for noncompact models.

TOP FIFTEEN BUSINESS SOFTWARE PACKAGES

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</table>

Source: Exclusive Audits & Surveys research from more than 260 Macintosh retailers and selected mail-order vendors. Covers sales during February 1993.

HP LaserJet:
Dpi up, Price Down

Hewlett-Packard recently announced its new top-of-the-line printer, the 17-ppm, 600-dpi $3749 LaserJet 4Si, which replaces the LaserJet IID and LaserJet IIIIs printers. The 4Si includes PCL 5, 2MB of RAM (expandable to 34MB), a parallel interface, and two slots for HP JetDirect interfaces. The $5499 MX version adds an additional 8MB (expandable to 26MB), Adobe PostScript Level 2, and LocalTalk and Ethernet interfaces for concurrent support of the Mac Operating System, NetWare, Windows, LAN Manager, LAN Server, EtherTalk, HPUX, Sun OS, Solaris, and SCO Unix workstations residing on multiple networks. The printers automatically switch interfaces and page-description lan-

Digitizing Your File Cabinet

Micro Dynamics’ Archiving and Retrieval System (MARS)—for storing, searching, and retrieving massive quantities of scanned documents and computer files on optical jukeboxes—is being restructured and upgraded to version 3.0. MARS 3.0 puts functions previously spread across several applications into MARS Workstation, an omnibus program for assigning keywords, creating archives, setting up access privileges, and searching for files (document scanning still uses a separate application). Version 3.0 can black out sensitive information or add notes on top of a scanned image; archive and play QuickTime movies; and display archived text files. Micro Dynamics is also launching Viking, which lets multiple MARS servers be linked; provides an Oracle- and Unix-based server; and has Windows retrieval capability. Pricing depends on installation size. Micro Dynamics, 301/589-6300.—D.L.
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And that includes cross-platform support. Which means you can share files with PowerPoint 3.0 for Windows™ directly. No translation necessary.

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The PowerPoint presentation graphics program fully supports QuickTime and System 7 and is part of a complete line of powerful Microsoft applications for the Macintosh.

using PowerPoint 2.01 or older, Aldus Persuasion, or any other competitive presentation graphics program.

So get your hands on PowerPoint 3.0 for the Macintosh. And before you know it, you will find yourself in a position of power.

Microsoft
Making it easier
Feeling underpowered? Macworld's special guide to upgrades will help you boost your Mac's performance.

by Galen Gruman

No matter which Mac you use, sooner or later you'll want something faster, bigger, better. More colors, more storage, more memory, and above all, faster speed. With nearly two dozen models of desktop Macs in use today, the upgrade possibilities seem endless—and bewildering.

But take heart: Macworld's special section on upgrading will help you get the best possible performance from your Mac—for the best possible price. These articles offer specific upgrade advice and product recommendations for every desktop Mac, from the Plus to the Quadras, in each of the four Mac lines: compact, low-cost, midrange, and high-end.

This introduction explores issues that apply to all Macs, with an eye toward helping you get started on the right upgrade path.

Ask Yourself Four Questions

Before wondering which upgrade products you should buy, ask yourself the following questions.

1. Do I need to upgrade? If you're now retouching scanned images or working with QuickTime movies when you used to use just a word processor and electronic mail, the answer is yes. If your system performance has slowed to a crawl because you've installed System 7 and newer, memory-hungry versions of your favorite programs, the answer is yes. But if you've realized that there are faster Macs out there and you feel left out, the answer is most likely no.

However you answer this question, make sure you assess what you do on your Mac and what you're likely to do in the near future, then evaluate those tasks against the processing power your Mac has right now.

2. Will basic enhancements solve my problem? Often, you need only a system enhancement (additional memory, a larger monitor, greater color support, and the like) to get rid of a bottleneck that makes your Mac seem underpowered. For example, if your only problem is sluggish file opening and saving, you probably need a faster hard drive. But if practically everything you do seems to be taking forever, it's time to upgrade your Mac.

3. Do I need an accelerator or a logic-board replacement? Accelerators speed up a Mac's processing and sometimes add support for additional monitors. But an accelerator doesn't update or replace the ROMs or other special Apple features on the logic board.

Guide to Macworld's Special Report on Upgrades

**COMPACT SERIES**, page 94
Classic, Classic II, Color Classic, Performa 200, Plus, SE, SE/30

**LC SERIES**, page 100
LC, LC II, LC III, Performa 400, Performa 405, Performa 430, Performa 450

**MIDRANGE SERIES**, page 104
Centris 610, Centris 650, II, IIci, IIcx, IIX, IIXx, IIXx, Performa 600

**HIGH-END SERIES**, page 110
IIXx, Quadra 700, Quadra 800, Quadra 900, Quadra 950
Logic-board replacements (available from Apple for just some Mac models) let you exchange your Mac's logic board for a newer version. But this option can be very expensive, and the performance gains you get may be very small (see "When to Replace Your Logic Board").

If the difference in price between an accelerator and a logic-board upgrade is minimal, go for the logic board; it's a better long-term strategy.

4. Do I upgrade or buy a new Mac? If you expect to run sophisticated programs and peripherals that take advantage of the latest Mac offerings, like QuickTime and the forthcoming Open Collaboration Environment, go with a new Mac—high-end peripherals and programs tend to use the functions in newer Macs that an accelerator board doesn't offer. Otherwise, an upgrade will probably suffice—for now.

Pick the Right Upgrade Products

Once you've determined an upgrade strategy, it's important to evaluate the products available based on their performance; features relevant to your work; price; and customer support (those are the qualities we looked at when evaluating products for our suite of upgrade stories). What follows are some guidelines for Mac owners on what to look for in system enhancements.

Memory

The first upgrade for almost any Mac is RAM. If you want to run System 7 and hefty applications such as Microsoft Word 5.1 and Microsoft Excel 4.0, you should have at least 8MB. You can get by with 4MB of RAM only if you stick to running one major program at a time and keep the number of system extensions to a minimum.

Not all Macs use the same RAM boards (called SIMMs, for Single In-line Memory Modules). You need to know both the type of SIMM (which you can tell by the number of pins) and the SIMM speed (expressed in nanoseconds, or ns) that's appropriate for your Mac. If you want to install it yourself—and it's relatively easy to do on most Macs—make sure you buy the appropriate RAM by telling the dealer or mail-order sales agent which Mac you plan to install the memory in (see the "Guide to Memory Upgrades" pullout table).

System 7 introduced a new form of memory, called virtual memory, that makes the Mac think a portion of a hard drive is RAM. This means you can run programs that require more memory than you actually have, but because it's disk-based, virtual memory is much slower than RAM. Most compact Macs don't support virtual memory, even with System 7, unless Connectix's Compact Virtual 3.0 software or Apple's 32-Bit System Enabler is installed.

Accelerator Boards

Accelerator boards tend to stretch the Mac's inner workings in ways Apple never intended, so incompatibilities with both very new and very old programs and peripherals are likely to occur. In addition, not all companies test their accelerator boards thoroughly on all supported Macs.

All vendors provide software fixes to customers who report problems; some companies automatically give the fixes to all customers who might be affected. We discovered that most accelerator vendors give good or exceptional technical support—Impulse Technology and Mobius Technologies both had excellent scores in our support tests, and only Dov Computer had a score of satisfactory.

Some accelerator board incompatibilities are caused by the board's processor. The 68040 in particular has several compatibility issues that might affect you.
Buying and Selling a Used Mac

by Saul D. Feldman

When it comes time to upgrade, logical economic questions arise: Should I upgrade the computer I have or sell it? And if I sell it, should I buy a more advanced model that’s used? Here are some tips to help you buy and sell a used Macintosh, plus a brief look at the possible tax consequences.

Three Ways to Buy

Expect to save about 20 percent of the street price of current Macs by buying them used, says Charles Thompson, general manager of the Boston Computer Exchange (BCE), a clearinghouse for used-computer buyers and sellers. But he recommends that only experienced computer users buy used machines because first-time owners need more hand-holding than an individual seller would offer.

There are three ways to buy a used Mac:

1. From an individual. Look for ads in newspapers, on computer bulletin boards, and through your local user group.

   **Pros:** Prices are the lowest. Sellers often sweeten the pot by leaving software on the hard drive.

   **Tips:** If you plan to use that software, check for viruses. Also, get the original disks and documentation. Policies on the transfer of ownership vary among vendors.

2. From a used-computer dealer. Some dealers do a perfunctory check of used Macs and sell them as is; some recondition existing machines; while others build a system from a collection of reconditioned parts. Often you get no manual or system software with the latter group—and don’t expect technical support.

   **Pros:** Dealers typically offer warranties ranging from 30 days to one year.

   **Cons:** Warranties are only as good as the reputation of the dealer.

   **Tips:** Check out the dealer’s reputation with local user groups. You have some protection if you pay by credit card: if something goes wrong and the warranty isn’t honored, you can ask your credit card company to withhold payment until the dispute is settled.

3. Through a service. You can also go through an intermediary, such as BCE, which serves as a link between buyer and seller.

   **Pros:** The intermediary maintains a database of used computers. A customer orders the computer through BCE, for example, which holds the money in escrow until the computer is received. After receipt, all computers are guaranteed for seven days. BCE will honor the warranty even if the seller reneges.

   **Cons:** You may get a better deal if you negotiate yourself.

Three Ways to Sell

If you are selling your Macintosh, you have the same three routes available to you.

1. Sell it yourself.

   **Pros:** You’ll probably get the most money if you sell the Mac on your own.

   **Cons:** Be prepared for phone calls; days, even weeks, after the computer has been sold. Also, dealing with strangers can set you up for other problems. A few years ago, thieves in the San Francisco Bay Area used computer classifiers to find people who had electronic equipment ripe for stealing.

   **Tips:** If you’re selling your Mac to a stranger, get payment in cash, money order, or certified check. Try to check for some valid form of identification if you have any qualms.

2. Sell to a broker.

   **Pros:** Selling your Mac to a used-computer broker lets you avoid the hassles of selling it yourself.

   **Cons:** You won’t get as much money. I called several, offering to sell a Mac SE/30 with 4MB of RAM, an 80MB hard drive, and an extended keyboard. Companies offered to pay anywhere from $900 to $1050.
coprocessor. If you don’t know what these calculations are, you don’t need a math coprocessor.

**Video Display** Since the fall of 1990, Apple has included built-in color monitor support for new Mac models, letting you hook up standard color monitor sizes (12-inch and 14-inch) without adding a video-display board. But you need a display board if you have an older Mac.

A sluggish display board or built-in video can make a system seem to run slowly when in fact the bottleneck is getting the image to the monitor. In addition, a small monitor can require extra scrolling, which slows your performance. Speedy video-display boards and larger monitors solve those problems.

Because many Macs have only a few expansion slots, vendors are increasingly turning to multifunction display boards. These include accelerator boards with a video port, video-display boards with Ethernet, and video-display boards with video-capture and video-presentation capability. If you have few slots available—whether NuBus or Processor Direct Slot (PDS)—the multifunction approach merits strong consideration.

For Macs with built-in video, the most cost-effective way to upgrade may be to add video RAM (VRAM). More VRAM will not speed up your display, but it will let your monitor show a wider range of colors. The “System Upgrades” table shows what VRAM expansion can deliver for each Mac.

**Storage** The constant improvements in hard-drive technology mean that yesterday’s fast drive is today’s slowpoke. The solution is to buy a faster hard drive, but don’t worry about getting the fastest. Unless you own a Centris or Quadra, your Mac has its own limit on how fast it can communicate with a hard drive. Drive speed is measured in milliseconds (ms) and referred to as access time; speeds of 15ms to 23ms are fine for most Macs. If you have a Quadra or other fast Mac, consider getting a SCSI accelerator, especially if you’re using the Mac as a database server or you’re working with large image files.

**Other Options** There are several upgrade options that might apply to your Mac: slot extenders that add NuBus or PDS slots; ROM upgrades for older Macs that wouldn’t otherwise be able to support a SuperDrive; and power-supply replacements that let you add even more devices to your Mac or use more power-hungry ones.

**Plan for the Long Term** Because upgrades often involve spending hundreds—perhaps thousands—of dollars, try to foresee your needs over the next several years. It’s easy to buy more performance than you need in the quest for having the latest and greatest. But it’s also easy to buy lots of marginal upgrades that, over time, add up to more money than what you would have spent on a major upgrade to begin with.

There will always be a faster, more capable Mac just around the corner—this is probably the one immutable law of computing. But you can keep up with the Joneses without going broke by thinking ahead and choosing your upgrade strategy wisely.
## System Upgrades

### Compact

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<th>Classic</th>
<th>Classic II (Performa 200)</th>
<th>Color Classic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>discontinued</td>
<td>discontinued</td>
<td>discontinued</td>
<td>discontinued</td>
<td>available</td>
<td>available</td>
</tr>
<tr>
<td>Overall speed *</td>
<td>0.8</td>
<td>1.0</td>
<td>3.2</td>
<td>1.0</td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Price $</td>
<td>$400</td>
<td>$575</td>
<td>$1150</td>
<td>$650</td>
<td>$1079</td>
<td>$1389</td>
</tr>
<tr>
<td><strong>Processor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>68000</td>
<td>68000</td>
<td>68030</td>
<td>68000</td>
<td>68030</td>
<td>68030</td>
</tr>
<tr>
<td>Speed</td>
<td>8MHz</td>
<td>8MHz</td>
<td>16MHz</td>
<td>8MHz</td>
<td>16MHz</td>
<td>16MHz</td>
</tr>
<tr>
<td>Math coprocessor</td>
<td>not supported</td>
<td>not supported</td>
<td>included</td>
<td>not supported</td>
<td>via add-on board</td>
<td>optional</td>
</tr>
<tr>
<td>Paged Memory Management Unit</td>
<td>not supported</td>
<td>not supported</td>
<td>included</td>
<td>not supported</td>
<td>included</td>
<td>included</td>
</tr>
<tr>
<td><strong>System Memory</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soldered logic-board RAM</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>1MB</td>
<td>2MB</td>
<td>4MB</td>
</tr>
<tr>
<td>Maximum RAM</td>
<td>4MB</td>
<td>4MB</td>
<td>128MB</td>
<td>4MB</td>
<td>10MB</td>
<td>10MB</td>
</tr>
<tr>
<td>SIMM type</td>
<td>30-pin</td>
<td>30-pin</td>
<td>30-pin</td>
<td>30-pin</td>
<td>30-pin</td>
<td>30-pin</td>
</tr>
<tr>
<td>Minimum SIMM speed</td>
<td>150ns</td>
<td>150ns</td>
<td>120ns</td>
<td>120ns</td>
<td>100ns</td>
<td>100ns</td>
</tr>
<tr>
<td><strong>Built-in Video</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Included</td>
<td>built-in monitor</td>
<td>built-in monitor</td>
<td>built-in monitor</td>
<td>built-in monitor</td>
<td>built-in monitor</td>
<td>built-in monitor</td>
</tr>
<tr>
<td>Standard VRAM</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>256K</td>
</tr>
<tr>
<td>Maximum VRAM</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>512K</td>
</tr>
<tr>
<td>Standard colors *</td>
<td>B&amp;W</td>
<td>B&amp;W</td>
<td>B&amp;W</td>
<td>B&amp;W</td>
<td>B&amp;W</td>
<td>256 **</td>
</tr>
<tr>
<td>Maximum colors *</td>
<td>B&amp;W</td>
<td>B&amp;W</td>
<td>B&amp;W</td>
<td>B&amp;W</td>
<td>B&amp;W</td>
<td>32.768</td>
</tr>
<tr>
<td>Maximum monitor size (8-bit)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Maximum monitor size (16-bit)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Number of Slots and Ports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NuBus slots</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Processor Direct Slots (PDS)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Cache slots</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sound-in ports</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Storage Devices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum hard drive transfer rate</td>
<td>260 KBps</td>
<td>660 KBps</td>
<td>1400 KBps</td>
<td>660 KBps</td>
<td>1100 KBps</td>
<td>1100 KBps</td>
</tr>
<tr>
<td>Maximum internal hard drives</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Accessible drive bays</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SuperDrive</td>
<td>no</td>
<td>yes ***</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>System Upgrade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replacement logic-board options</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>Classic II</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Macworld's recommended upgrade strategy</td>
<td>replace with Color Classic or LC III</td>
<td>replace with Color Classic or LC III, or add SuperDrive</td>
<td>install accelerator board; slot-expansion chassis if needed</td>
<td>replace with Color Classic or LC III</td>
<td>replace with Color Classic or other Mac</td>
<td>install VRAM or accelerator board</td>
</tr>
</tbody>
</table>

NA = not applicable.

* Numbers indicate how many times as fast a particular Mac is in comparison to the Classic.

† Prices for discontinued models are based on typical resale values as of March 1993. Prices for current models vary from base to high-end configurations. Prices listed for models with Performa equivalents are for standard Mac models only.

§ A Performa 600 has no math coprocessor, and the 600's cache is optional.

Some models come with 4MB of on-board RAM and can be expanded to 132MB.
**General Guidelines**

Almost every Mac has its own permissible memory configurations as well as particular memory bank positions. The illustrations in this pullout guide pinpoint the location of memory banks on all desktop Macs (from the Plus to the Quadras).

Beside the illustrations are the memory specs for each Mac, including any special RAM requirements, video RAM options (if supported), and a table showing which SIMMs are needed and how they should be placed to achieve at least 4MB of memory (the minimum RAM recommended for System 7). (The RAM configuration tables don't include 16MB or larger SIMMs, which are hard to get and expensive.)

Whatever Mac you have, the following rules apply to installing memory:

1. Each RAM slot can accommodate one SIMM. All slots in a bank must be either completely filled or completely empty (as shown below in the close-up of an SE/30's banks configured for 4MB).
2. Unless otherwise noted, if you fill only one bank, fill Bank A.
3. All SIMMs in a bank must be of the same capacity (you can't put one 4MB SIMM and one 2MB SIMM in the same bank).
4. Unless otherwise noted, if you use SIMMs of different capacities in each bank (for example, 4MB SIMMs in Bank A, 2MB SIMMs in Bank B), always put the higher-capacity SIMMs in Bank A.
5. Unless otherwise noted, use standard 30-pin Mac SIMMs.

**Compact Macs**

**Plus, SE**


<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
<th>Bank B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4MB</td>
<td>2 x 1MB</td>
<td>2 x 1MB</td>
</tr>
</tbody>
</table>

Notes: For most SEs (those that have a memory jumper), if you use SIMMs of different capacities in each bank, put the higher-capacity SIMMs in Bank B. If you fill only one bank, it must be Bank B. Early SEs use a small resistor (labeled R35) instead of a memory jumper; for these SEs, put the higher-capacity SIMMs in Bank A.

**SE/30**

Soldered logic-board RAM: none. Maximum RAM: 128MB. SIMM capacities supported: 256K, 1MB, 4MB, 8MB, 16MB. Minimum SIMM speed: 120ns. RAM configurations: Two banks with four slots each.

<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
<th>Bank B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4MB</td>
<td>4 x 1MB</td>
<td>empty</td>
</tr>
<tr>
<td>8MB</td>
<td>4 x 1MB</td>
<td>4 x 256K</td>
</tr>
<tr>
<td>16MB</td>
<td>4 x 1MB</td>
<td>4 x 1MB</td>
</tr>
</tbody>
</table>

Notes: Although adding two 4MB SIMMs brings the total amount of RAM to 12MB, the Color Classic can address only up to 10MB. VRAM: 256K on-board, expandable to 512K.

**Classical II (Performa 200)**

Soldered logic-board RAM: 2MB. Maximum RAM: 16MB. SIMM capacities supported: 1MB, 2MB, 4MB. Minimum SIMM speed: 100ns. RAM configurations: One bank with two slots.

<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
</tr>
</thead>
<tbody>
<tr>
<td>4MB</td>
<td>2 x 1MB</td>
</tr>
<tr>
<td>6MB</td>
<td>2 x 2MB</td>
</tr>
<tr>
<td>10MB</td>
<td>2 x 4MB</td>
</tr>
</tbody>
</table>

Notes: If the Mac isn't running in 32-bit mode, memory is limited to 8MB.

**Color Classic**

Soldered logic-board RAM: 4MB. Maximum RAM: 10MB. SIMM capacities supported: 1MB, 2MB, 4MB. Minimum SIMM speed: 100ns. RAM configurations: One bank with two slots.

<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
</tr>
</thead>
<tbody>
<tr>
<td>6MB</td>
<td>2 x 1MB</td>
</tr>
<tr>
<td>8MB</td>
<td>2 x 2MB</td>
</tr>
<tr>
<td>10MB</td>
<td>2 x 4MB</td>
</tr>
</tbody>
</table>

Notes: Although adding two 4MB SIMMs brings the total amount of RAM to 12MB, the Color Classic can address only up to 10MB. VRAM: 256K on-board, expandable to 512K.

**Low-Cost Macs**

**LC, LC II (Performa 400, 405, 430)**

Soldered logic-board RAM: 2MB (LC), 4MB (LC II). Maximum RAM: 10MB. SIMM capacities supported: 1MB, 2MB, 4MB. Minimum SIMM speed: 100ns. RAM configurations: One bank with two slots.

<table>
<thead>
<tr>
<th>Total RAM Bank A</th>
<th>LC Grade</th>
<th>Total RAM Bank A</th>
<th>LC Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>4MB</td>
<td>2 x 1MB</td>
<td>6MB</td>
<td>2 x 2MB</td>
</tr>
<tr>
<td>8MB</td>
<td>2 x 2MB</td>
<td>10MB</td>
<td>2 x 4MB</td>
</tr>
</tbody>
</table>

---

**Legend:**

- = Bank A
- = Bank B
- = VRAM
- = Bank C
- = Bank D

---

**DRAM:**

- = Bank A
- = Bank B
- = VRAM

---

**Notes:**

- For most SEs (those that have a memory jumper), if you use SIMMs of different capacities in each bank, put the higher-capacity SIMMs in Bank B. If you fill only one bank, it must be Bank B. Early SEs use a small resistor (labeled R35) instead of a memory jumper; for these SEs, put the higher-capacity SIMMs in Bank A.

- Unless otherwise noted, if you use SIMMs of different capacities in each bank (for example, 4MB SIMMs in Bank A, 2MB SIMMs in Bank B), always put the higher-capacity SIMMs in Bank A.

- Unless otherwise noted, use standard 30-pin Mac SIMMs.
Upgrades

Notes: Although adding two 4MB SIMMs to the LC II brings the total amount of memory to 12MB, the LC II can address only up to 10MB. VRAM: 256K on-board, expandable to 512K by replacing the 256K VRAM SIMM with a 512K VRAM SIMM.

**LC III (Performa 450)**

Soldered logic-board RAM: 4MB. Maximum RAM: 36MB. SIMM capacities supported: 1MB, 2MB, 4MB, 8MB, 16MB, 32MB. Minimum SIMM speed: 80ns. RAM configurations: One bank with one slot.

<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
<th>Bank B</th>
</tr>
</thead>
<tbody>
<tr>
<td>5MB</td>
<td>1MB</td>
<td>empty</td>
</tr>
<tr>
<td>8MB</td>
<td>1MB</td>
<td>empty</td>
</tr>
<tr>
<td>16MB</td>
<td>2MB</td>
<td>empty</td>
</tr>
<tr>
<td>32MB</td>
<td>4MB</td>
<td>empty</td>
</tr>
<tr>
<td>64MB</td>
<td>8MB</td>
<td>empty</td>
</tr>
</tbody>
</table>

Notes: Use 72-pin SIMMs. VRAM: 512K on-board; can be upgraded to 768K. LC and LC II owners with a 512K VRAM SIMM who upgrade to an LC III can use the 512K VRAM SIMM in the LC III (for 1MB total), but the amount of addressable VRAM remains 768K. Composite SIMMs not recommended.

**MIDRANGE MACS**

**II, Ilx**

Soldered logic-board RAM: none. Maximum RAM: 68MB (Mac II: 128MB [Mac IIx]). SIMM capacities supported: 256K, 1MB, 4MB, 8MB, 16MB. Minimum SIMM speed: 100ns. RAM configurations: Two banks with four slots each.

<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
<th>Bank B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4MB</td>
<td>4 x 1MB</td>
<td>empty</td>
</tr>
<tr>
<td>5MB</td>
<td>4 x 1MB</td>
<td>empty</td>
</tr>
<tr>
<td>8MB</td>
<td>4 x 1MB</td>
<td>empty</td>
</tr>
<tr>
<td>16MB</td>
<td>4 x 1MB</td>
<td>empty</td>
</tr>
<tr>
<td>32MB</td>
<td>4 x 2MB</td>
<td>empty</td>
</tr>
<tr>
<td>64MB</td>
<td>4 x 2MB</td>
<td>empty</td>
</tr>
</tbody>
</table>

Notes: The Mac II can’t address more than 68MB of memory regardless of how much is installed. For a Mac without a SuperDrive upgrade, if you use SIMMs of different capacities in each bank and you’re using SIMMs of 4MB or greater capacity, put the higher-capacity SIMMs in Bank B. The II requires that 16MB SIMMs be PAL SIMMs; the Ix requires that 4MB and 16MB SIMMs be PAL SIMMs. Memory is limited to 8MB if the Mac isn’t running in 32-bit mode.

**Ilci**


<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
<th>Bank B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4MB</td>
<td>4 x 256K</td>
<td>empty</td>
</tr>
<tr>
<td>8MB</td>
<td>4 x 512K</td>
<td>empty</td>
</tr>
<tr>
<td>16MB</td>
<td>4 x 512K</td>
<td>empty</td>
</tr>
</tbody>
</table>

Notes: Memory is limited to 8MB if the Mac is not running in 32-bit mode.

**Ilci**


<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
<th>Bank B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4MB</td>
<td>4 x 1MB</td>
<td>empty</td>
</tr>
<tr>
<td>8MB</td>
<td>4 x 2MB</td>
<td>empty</td>
</tr>
<tr>
<td>16MB</td>
<td>4 x 4MB</td>
<td>empty</td>
</tr>
<tr>
<td>32MB</td>
<td>4 x 8MB</td>
<td>empty</td>
</tr>
<tr>
<td>64MB</td>
<td>4 x 16MB</td>
<td>empty</td>
</tr>
</tbody>
</table>

Notes: If you install SIMMs of different capacities in each bank and you use the on-board video, put the higher-capacity SIMMs in Bank B. VRAM: Use system RAM and is not upgradable.

**Ilcx**

Soldered logic-board RAM: none. Maximum RAM: 68MB. SIMM capacities supported: 256K, 1MB, 4MB, 8MB, 16MB, 32MB. Minimum SIMM speed: 100ns. RAM configurations: One bank with four slots each.

<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
</tr>
</thead>
<tbody>
<tr>
<td>5MB</td>
<td>4 x 1MB</td>
</tr>
<tr>
<td>9MB</td>
<td>4 x 2MB</td>
</tr>
<tr>
<td>17MB</td>
<td>4 x 4MB</td>
</tr>
</tbody>
</table>

Notes: With System 7 virtual memory enabled, only 12MB of RAM may be addressed. VRAM: Use system RAM and is not upgradable.

**Ilivx (Performa 600)**

Soldered logic-board RAM: 4MB. Maximum RAM: 68MB. SIMM capacities supported: 256K, 1MB, 2MB, 4MB, 8MB, 16MB, 32MB. Minimum SIMM speed: 80ns. RAM configurations: One bank with four slots each.

<table>
<thead>
<tr>
<th>Total RAM</th>
<th>Bank A</th>
</tr>
</thead>
<tbody>
<tr>
<td>5MB</td>
<td>4 x 256K</td>
</tr>
<tr>
<td>8MB</td>
<td>4 x 1MB</td>
</tr>
<tr>
<td>12MB</td>
<td>4 x 2MB</td>
</tr>
</tbody>
</table>
**Centris 610**

Solded logic-board RAM: 4MB. Maximum RAM: 64MB. SIMM capacities supported: 4MB, 8MB, 16MB, 32MB. Minimum SIMM speed: 80ns. RAM configurations: Two banks with one slot each.

![Centris 610 RAM configuration](image)

**Notes:** Uses DOS-style 72-pin SIMMs (not the common 30-pin Mac or DOS SIMMs). VRAM: 512K on-board, expandable to 1MB. Composite SIMMs not recommended.

**Centris 650**

See the memory specifications for the Quadra 600; the computer's memory configurations are the same, except that the 650's minimum SIMM speed is 80ns and the 800's is 70ns.

**Ilfx**


![Ilfx RAM configuration](image)

**Notes:** Uses 64-pin SIMMs (the same as for Laser/Writer INTX).

**Quadra 700**

Solded logic-board RAM: 4MB. Maximum RAM: 64MB. SIMM capacities supported: 1MB, 4MB, 8MB, 16MB, 32MB. Minimum SIMM speed: 80ns. RAM configurations: One bank with four slots.

![Quadra 700 RAM configuration](image)

**Notes:** 16MB SIMMs must be low-profile SIMMs. Using four 16MB SIMMs brings the total RAM to 60MB, but the Quadra 700 can address only 64MB of it. VRAM: 512K on-board, expandable to 2MB with four 256K VRAM SIMMs. VRAM must be added in two-SIMM increments.

**Quadra 800**

Solded logic-board RAM: 8MB. Maximum RAM: 136MB. SIMM capacities supported: 4MB, 8MB, 16MB, 32MB. Minimum SIMM speed: 70ns. RAM configurations: Four banks with one slot each.

![Quadra 800 RAM configuration](image)

**Notes:** Uses DOS-style 72-pin SIMMs (not the common 30-pin Mac or DOS SIMMs). Some Centris 650s have 4MB of solded logic-board RAM (for a maximum of 132MB of RAM); subtract 4MB from all totals for such a model. VRAM: 512K on-board, expandable to 1MB. Composite SIMMs not recommended.

**Qudra 900, 950**

Expanding a Compact Mac

Prolong the life of your Plus, Classic series, or SE series Mac

by Suzanne Stefanac

and-me-downs. Outdated curiosities. It's easy to dismiss older compact Macs as little more than antiquated appliances. Unless, of course, you need to use one. A Plus or even an SE/30 might lack the power and suavity of Apple's newer offerings, but many thousands of them get the job done each day. I know. Back in the dawn of desktop publishing, I helped edit the first magazine put out on the only Macintosh around—a 128K with a single floppy drive and no hard drive. Memories of those days made several years of publishing a 16-page newsletter on an unaccelerated 1MB Plus seem like a cinch. (OK, scrolling TIFF files in PageMaker was a tiny bit aggravating.)

I know scientists and educators who keep large flat-file databases on SEs. One researcher I've interviewed runs sophisticated statistical analyses on an SE/30. A cartoonist friend builds whimsical animations on his Plus. My boyfriend, Alan, uses my old Plus to lay out floor plans for his theater sets; this is CAD, albeit not rocket science. Like many other users of compact Macs, he doesn't complain because this is the machine he's familiar with (my IIci is generally in use). But there's always room for improvement.

Still, upgrading a compact Mac involves some painful choices. These Macs were not designed, for the most part, to be upgraded. Sure, you can add memory and maybe an expansion board. But that's about it. If you're seriously constrained by your compact Mac's limitations, you should graduate to an LC or midrange Mac that offers wider video and expansion options, plus an upgrade path for the long term. Mac prices are getting low enough, even for those on a budget. If you decide that your compact Mac is basically all right, but you'd like to see improvements in one or two areas, then selective upgrading makes sense if the price is right. If you've outgrown your Mac and your budget is very tight, an upgrade may be your only option.

Let's first look at some general upgrade issues and then take a Mac-by-Mac look at specific options and recommendations. For information about where to buy products mentioned in this article, see "Buyers' Guide to Upgrades."

All Compact Macs

THE UPGRADE OPTIONS FOR COMPACT Macs vary based on the model, but a few options are common to all.

Memory The quickest, cheapest fix for a sluggish system is to add memory. Memory needs depend on system software and the type and number of applications you run. System 7 is more frustrating than valuable if you have fewer than 4MB of RAM; and if you want to have more than one sizable application open at a time, 8MB of RAM is a must. Which brings us to the Plus, SE, and Classic—these machines can access only 4MB of RAM because of their memory architecture. Fortunately, many 68030- and 68040-based accelerators have slots that let you add as much as 64MB of RAM; but if you add this memory, the RAM on the logic board is ignored. (These accelerators bypass the Mac's memory architecture in favor of their own, allowing the larger memory capacity.)

and-me-downs. Outdated curiosities. It's easy to dismiss older compact Macs as little more than antiquated appliances. Unless, of course, you need to use one. A Plus or even an SE/30 might lack the power and suavity of Apple's newer offerings, but many thousands of them get the job done each day. I know. Back in the dawn of desktop publishing, I helped edit the first magazine put out on the only Macintosh around—a 128K with a single floppy drive and no hard drive. Memories of those days made several years of publishing a 16-page newsletter on an unaccelerated 1MB Plus seem like a cinch. (OK, scrolling TIFF files in PageMaker was a tiny bit aggravating.)

I know scientists and educators who keep large flat-file databases on SEs. One researcher I've interviewed runs sophisticated statistical analyses on an SE/30. A cartoonist friend builds whimsical animations on his Plus. My boyfriend, Alan, uses my old Plus to lay out floor plans for his theater sets; this is CAD, albeit not rocket science. Like many other users of compact Macs, he doesn't complain because this is the machine he's familiar with (my IIci is generally in use). But there's always room for improvement.

Still, upgrading a compact Mac involves some painful choices. These Macs were not designed, for the most part, to be upgraded. Sure, you can add memory and maybe an expansion board. But that's about it. If you're seriously constrained by your compact Mac's limitations, you should graduate to an LC or midrange Mac that offers wider video and expansion options, plus an upgrade path for the long term. Mac prices are getting low enough, even for those on a budget. If you decide that your compact Mac is basically all right, but you'd like to see improvements in one or two areas, then selective upgrading makes sense if the price is right. If you've outgrown your Mac and your budget is very tight, an upgrade may be your only option.

Let's first look at some general upgrade issues and then take a Mac-by-Mac look at specific options and recommendations. For information about where to buy products mentioned in this article, see "Buyers' Guide to Upgrades."

All Compact Macs

THE UPGRADE OPTIONS FOR COMPACT Macs vary based on the model, but a few options are common to all.

Memory The quickest, cheapest fix for a sluggish system is to add memory. Memory needs depend on system software and the type and number of applications you run. System 7 is more frustrating than valuable if you have fewer than 4MB of RAM; and if you want to have more than one sizable application open at a time, 8MB of RAM is a must. Which brings us to the Plus, SE, and Classic—these machines can access only 4MB of RAM because of their memory architecture. Fortunately, many 68030- and 68040-based accelerators have slots that let you add as much as 64MB of RAM; but if you add this memory, the RAM on the logic board is ignored. (These accelerators bypass the Mac's memory architecture in favor of their own, allowing the larger memory capacity.)
Also, because the Plus, SE, and Classic lack a Paged Memory Management Unit (PMMU), they do not support virtual memory, which allows a processor to treat part of a hard drive as though it were RAM, thus providing access to additional memory. Does this mean that Plus, SE, and Classic owners can't use virtual memory? No. They can if they add an accelerator with a PMMU and buy Compact Virtual 3.0 ($99, from Connectix Corporation), a software workaround that allows such Macs to support virtual memory and thus access up to 12MB on a hard drive as if it were RAM (under either System 6 or System 7). Many vendors supply Compact Virtual with their accelerators. Be sure that a new accelerator is not based on a 68EC030 processor, since these processors do not contain PMMU circuitry and thus, even with Compact Virtual, you will be unable to access virtual memory. Likewise, no 68040-based accelerator can support virtual memory, even with Compact Virtual.

Why would you want virtual memory? If you work with applications or files that store large amounts of data in RAM, such as low-end page-layout programs, virtual memory is an alternative to loading up your system with RAM. Be forewarned, however, that virtual memory is much slower than actual system RAM.

Because the SE/30, Classic II, and Color Classic are based on the 68030, which has a built-in PMMU, they natively support virtual memory.

Math Coprocessing A math coprocessor (also called an FPU, for floating-point unit) performs certain calculations that would otherwise bog down the processor—for example, operations used in CAD, modeling, and scientific analysis. If your work involves these calculations, buy a math coprocessor. However, almost no business spreadsheets use these calculations, so don’t think you’ll accelerate Excel if you buy a math coprocessor. The SE, Plus, and Classic do not support math coprocessors. The SE/30 includes a math coprocessor, and the Classic II has a slot for a third-party add-on coprocessor board. Apple offers an optional, $79 math coprocessor for the Color Classic.

Storage If you can recall the whining sound a 128K Mac made when you swapped floppy disks, you know there was a time when 400K was as much storage as you could get. Now a Classic can handle an internal hard drive that holds as much as 120MB—and MicroNet offers SE owners a $3495 drive that holds 1GB. Of course, you can hook up just about any hard drive to the Mac’s SCSI port.

Remember that older Macs can’t support the industry’s highest transfer rates; your data will travel at the same old SCSI rates your Mac is used to. That means you don’t need to worry about getting a fast drive—any modern drive will do.

Video Display For those tired of squinting into a 9-inch universe, vendors offer many video-display options for compact Macs. For all but the Classic II, you can buy a video-display board to drive an external monitor. The Color Classic and SE/30 support 8-bit or better color monitors. Video-display boards for the Color Classic—which include any boards designed for the LC series—can display up to 24-bit color on external monitors. The Plus, SE, SE/30, and Classic support black-and-white display.

Port Expansion The Axion Switch ($159) from Axion lets you switch between four serial devices, and the Hurdler SCSI Serial Expansion ($695) from Creative Solutions provides a more serious option (complete with two coprocessors) that lets you access up to six serial devices simultaneously. The latter should be a boon to bulletin board system operators,
EXPANDING A COMPACT MAC

who need to run additional modems and a printer all at once.

Acceleration Installing third-party accelerators can be a pain or a snap. Plus and Classic accelerators must somehow connect to the original processor, and some schemes are more successful than others. (Installation isn’t a concern for Classic II owners, because there are no accelerators for this Mac.) Upgrades for the SE, SE/30, and Color Classic install much more easily; you just snap them into the waiting Processor Direct Slot (PDS). Because installation can be so tricky, many vendors of these upgrades will install them for a minimal cost or for free. Unless you’ve installed circuit boards before, have a pro do it—you’d be amazed at how easy it is to ruin an accelerator, a logic board, or both.

Also, many memory boards and some math coprocessors compete unsuccessfully for space with accelerators. So-called high-profile SIMMs are taller than ordinary, low-profile SIMMs. Check with the accelerator vendor about possible space incompatibilities.

Plus

Strengths A sentimental favorite, the Plus is quiet and light.

Weaknesses The Plus has no NuBus or PDS slot and no Apple Desktop Bus (ADB) port. It’s limited to 4MB of system RAM. You need an accelerator with a PMMU and Compact Virtual to support virtual memory or extra system RAM. The Plus lacks a SuperDrive, an internal hard drive (although you could add one), a math coprocessor, and sound-recording circuitry. Its power supply and its SCSI technology often are buggy. System 7 runs very slowly.

Strategies The Plus has very few upgrade options and is, fundamentally, hardly worth upgrading. Use it as is, sell it, or give it to charity. Consider buying an LC III to replace it, or if you like the all-in-one approach, check out the Color Classic. If you can’t bear to part with your Plus, here are some options to consider.

Acceleration The Brainstorm Accelerator ($249) from Brainstorm Products gets high praise for enhanced speed and dependability from user groups and those who post commentaries on online services. (Because it is based on a 16MHz 68000 processor, this two-component upgrade—a processor and a Brainstorm BusAccelerator chip—was not included in our accelerator tests, which we limited to 68030- or 68040-based accelerators.)

Power Supply If you’re determined to accelerate your Plus, you might also consider beefing up its power supply. Total Systems rebuilts Mac Plus power supplies using heavy-duty components.

Video Display If you want to add a larger monochrome monitor, you have a few choices: display systems from Lapis Technologies or the monitor that comes with MicroMac Technology’s case-and-accelerator upgrade ($998).

SE

Strengths The SE’s one PDS slot allows easy installation of, for example, an accelerator board or a large-screen video-display board. SEs built after August 1989 have 1.44MB SuperDrives. The SE includes two ADB ports.

Weaknesses The SE has a limit of 4MB for system RAM and has no math coprocessor or sound-recording circuitry. It can’t accept PDS boards designed for the SE/30, and the SE requires a ROM upgrade to support color QuickDraw. The fan can be noisy.

Strategies Buy an accelerator if you need improved performance, but don’t go for the top of the line, because a new Mac would be cheaper.

Acceleration A stock SE comes with a 68000 processor running at 8MHz. If you add an accelerator with a 25MHz 68030, you perform two key improvements: first, you speed up the processor’s internal clock by a factor of three, allowing the computer to process more instructions in a given amount of time; second, you replace the SE’s hybrid 16-bit and 32-bit processor with a true 32-bit processor that, in general, is faster and more efficient. You get roughly the same computing power as a Mac IIci—yet 25MHz 68030 accelerators cost as little as $400 in terms of street price, much less than even a used IIci. Adding an accelerator also adds support for virtual memory and larger memory addressing.

When buying an accelerator board for the SE, decide which is more impor-
tant: performance or price. A 25MHz 68030 accelerator may seem modest when compared with racier cousins, but for those on a budget, a $449 Novy Systems Quik30 25MHz board (without a math coprocessor) will speed up most tasks by four to six times.

If you’re really looking for some lightning action, Macworld Lab tests show that Applied Engineering’s TransWarp SE 40MHz ($1198) board came in slightly ahead of three 50MHz upgrades: Extreme Systems’ Vandal 50MHz ($999) and two Total Systems boards—the Gemini Integra 50MHz ($1089) and the Gemini Ultra SE 50MHz ($979). (All prices include a math coprocessor; expect Applied Engineering’s street prices to be closer to Total Systems’.) Any of these accelerators will grant your SE access to System 7 and just about any application that doesn’t require color, but the Gemini Integra, with its built-in monochrome video capabilities supporting displays up to 15 inches, is the best overall processor-upgrade deal.

**SuperDrive**

The 1.44MB floppy is becoming the standard Macintosh floppy, which means you need a SuperDrive if you exchange disks with other people. Apple’s SE/30 logic-board upgrade for the SE is no longer available, but you can still get the enhanced ROM if you buy Apple’s Macintosh FDHD Upgrade Kit ($285 internal and $329 external).

Several companies offer external SuperDrive-compatible floppy drives. Applied Engineering’s AEHD Plus Drive ($449) relies on software and firmware routines that allow your SE to read 400K, 800K, and 1.44MB floppies. Likewise, the PLI SuperFloppy drive ($399) can read all three, but the PLI TurboFloppy ($359) reads only 1.44MB floppies.

**SE/30**

**Strengths**

The SE/30 has a PDS slot, two ADB ports, a built-in math coprocessor, and stereo sound output. Color QuickDraw in ROM allows display of gray-scale or color with an appropriate video-display board.

The SE/30 runs three to four times faster than the Classic II, even though both have a 68030 processor that runs at 16MHz. The primary reason for the better speed lies in the width of the data path between the processor and memory: an SE/30 can transfer data to and from its memory in 32-bit chunks, while a Classic II is limited to 16-bit chunks. In terms any computer can appreciate, an SE/30’s internal data freeway has twice as many lanes as a Classic II’s. Because the 68030 has a PMMU, the SE/30 natively supports virtual memory.

**Weaknesses**

The SE/30’s so-called dirty ROM limits system RAM to 8MB (Mode32, software developed by Connectix, expands this to 128MB). The SE/30 has no sound-recording circuitry.

**Strategies**

The best improvement is to get access to more RAM, which means making sure you’ve installed Mode32 or, if you’re running System 7.1, Apple’s 32-Bit System Enabler Extension.

**Memory**

Because the SE/30’s 68030 processor has a built-in PMMU, the SE/30 can run virtual memory without additional hardware. In 24-bit mode (the default setting), the SE/30 addresses up to 13MB of virtual memory. For System 7.0, Apple has licensed Mode32, a Connectix utility that lets an SE/30 running System 7 access up to 1GB of virtual memory by making the SE/30 run in 32-bit mode. If you use System 7.1, you can get Mode32 from online services.

Even under System 7, the SE/30’s dirty ROM lets it access no more than 8MB of system RAM because it doesn’t support full 32-bit addressing. With Mode32, the SE/30 runs in 32-bit mode, enabling it to address up to 128MB. However, some older programs will not run in 32-bit mode, and no accelerator boards based on the 68040 processor support Mode32 when used on the SE/30.

System 6 holdouts (you know who you are, and we know your machines are faster without System 7) needn’t despair—memory addressing beyond 8MB on an SE/30 is within your grasp. Optima ($175), another Connectix software utility, implements 32-bit addressing under System 6, letting you access up to 32MB of contiguous memory. Optima/128 ($175) lets you access up to 128MB of application memory. Use Optima if you’ve added a lot of RAM to your SE/30 but don’t want to upgrade to System 7 to be able to access it all.

**Acceleration**

To push the SE/30 into a new league, you have to turn up the clock speed—DayStar Digital offers 33MHz, 40MHz, and 50MHz 68030 Universal PowerCaches—or opt for a 68040-based accelerator—the Fusion Data Systems TokaMac SX25, for instance. Check your wallet and to-do list and choose the DayStar 50MHz upgrade ($999 with math coprocessor) for demanding tasks or the
DayStar 33MHz upgrade ($549 with math coprocessor) for speeds that are twice those of a vanilla SE/30.

**Video Display** If you're contemplating doing 24-bit color work and don't want to spring for a new Mac just yet, Lapis Technologies offers two boards that will do the trick—the ProColor-Server II 24 ($599) and 24x ($699). The first comes with 1.5MB of video RAM (VRAM) to support monitors up to 16 inches; the second comes with 2MB of VRAM and can display 24-bit color on monitors up to 21 inches. Xceed Technology also offers a 24-bit color video-display board ($799). Lapis and Mobius both offer boards that add 10BaseT and thin coax Ethernet connections to their video boards that support monochrome display on two-page monitors.

**Slot Expansion** Second Wave offers an expansion chassis with four or eight NuBus slots for an SE/30. The price for the Expanse isn't cheap ($995 for four slots and $1895 for eight slots), but if you want to have Ethernet, video capture, and 24-bit color on an already-paid-for SE/30, it could be a godsend.

**Classic**

**Strengths** It has a SuperDrive.

**Weaknesses** The Classic lacks an expansion slot, a math coprocessor, and sound-recording circuitry. It is also limited to 4MB of system RAM and can't run the Mode32 program that would allow it to address more. The power supply works only with the voltage of the country in which it is designed to be sold. A single ADB port limits the number of input devices you can connect.

**Strategies** If all you want is more speed, buy an inexpensive accelerator or the logic-board replacement from Apple. Otherwise, replace the Classic with a Color Classic or an LC III.

**Logic-Board Replacement** The surest path to a faster system is an official Apple logic-board upgrade, which for $629 turns a Classic into a 16MHz 68030 Classic II. The Classic II is about twice as fast as a Classic and doesn't have the Classic's memory limits—the Classic II can address up to 10MB of RAM. Apple's upgrades include the latest ROMs and system software. The Classic II upgrade also gets you sound-recording circuitry and a microphone—no need to buy a MacroMind/Paracomp MacRecorder. But you may need to buy new SIMMs—Apple's upgrade includes only 2MB of RAM, plus the Classic II requires 100-nanosecond chips, while the original Classic used the slower 120ns variety. The dealer who installs your upgrade can tell you whether your existing SIMMs will work. However, while you gain more RAM and better speed, you lose the ability to add a video-display or accelerator board.

**Acceleration** The Classic is a relatively slow, stripped-down machine that definitely benefits from acceleration. In Macworld Lab tests, Applied Engineering came out ahead—about eight times as fast—with its 40MHz 68030 TransWarp Classic ($798, with a math coprocessor).

**Classic II (Performa 200)**

**Strengths** The 68030-based Classic II supports virtual memory and up to 10MB of system RAM. It has sound input and a slot for a math coprocessor or ROM upgrade. Its 32-bit QuickDraw lets the Classic II display color images in simulated shades of gray on its built-in monochrome monitor. An external microphone allows 8-bit mono sound input.

**Weaknesses** The Classic II's 1-bit black-and-white display and lack of expansion slot make it difficult to take advantage of 32-bit color QuickDraw. No vendors offer video boards for the Classic II. Also, because pins on the 68030 processor are too close together, it is difficult to design reliable clip-on adapters for the Classic II, and to date there are no accelerators available. This is unfortunate because, like the LC, the Classic II must rely on a 16-bit data path, the main reason that this machine runs so much more slowly than the SE/30 with the same 16MHz 68030 processor.

**Strategies** Live with it, sell it, or replace it with an LC III or Color Clas-
Also sold by Total Systems as the Gemini Integra.
Also sold by Novy's Systech division under the same name and by MacProducts USA as the RailGun Pro.

Color Classic

Strengths A hybrid of the Classic II and the LC II, the Color Classic features a 10-inch built-in color monitor, PDS and math coprocessor expansion slots, two ADB ports, and support for up to 10MB of system RAM. The Color Classic's standard 256K of video RAM displays 8-bit color on its built-in monitor; this can be expanded to 512K to support 16-bit color. To save energy, the Screen Power Saver feature puts the monitor to sleep after a preselected idle time. The Color Classic also offers several sound options, including volume control buttons and a built-in microphone for 8-bit mono sound input. A major boon for upgrades is a case designed to provide easy access to the logic board—simply un latch the clasp holding the back panel and slide out the logic board.

Weaknesses With games and CD ROM applications designed to run on a 640-by-480-pixel screen, you can't see everything that's happening because the Color Classic's screen is smaller (512 by 384 pixels). The logic board's 16-bit data bus limits overall performance.

Strategies The Color Classic accepts any PDS board designed for the LC, including accelerator, Ethernet, video-display, and Apple IIe emulation boards. Depending on your performance needs, add the appropriate board (see "Making the Most of an LC," in this issue). Add the optional 256K VRAM chip ($99) from Apple to get 16-bit color. Add a video-display board to get 24-bit color.

Toasting the Compacts

When your toaster stops toasting toasty enough or fails to accept wider loads, you don't add a ToastCrisp module or a slot expander. You buy a new toaster. Compact Macs—despite their appliance-like design—do allow incremental changes. The performance of the Plus, SE, SE/30, Classic, Classic II, and Color Classic can all be enhanced. Deciding which upgrade path best suits your budget and suite of tasks is the trick. But if your needs are bigger than a breadbasket, you might need a new Mac.

Suzanne Stefanac is a Macworld contributing editor who remembers the sound of disk-swapping with some small nostalgia.

Macworld Lab testing supervised by Tim Warner.
Making the Most of an LC

How to choose the best—and most affordable—upgrades for your LC

by Galen Gruman

The best-selling Macs ever, the LC series—the LC, LC II/Performa 400, and LC III/Performa 450—offer good performance at hard-to-beat prices, making them the perfect Macintoshes for word processing, home-office computing, electronic-mail access, uncomplicated spreadsheet work, and other basic business applications.

Although their small, pizza-box size makes the LCs appear to be impossibly constrained in terms of performance, there are several worthwhile upgrades that will give your LC a long, useful life. This article covers the pros and cons of various LC enhancements to help you determine which ones are right for you. Products mentioned in this article are listed with contact information in “Buyers’ Guide to Upgrades,” in this issue.

LC and LC II (Performa 400, 405, 430)

These Slim Macs were the first to offer affordable color-monitor support and adequate processing power, plus the advantage of taking little room on a crowded desk or in a college dorm room.

Strengths The LC and LC II (the Performa 400, 405, and 430 are technically the same computer as the LC II) share a common design, so any peripheral or upgrade option designed for one works with the other. Their built-in video circuitry lets them drive 14-inch monitors at 8-bit color depth (256 colors)—the most common display configuration today. Their 32-bit-clean ROMs allow you to address memory above 8MB. (At press time, Apple discontinued the LC II.)

Weaknesses The LCs have just one Processor Direct Slot (PDS) and a 10MB RAM limit. Their weak, 25.6-watt power supply can barely power the logic board and one PDS board.

The LC uses a 68020 processor, which doesn’t have the circuitry needed to support some System 7 features, such as virtual memory. The LC and LC II have a 16-bit system bus, which hobbles the speed of the LC II’s 68030, making it about as slow as the older 68020.

Strategies The LC and LC II are still fairly new machines, so you don’t have to worry about upgrading outdated components. Instead, focus on removing any unnecessary bottlenecks, such as insufficient memory or slow hard drives—or the logic board itself. Here are some performance enhancements to consider.

Memory The first upgrade any LC/LC II owner should consider is memory (the LC has 2MB standard; the LC II has 4MB). Insufficient memory—less than 8MB if you’re using System 7, and under 4MB with System 6—prevents you from running several applications and INITs concurrently.

Logic-Board Replacements Upgrading an LC or LC II to an LC III is the best way to overcome generally sluggish performance, since Apple’s $599 logic-board replacement will almost double your system’s speed. The upgrade adds 16-bit color depth (32,768 colors) for 14-inch monitors and 8-bit color for 16-inch monitors, as well as support for 15-inch monochrome portrait monitors.

There’s one considerable drawback to this upgrade, though. The LC III’s RAM
SIMMs differ from those used in an LC or LC II. As a result, any memory you've already added to your LC or LC II won't work with the LC III upgrade. If you recently bought this memory, you might be able to return it in exchange for LC III SIMMs, but it depends entirely on your dealer's refund and exchange policy (more on the LC III's SIMMs later).

Two boards—Extreme Systems' $149 Extender (also sold under the Magic label by MacProducts USA) and DayStar's $199 Equalizer LC—bypass the LC's 020 in favor of an 030. But they have only one (for most people, marginal) benefit: they make virtual memory available to System 7 users (see "Expanding a Compact Mac," in this issue, for more on virtual memory).

**Acceleration** While the LC III upgrade makes the best sense overall, anyone interested in the best possible raw performance will want an accelerator board. Macworld Lab tested seven accelerators for the LC and four for the LC II.

DayStar Digital’s 50MHz 68030-based PowerCache turned in the best performance—about 1.3 times as fast as the LC III. (“LCs: Replace or Accelerate?” shows the complete results.)

Surprisingly, an LC with Fusion Data Systems’ TolaMac LC25 accelerator, which uses a 25MHz 68040, performed about 0.85 times the speed of an LC III, which has a 25MHz 68030. The LC III shuttles data 32 bits at a time, compared with the earlier LC's 16 bits at a time. As a result, in a given period of time the LC III moves more data than the LC, resulting in better performance.

Consider the other accelerator boards carefully. The 32MHz Impact 030 from Extreme Systems is a good buy and offers overall performance that is just a little slower than that of the DayStar board. But the others perform similarly to an LC III and can cost more than the LC III upgrade. The best strategy, then, is to go for the LC III upgrade or a 50MHz accelerator and ignore the rest.

**Math Coprocessing** Several vendors offer math coprocessors (also called a floating-point unit) mounted on boards that fit in the LC/LC II PDS. Macworld Lab tested boards from DayStar Digital, Logica Research, and Sonnet Technologies. (All the accelerators tested had a math coprocessor installed—an option that usually costs $100 to $150.)

Our tests confirmed the truth about math coprocessors: except for specialized math functions called transcendental—which are used in waveform analysis, 3-D modeling, and other work involving curves—math coprocessors offer no performance boost. And if you're into that kind of detailed math, you're not likely to be doing it on an LC or LC II.

**Slot Expansion** When you need to expand your system—add a 24-bit video display, Ethernet, video capture, or an accelerator board, for example—don't assume you must get rid of your one-slotted LC model and buy a more expandable Ilx, Centris, or Quadra.

Two vendors offer slot-expansion devices that let you add PDS slots to an LC computer. Sonnet Technologies' Twin Slot LC is a $349 kit that includes a bay for a second internal hard drive (the LC and LC II support only one), two PDS slots, a 40-watt power supply, and a taller LC cover so that all these add-ons will fit into the computer's slender pizza-box chassis.

The $349 Max from DGR Technologies is similar, except it offers three PDS slots and a special case (which fits between the LC's case and cover) to provide the necessary expansion room.

**Power Supply** Another aspect of expansion is power. The LC models'
skimpy power supply may not be enough to handle some boards (which is why the slot-expansion kits include a new power supply). Apple has rated the power-handling ability for the LC PDS slots at 4w.

Several vendors, including Applied Engineering and Quadmation, offer more-capable power supplies. DayStar, whose accelerator boards use about 8w, will provide a free power supply to anyone whose LC can’t accommodate DayStar boards.

**Video Display** The LC and LC II have decent—but not speedy—built-in video RAM (VRAM) that’s fine for word processing, presentation design, and spreadsheet use. But if you intend to work with color images, paint programs, or QuickTime, look to enhancing your video performance. Similarly, if you need monitors larger than 14 inches, you’ll have to upgrade your video.

You have two choices: replace the LC or LC II with an LC III logic board or add a speedy video-display board. Lapis Technologies’ ProColorServer 24 and ProColorServer $8*16 support monitors as large as 21 inches at 1152-by-870-pixel resolution. The S$99 ProColorServer 24 also works with monitors as large as 16 inches (832-by-642-pixel resolution) at 24-bit color depth (16.7 million colors), while the $499 ProColorServer $8*16 supports displays as large as 16 inches at 16-bit color depth (32,768 colors).

Lapis has also announced the DisplayNet LC series ($549), which lets you use 15-inch portrait and 19-inch twopage monitors in black-and-white and gives you Ethernet as well. The DisplayNet series is expected to be available by the time you read this.

Envisio offers a board that lets you work with multiple monitor sizes. The Quick 16 video-display board ($495) provides 16-bit color on monitors as large as 16 inches and includes a socket for an optional math coprocessor.

An LC III upgrade provides the same capabilities as the ProColorServer $8*16 and the Quick 16, plus better overall performance, for about $200 more (price includes buying the necessary VRAM for the LC). But the Lapis ProColorServer 24 and DisplayNet are clearly worthwhile for users who need that type of video. The LC III upgrade also supports 15-inch portrait monitors, such as the Lapis DisplayNet; this makes the upgrade, coupled with an Ethernet board, a better long-term alternative for users of portrait monitors.

**LC III ( Performa 450)***
The LC II was a minimal upgrade to the LC, at best. But with the LC III, Apple has made some significant improvements (a faster 32-bit system bus, a faster 25MHz 68030 processor, greater memory capacity) to its lowest-cost, modular color Mac.

**Strengths** The LC III has fairly fast performance (nearly equal to a IIci), supports up to 36MB of system RAM, and offers video support for 15-inch portrait monochrome and 16-inch color monitors, with up to 16-bit color depth (32,768 colors) on 14-inch monitors. The 32-bit system bus also means that accelerators and other add-ons won’t be hobbled as they are on the LC and LC II.

**Weaknesses** Like the earlier LC models, the LC III is restricted to just one PDS. The LC III’s power supply remains underpowered, delivering just 4w to the PDS, even though many typical boards use 6w to 8w.

**Strategies** Few upgrades are yet available for the LC III (VRAM is an exception). But many of the strategies for the LC and LC II apply to the LC III as well.

**Memory** Although the LC III can theoretically support 36MB, most owners will probably have to settle for less. The LC III has only one RAM slot, so buy the largest-capacity SIMM you can find, since adding more memory later means throwing away the additional RAM you installed earlier.

Unlike the LC and LC II, the LC III uses 72-pin DOS SIMMs, which are readily available in the 4MB capacity but not in larger sizes. If you look around you should be able to find 8MB and 16MB SIMMs—and doing so will ensure that you have memory to spare for the days when even 8MB isn’t enough.

To get the LC III’s 36MB maximum memory, you’d have to buy one 32MB SIMM board (the LC III comes standard with 4MB), but SIMMs in that capacity were just starting to ship at press time.

Plus, the price per megabyte goes up as the SIMM capacity rises—one 16MB SIMM costs about 50 percent more than two 8MB SIMMs. So you’ll pay more per megabyte than a colleague with a Centris or IIvx, which can achieve 36MB of RAM through multiple RAM slots.

**Acceleration** DayStar Digital has an adapter that lets its 50MHz 030-based PowerCache accelerator board work in the LC III.

**Math Coprocessing** The LC III is the first LC with a slot for an optional math coprocessor. Shop around (at local dealers and mail-order vendors) for a good deal on a Motorola 68882 math coproces-
Best Mac LC Upgrade Strategies

Devising the Best Strategy. To get the most out of your Mac, increase not only its raw speed but also the capabilities of its main components: RAM, storage, video, and special-purpose processing.

Avoid Apple’s LC II logic-board upgrade is overpriced and delivers few benefits.
Avoid A math coprocessor adds only scientific analysis. If you do such work, you need a better Mac.
Avoid A 16MHz 68303-based accelerator gives the LC nothing but virtual-memory support.
Avoid Fusion Data Systems’ 040-based TokaMac LC35 accelerator costs more and delivers less than other options.

Avoid More RAM (a total of 8MB) is needed to take full advantage of System 7 features and to support today’s memory-hungry software.

Best Apple’s LC III logic-board upgrade is the best way to enhance an LC or LC II’s overall performance.

LC Accelerator Performance (in seconds)

Use these LC-specific speed results to compare acceleration options for your Mac LC. Results are presented for the four major types of tasks (processor-intensive, drive-access, video-display, and floating-point math); you should give the most weight to the results for tasks you do frequently. Unlike the rankings at left, these results cannot be compared with those of other Macs reported in this issue’s other upgrades articles.

Processor
We timed several tasks in Claris FileMaker, ClarisWorks, Deneba UltraPaint, Microsoft Excel, and Microsoft Word.
Shorter bars are better.

Drive-Access
We timed file opens in Microsoft Excel and Microsoft Word, and disk-based sorts in Claris FileMaker.
Shorter bars are better.

Video-Display
We timed horizontal and vertical scrolling in ClarisWorks, Microsoft Excel, and Microsoft Word.
Shorter bars are better.

Floating-Point
We timed scientific recalculation (which use floating-point math) in Microsoft Excel and ClarisWorks.
Shorter bars are better.


e t e l o r 3 M C W O R L D 1 0 3

Macintosh LC III Logic Board Upgrade

The Apple logic-board replacement for the LC and LC II makes the most sense economically, with a combination of improved performance, video display, and memory options that no accelerator board can offer.


Video Display
The LC III’s built-in video satisfies most needs—especially with added VRAM. If you have a 16-inch monitor and want 16-bit or better color depth, consider either Lapis Technologies’ ProColorServer or Envisio’s Quick 32 video-display boards. If you have a 19-inch monochrome monitor, RasterOps offers both a gray-scale and a black-and-white video-display board. And Lapis plans to offer its DisplayNet video-display board for the LC III as well.

Building a Better LC

If you’re happy with your LC or LC II as it is, leave it alone. But if you want better performance—for current or future work—you’ve got three good options.

• Replace your current LC or LC II with an LC III logic board. Overall, this is your best upgrade option.
• Get either the 50MHz DayStar Universal PowerCache or the 32MHz Extreme Systems Impact 030 accelerator board. This makes the most sense if raw performance is more important to you than expansion.

Macworld Lab testing supervised by LAUREN BLACK.
Getting More from a Mac II

Top upgrade strategies for the Mac II and Centris midrange lines

by Jim Heid

SONGS GROW OLD, THEY BECOME classics. When computers grow old, they become frustrating. Fortunately, the Macintosh II family is more receptive to upgrades than most Macs are. All Mac II's, except the IIci, contain at least three NuBus expansion slots, which open the door to, among other things, accelerator boards that boost processing speed; video-display boards that provide more colors, faster display speed, or both; and network boards that provide faster alternatives to the built-in LocalTalk ports that all Macs have.

This article surveys both the Mac II line (except for the IIIfx, which is covered in "Building the Ultimate Mac," in this issue) and the Centris line, and assesses each machine's strengths and weaknesses, along the way spotlighting the upgrades that are most cost-effective for each model. Products mentioned in this article are listed with contact information in "Buyers' Guide to Upgrades," in this issue.

II and IIx

THE OLDEST AND LARGEST MEMBERS OF the Mac II family, the II and IIx are also the least prone to obsolescence.

Strengths Six expansion slots—more than even the Quadra 950 provides—and a heavy-duty power supply combine to make the II and IIx (as well as the IIIfx) the most expandable Macs. Both models can accommodate a 5 1/4-inch internal hard drive and therefore can accept a wider array of high-capacity drives than smaller Mac II's, whose cases were built to house only 3 1/2-inch hard drives. (The smaller-format hard drives don't yet have the capacity ranges of the 5 1/4-inch drives.) The Mac II and IIx can also handle two floppy disk drives.

Weaknesses The II and IIx do not have built-in video, which means you must fill one slot with a video-display board. If you have the computer's original hard drive, it's probably slow by today's standards—the 20MB, 40MB, and 80MB drives that Apple used in the Mac II had access times in the ballpark of 30 to 60 milliseconds; today, access times of under 20ms are common.

The Mac II and IIx ROMs aren't 32-bit clean and were designed to support only up to 8MB of system memory. You can work around these limitations, though—the Mode32 control panel from Connectix (bundled with many accelerators and available from most bulletin boards) bypasses the so-called dirty code in the computer's ROM. In addition, Apple's new 32-Bit System Enabler, an extension to System 7.1, enables a Mac II, IIx (or IIIfx) to access memory beyond 8MB. The extension is available for $10 from Apple (call 800/892-4649 to order) or by downloading it from CompuServe, America Online, or AppleLink. You can install more than 8MB on the logic board, but you need special RAM SIMMs containing a programmable-array logic (PAL) chip or its equivalent.

The Mac II has some additional weaknesses of its own. It lacks a SuperDrive; Apple sells a SuperDrive upgrade, the Macintosh FDHD Upgrade Kit, for $385. The ROM chips in Mac II's that
were built before December 1987 contain a bug that prevents these machines from working with some accelerator boards, including the Radius Rocket. A free upgrade to the Revision B ROMs is available from any Apple dealer. (These ROMs are also included with the SuperDrive upgrade.)

Also, the Mac II lacks the Paged Memory Management Unit (PMMU) required for virtual memory. Motorola no longer manufactures its 68851 PMMU chip, although you might find one at a dealer that handles used Macs. Failing that, if you want virtual memory, you need to buy one of DayStar Digital's accelerators. They're the only Mac II-compatible accelerators that support virtual memory and don't require a PMMU on the logic board.

**Strategies** Apple offers a $1799 logic-board upgrade that turns a II or IIX into a IIX. But remember that you also need to buy memory—the IIX can't use the existing SIMMs on your Mac II or IIX. And if you have a Mac II, you'll probably want the SuperDrive upgrade, too. When you're finished, you'll have a machine that's still quite a bit slower than today's faster Macs.

An accelerator board is a better upgrade for a Mac II or IIX. For ease of installation, the Radius Rocket boards are best; they install in a NuBus slot and don't require the delicate chip-pulling surgery that DayStar Digital's Universal PowerCache does. The Rockets' ability to accommodate up to 128MB of memory (using standard SIMMs) is another plus.

The Rocket 33 also turned in the best overall performance in Macworld Lab's tests. The Rocket 33 was, on average, more than twice as fast as DayStar's 33MHz Universal PowerCache and slightly faster than a Quadra 700.

There's a catch, though. The Radius Rocket boards are incompatible with such things as System 7 file sharing, System 7.1, AppleTalk Remote Access, and QuickTime. Version 1.5 of the RocketWare software (which comes with the Rocket accelerator boards) fixes most, but not all, of these incompatibilities (problems still exist with QuickTime and many sound-oriented products). RocketWare 1.5 is also available free through Radius technical support and online services.

If you're considering the DayStar PowerCache for a IIX, note that some newer IIX models have a soldered, rather than socketed, processor chip. If yours is soldered (you have to remove the hard drive mounting pan to check), send the logic board to DayStar Digital to have a socket installed (for free).

**IIX**

**WHILE NOT AS EXPANDABLE AS THE IICL, the IIX, with the right upgrades and add-ons, is still a worthy midrange Mac.**

**Strengths** The IIX has three NuBus expansion slots and a rear-panel connector for an external SuperDrive. (One SuperDrive is built in—the case can accommodate a second SuperDrive if no hard drive is installed.) And the IIX accommodates up to 128MB of RAM (using eight 16MB SIMMs).

**Weaknesses** The IIX has no built-in video; once you install a video-display board you are left with only two slots free, cramping expansion possibilities. The 3½-inch hard drive bay limits internal hard drive capacity, though not significantly. The IIX's ROM is not 32-bit clean.

**Strategies** Apple sells a logic-board upgrade that transforms the IIX into a Quadra 700. The $1999 upgrade includes 4MB of RAM (soldered to the 700's logic board), a microphone, a sound-input chip, and a new case. In addition, the
Quadra 700 provides you with fast, built-in 24-bit video, an Ethernet port, and a fast SCSI port. If those are the features your Mac needs (along with faster overall speed, of course), the Quadra 700 upgrade is a good choice and might actually cost less than several upgrade boards put together.

If you're just after faster processing, several accelerators—the Radius Rocket 33 and Impulse Technology's Performance/040 among them—make a Mac faster than a Quadra 700. Note that after adding an accelerator, some weak spots remain, including a relatively slow SCSI port and no Ethernet networking.

One strategy might be to combine a Radius Rocket equipped with the SCSI-2 Booster with one of E-Machines' ColorLink series video boards, which also provide Ethernet ports. Total cost: $2200 to $3200, depending on which Rocket you choose. This leaves one slot free for, say, a video-capture board.

**Ilci**

A still-viable midrange Mac, the Ilci accommodates a larger selection of performance enhancements than does any other Mac II.

**Strengths** The Ilci has three NuBus slots and a cache card slot. The cache card speeds performance by providing a small amount (usually 32K to 64K) of fast memory, which holds the most recently used program instructions or data in the likely event the processor needs them again.

The built-in video is capable of displaying 256 colors, which is adequate for basic business tasks and spot-color publishing. The Ilci accommodates up to 128MB of memory; the Ilci's ROM is 32-bit clean.

**Weaknesses** The built-in video uses up to 300KB of the Ilci's memory, thereby slightly reducing the amount of RAM available for applications. More significant, this slows the machine when the SIMMs in Bank A are of a larger capacity than those installed in Bank B. The 3½-inch hard drive bay limits internal hard drive selection.

**Strategies** The Quadra 700 logic-board replacement provides improved performance, 24-bit video, Ethernet, and faster NuBus and SCSI operations. If you're just after a speed kick, you have options galore. Simply installing a video-display board and not using built-in video will improve performance, though not as significantly as a cache card or an accelerator will.

Most Ilci models contain Apple's 32K cache card (the card was an extra-cost option for early models). If yours is an older Ilci and you want a modest performance gain, consider a cache card such as DayStar Digital's FastCache. FastCache boards containing 32K or 64K of cache memory are available for the Ilci and retail for only $189 and $239, respectively.

For a bigger boost, consider an accelerator board. DayStar Digital's 68030-based Universal PowerCache boards install in the cache card slot (rather than taking up one of the three NuBus slots) and offer good performance and excellent compatibility.

DayStar's 68040-based Turbo 040 accelerators are faster still and also contain a Processor Direct Slot (PDS) that accepts a cache card. In Macworld Lab tests, the 33MHz DayStar Turbo 040 with the optional 128K cache card performed the best overall in typical mid-range-Mac tasks. But if you're on a budget, it's hard to argue with Applied Engineering's TransWarp CI, a 50MHz 68030 accelerator that retails for just $799 ($958 with a math coprocessor [FPU]—we tested it with the coprocessor).

**Ilsi**

With just one expansion slot, the Ilsi is the least-expandable Mac II. It's also the only midrange Mac II for which Apple offers no logic-board upgrade.

**Strengths** The Mac Ilsi is compact. Its expansion slot is flexible, accepting either one 68030 PDS board or one NuBus board (both require an adapter board for installation). The ROM is 32-bit clean, and the Ilsi includes built-in 8-bit (256-color) video.

**Weaknesses** Large expansion boards can tax the small power supply. The Ilsi has just four SIMM slots, limiting maximum memory capacity to 65MB. Built-in video, like that of the Ilci, can slow overall performance. There's no built-in math chip (one is built into most 68030 PDS or NuBus adapter boards as well as many accelerators).

**Strategies** Fewer accelerators are available for the Ilsi than for other Mac II's,
Best Mac II Upgrade Strategies

Devising the Best Strategy To get the most out of your Mac, increase not only its raw speed but also the capabilities of its main components: RAM, storage, video, and special-purpose processing.

**BEST A 1.44MB SuperDrive (available from several vendors) ensures that you can exchange data with any Macintosh user, and even DOS users.**

**BEST More RAM (a total of 8MB) is needed to take full advantage of System 7 features and to support today's memory-hungry software.**

**BEST The Radius Rocket 33 accelerator (which uses a 33MHz 68030) is the most cost-effective speed booster.**

**MAYBE** Connectix's Mode 32 software (available from bulletin boards) lets you address more than 8MB of system RAM. System 7.1 users can instead use Apple's 32-bit System Enabler Extension.

Thanks largely to the Ilsi's featherweight power supply.

Impulse Technology's Performance/040 board works in Ilsi models equipped with Apple's NuBus adapter board, but think twice before installing one. When equipped with 8MB of memory, the Performance/040 draws 12 watts—just 3w short of the 15w limit for a NuBus board. Combine that with the 4MB of logic-board memory required by the Performance/040, and you're pushing the power supply to the max.

A PDS accelerator (which doesn't require its own memory) is a safer bet. For scientific tasks that use floating-point math, Logica's LogiCache Accelerator and DayStar's 40MHz and 50MHz Universal PowerCaches performed better than a Centris 610, with the Logica board performing better than a Quadra 700.

Another way to accelerate an Ilsi is by replacing the oscillator clock that drives the processor. For about $4 you can buy a replacement oscillator that boosts the Ilsi's speed by around 25 percent. This process is not for the squeamish, however: tampering with the logic board voids Apple's warranty and, if done incorrectly, could fry your logic board. For more details on how to perform this operation, contact BMUG, a user group located in Berkeley, California, and request a reprint of its spring 1993 newsletter article called "Make Your Mac Ilsi Zip." The cost is $1. Send your reprint request with payment to BMUG, Ilsi Upgrade Article, 1442A Walnut Street #62, Berkeley, CA 94709-1496.

The best way to expand a Mac Ilsi is with a NuBus expansion chassis from Second Wave. The Expanse NB8 and Expanse NB4 are desktop boxes that provide eight and four NuBus slots, respectively, as well as a power supply and fan. An adapter board plugs into Apple's NuBus adapter board, which in turn goes into the Ilsi's PDS. There's even room in the chassis case for an internal SCSI hard drive.

If you need fast 24-bit video and an Ethernet port, consider one of E-Machines' ColorLink SX-series NuBus

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Does It Make Sense to Upgrade a Duo Dock?

Apple's Duo Dock/PowerBook Duo promises the best of both worlds: a midrange desktop Mac and a lightweight portable. But can you upgrade the Duo Dock so that its life span justifies its cost? The answer is no—and yes. Here's why.

**High Starting Cost** The standard Duo Dock docking station is $1079. A Duo 230 with 4MB of memory and an 80MB hard drive is another $2609. What you get is a 33MHz, 68030-based Mac with two NuBus expansion slots and a hard drive bay (in the docking station) for a total of $3868. A Centris 650 with 4MB of memory, an 80MB hard drive, a 33MHz 68040 processor, three NuBus slots, and a slot for another hard drive (or other storage device) costs $3189—which shows that the Duo Dock's convenience certainly has its cost.

By the time you add such necessary items as a monitor, an extended keyboard, a mouse, and a modem to this Duo Dock system, you've spent almost $5000.

**Limited Expansion** An accelerator board must be installed on a logic board to work, but the Duo's logic board offers no expansion slots, due to its space constraints. As a result, you can't add an accelerator board.

**It's Not Hopeless** You can add to the docking station video-display boards, Ethernet boards, and other such hardware that extends the Mac's capabilities.

And while the docking station has just two NuBus slots (and hard-to-access ones, at that), Second Wave offers a solution to that problem: the Expanse series of NuBus expansion chassis. The Expanse NB4 ($1295) has four NuBus slots; the Expanse NB8 ($2295) offers eight NuBus slots.

Both models come with power supplies to power the extra slots.

**The Price of Freedom** With the types of upgrade available from Second Wave, you can get a desktop Mac roughly equivalent to a Ilvi—for about twice the cost. The advantage is that you have a flexible system that can follow you anywhere. The disadvantage is that you're essentially stuck at a Ilvi's level of performance, unless Apple later offers a faster PowerBook Duo (which is likely) and an upgrade path from the current generation of Duos (which is not).—GALEN GRUMAN
boards. If you want an accelerator and improved video or networking, your choices are simple: buy an expansion chassis or a more-expandable Mac.

**Ilvx (Performa 600)**

Plenty of upgrade options and a generous array of built-in features give the Ilvx a long life expectancy.

**Strengths** The Ilvx has two NuBus expansion slots and an accelerator board slot (designed specifically for accelerator boards; it's not a PDS or a cache card slot). The Ilvx has 32K of built-in cache memory and a math coprocessor (the Performa 600 has neither; otherwise, the two computers are the same).

There's room inside the case for a removable-media drive such as a CD ROM player or SyQuest drive. You can upgrade the Ilvx to a Centris 650, and the Ilvx can accommodate up to 68MB of RAM (four 16MB SIMMs). ROMs are 32-bit clean.

**Weaknesses** The Mac Ilvx is no speed demon—it's slightly slower than a Iici. Some accelerators are not yet compatible with the Ilvx.

**Strategies** To display thousands of colors (on most monitors) instead of 256, add a VRAM SIMM to bring video memory up to 1MB. If you are interested in multimedia, CD ROM, or Photo CD, consider purchasing Apple's internal, double-speed CD ROM drive, the AppleCD 300i—it adds less than $300 to the system cost.

The Impulse Performance/040 and Radius Rocket accelerators weren't compatible with the Ilvx as of this writing and couldn't be tested. (The Rockets are Ilvx-compatible when used under Radius's RocketShare multiprocessing software [$499]; Radius says RadiusWare 1.5, the standard Rocket driver software, is Ilvx-compatible.) The only Ilvx-compatible accelerators tested were three from DayStar Digital's PowerCache series. The 50MHz PowerCache boosted overall performance by about 25 percent—nothing to get goosebumps over.

If you crave speed, go for Apple's Centris 650 logic-board upgrade ($1199). In addition to a roughly 150 percent improvement in overall performance, you get a faster SCSI port and built-in Ethernet. The Centris 650 can't use any 1MB SIMMs you might have (its minimum SIMM size is 4MB), but this isn't a significant drawback, since the upgrade includes 8MB of RAM.

**Centris 610 and 650**

If you have one of these latest Macintoshes, you probably aren't thinking about upgrades—yet. But both of Apple's newest midrange Macs do provide room to grow.

**Strengths** The Centris 610 and 650 can accept a VRAM upgrade that allows them to display thousands of colors on most monitors. The 610 and 650 provide NuBus expandability, with the Centris 610 supporting one 7-inch NuBus slot (via a $99 adapter) and the Centris 650 providing three full-size NuBus slots.

The 650 also has a PDS slot that accepts PDS boards designed for Quadras. Most models of the 610 and 650 come with built-in Ethernet ports. If you
bought a model that doesn't include an Ethernet port, you can add one via third-party adapter board or SCSI-based box.

**Weaknesses** The Centris 610 has no math coprocessor, and the 610's expansion slot only accepts NuBus boards that are 7 inches long. Because the 610's slot size is a new standard for Apple, few boards on the current market will fit it. In addition, you must buy a $99 adapter to add a NuBus board to the 610.

**Strategies** If you buy a base-model Centris 650 or any Centris 610 and find yourself getting into 3-D graphics, you might consider upgrading the processor from a 64LC040 (a version of the 68040 with no math coprocessor) to a full-fledged 68040, which has a built-in math coprocessor that speeds up 3-D rendering programs. The base model of the 650, with 4MB of RAM and an 80MB hard drive, comes with the 68LC040 chip; other 650 models have the 68040.)

Radius says the Rocket family works in the Centris 650 when used with RocketShare. A Rocket-equipped Centris 650 running RocketShare essentially gives you parallel processing: two 68040-based Macs on your desktop, each capable of performing a task at the same time. You can, for instance, scan a large image using one processor and use the other processor for spreadsheet calculations, word processing, or other tasks.

**Adding It All Up**

**WHETHER YOU BUY A NEW MAC OR UPGRADE an older one, keep in mind that faster, less expensive, more powerful machines will always be on the horizon.**

The Macintosh world is a moving target, and your system is a snapshot—an image of the intersection between your budget and Apple’s product line at the time of your purchase. If you can’t afford to change that image by buying a new machine, it’s comforting to know that you can at least spruce it up with accelerators and other upgrades.

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**Contributing editor JIM HEID’s primary machine—for now—is a Mac II with a 68040 accelerator. His latest books are Inside the Apple Macintosh (Brady, 1992) and Macworld Guide to Word 5 (IDG Books Worldwide, 1992).**

Macworld Lab testing supervised by MATTHEW CLARK.
Building the Ultimate Mac

Want to max out your IIfx or Quadra? Here's how.

by Matthew Leeds

There is an art to getting the maximum performance from your Macintosh, a balancing act that continually changes as technology advances, products improve, and Apple rolls out new Macs. Just a few years ago, the IIfx was introduced as wickedly fast, the Mac everyone lusted after. Now it struggles to keep up with the Quadras, and Quadra owners already hear the siren song of the next-generation Macs based on the PowerPC processor.

Among IIfx and Quadra owners, who should consider upgrading the performance of the once-ultimate Mac? People waiting for minutes at a time while the screen redraws on a desktop publishing project, going out to lunch when color-separating a file, or taking the weekend off while rendering a 3-D image.

It often takes more than general acceleration to upgrade a high-end Mac. The people who use these machines have special needs and the data manipulation they do may require tailored remedies. For example, you may find that you need to speed up specific applications, not just the system as a whole, or that you have unusual data-storage requirements.

Some upgrade strategies apply to all high-end Macs; other strategies, to specific models. This article first covers general strategies, then specific strategies for each Macintosh model. Products mentioned in this article are listed with contact information in “Buyers' Guide to Upgrades,” in this issue.

All High-End Macs

Although high-end users tend to work on specialized applications, there are some general guidelines for all of them to follow.

Memory Anyone doing serious desktop publishing should consider 20MB the minimum, while Photoshop users working with large files need at least three times as much RAM as the largest file they work with. Having this much RAM ensures that the Mac can load the entire document and its supporting files into memory, so calculations don't bog down waiting for data to be transferred from the hard drive. At all times avoid using Apple's virtual memory—it's snail-slow.

Math Coprocessing Because a math coprocessor (also called an FPU, for floating-point unit) resides on the logic board of the Mac IIx and is built into the processor of the Quadras, there is nothing to upgrade.

Hard Drives A hard drive's performance contributes significantly to the Mac's overall performance. On low-end and midrange Macs, the hard drive is less important because other system components are slower. But an adequate drive for, say, an IIci, can become a bottleneck between applications and the processor when used on, say, a Quadra 950.

When shopping for a fast hard drive, don't rely solely on average access times or raw theoretical transfer rates—they don't accurately predict real-world results. Pay less attention to small differences in access time (like 2 milliseconds) and instead look for read-ahead buffers and write-ahead buffers, which can make a significant difference in actual performance. Only a few companies manufacture the mechanisms used in high-speed,
high-capacity hard drives, so you can focus more on the vendor's price and the mechanism's performance than on the label on the case.

The latest hard drives offer gigabyte or better capacity, high data-transfer rates, and first-rate reliability. Macworld Lab tested several hard drives with capacities greater than 1GB and found that—with the exception of those using Seagate's ST11200N mechanism—all performed very well in terms of speed. The ST11200N mechanism was much slower—about 10 to 15 percent—in reading data than other mechanisms. (Macworld will cover high-speed storage in more depth in the August issue.)

We also found (based on tests of four systems) that, unless they use two SCSI ports simultaneously, drive arrays (also called Level 0 RAID, or redundant array of independent drives, systems) offer little or no performance advantage over regular high-capacity drives, despite a theoretical advantage. They also offer another disadvantage: increased chance of data loss. Data is written partly on one drive and partly on another, so if one drive has a problem, you might lose all the data stored on both drives.

SCSI Acceleration A related performance bottleneck is the SCSI port built into every Mac since the Plus. No Mac SCSI port can transfer data faster than about 3.5 megabytes per second (MBps). That's why many vendors support the new SCSI-2 standard, which adds new software and two new data bus types: SCSI-2 Fast and SCSI-2 Wide. SCSI-2 Fast offers a maximum transfer rate of 10 MBps; SCSI-2 Wide offers a maximum of 40 MBps.

SCSI-2 boards can provide better data-transfer rates than the native Mac SCSI port, particularly when coupled with drives that support SCSI-2 Fast and/or Wide. Note that some drives are labeled as SCSI-2 compatible or compliant; this just means that they support the SCSI-2 command set, and it is not a reliable means of determining if they support SCSI-2 Fast or Wide.

If you buy a SCSI-2 board that plugs into a NuBus port, you're limited to a 10 MBps maximum transfer rate because that's the NuBus speed limit. The Quadras have a new version of NuBus, called NuBus 90, that can handle 20 MBps, but there are no SCSI-2 boards designed for NuBus 90, so even on a Quadra you are limited to 10 MBps. You can avoid this limit by using a SCSI-2 board that plugs into the Processor Direct Slot (PDS).

Port Expansion One form of expansion worth considering for all high-end Macs is Applied Engineering's $366 QuadraLink DMA, which adds four serial ports to any Mac. This high-speed serial board is useful with ultrafast modems or for controlling multiple serial devices such as several video tape decks. (A $439 version includes the ShadowLAN software that lets users share the ports across a LocalTalk or Ethernet network.)

Video Display Publishers, product designers, and CAD users will want large screens—and probably photo-realistic 24-bit color—so accelerated, large-screen video is a must (see "24-Bit Color Graphics," Macworld, February). SuperMac Technology's $2999 Thunder/24 is the fastest such board, and SuperMac's $1849 Spectrum/24 PDQ Plus is a close second at a much lower price. Both beat even the speed of the Quadra 950's internal 24-bit video. Other users should consider adding VRAM.

IIfx

ALTHOUGH DISCONTINUED A YEAR AGO, the IIfx lives on today through Apple's...
logic-board replacement that turns a Mac II or IIx into a IIfx. Its performance is comparable to that of the new midrange Centris Macs and, for some tasks, to the Quadra 700.

**Strengths** With six NuBus slots, the IIfx is one of the most expandable Macs ever made, and its 128MB maximum memory will meet most high-end users' needs. Its 40MHz 68030 processor and accompanying 68882 math coprocessor are fast enough for many computation-intensive tasks.

**Weaknesses** The IIfx does not use a 68040, which is clearly the de facto high-end Mac processor. (Among the 68040's advantages is a built-in math coprocessor that works faster than the 68030/68882 combination in the IIfx—an important consideration for rendering and CAD users.) Since it's a discontinued product, long-term support and compatibility remain in doubt. For example, the IIfx uses a special type of RAM (a 64-pin SIMM also used in the Apple LaserWriter IINTX) that no other Mac (or other popular computer) uses, and this RAM is likely to be harder to get as fewer IIfx's remain in use and the incentive for companies to provide it decreases.

**Strategies** If you have already invested a lot in your IIfx, such as adding a lot of RAM and accelerated video, it's probably worthwhile to stick with the system you already have. But keep in mind that a fully loaded Centris 650 (about $5100) or Quadra 800 (about $8100) offers a platform that will let you improve your processing power over the long term. By selling your IIfx and buying a new Mac (and keeping the IIfx's NuBus boards for that new Mac), you may spend only a little more than you would to upgrade, but you would be getting a better, long-term configuration.

**Acceleration** Adding a 33MHz 68040 accelerator to a IIfx can boost its performance to that of a Quadra 950, but not all 68040-based accelerators offer the same speedup. Macworld Lab testing revealed that Impulse Technology's $2399 33MHz Performance/040 provides only nominal improvement (about 1.4 times as fast as the stock IIfx), compared with 1.8 times as fast for Fusion Data Systems' $2395 TokaMac IIfx33.

At press time, Radius's Rocket 33 did not support the IIfx because of software incompatibilities, but Radius expects an IIfx-compatible version to be available by the time you read this. The Rocket 33's list price, including the necessary software, is $2499, plus you must also buy separate RAM for the Rocket, since it does not use the IIfx's RAM. As you can see, the cost of a Rocket can really add up fast. The Rocket does let you add piggyback boards to accelerate SCSI performance and Photoshop filters.

Several vendors have promised to release a new crop of 40MHz 040 accelerators by the time you read this; if ultimate speed is your goal, you should go for one of these.

A much less expensive acceleration method is Newer Technology's VSO-IIfx, which directly speeds up—it does not bypass or replace—the Mac IIfx's own processor. This $435 option boosts speed by about 30 percent. This option requires the user to experiment with overdrive settings, because a setting that is too fast can result in system crashes. To use the maximum setting might require replacing the RAM in your IIfx with faster RAM.

**Fast Storage** The fastest storage system in our tests by far was Newer's SCSI II Dart, which combines a IIfx PDS SCSI board and a RAM drive (a box containing special RAM chips that works like a hard drive but much faster). In real-world tests, it ran twice as fast as the fastest hard-drive system on the IIfx. But it's very expensive: the 128MB version we tested costs $9816; at its maximum storage of 512MB,
it costs $34,072. You also need a SCSI-2 board to get the best performance from the SCSI II Dart.

For hard drives, the best bet is PLI's $502 QuickSCSI board and any vendor's SCSI-2 Fast drive. Not only is PLI's board the fastest among those we tested, but it is also the most affordable. We also saw some benefit to using a drive array with the QuickSCSI board, but you might be better off spending your money on a faster single-drive system than on an expensive array.

**Case Expansion** One pricey option is to have your IIx logic board installed in a tower case. Sixty Eight Thousand offers a Dash 30fx upgrade to a IIx that includes a tower case that holds up to ten half-height drives, a 400-watt power supply, and a SCSI-2 board. The Dash 30fx also accelerates the 40MHz IIx's logic board to 50MHz. You'll need special fast RAM to run at 50MHz, and this upgrade costs $3000, far too expensive for what you get.

**Quadra 700**

**When First Released 18 Months Ago,** the Quadra 700 offered users high performance but minimal expansion for a fairly high price. Today, the Centris 650 offers a better package in terms of both price and design, but Quadra 700 owners can still do some things to enhance the Mac's capabilities.

**Strengths** The Quadra 700 has a fairly fast processor (25MHz 68040) and supports up to 2MB of VRAM, providing users with 24-bit display on monitors as large as 16 inches without a video-display board.

**Weaknesses** The Quadra 700 has limited expansion, with no accessible drive bays and room inside for just one floppy drive and a single third-height 3/4-inch hard drive. The 700 has just two NuBus slots, and if you use the PDS slot (cache cards plug into the PDS slot as do some SCSI-2 boards), the PDS board will cover one of those slots, making it unavailable.

**Strategies** The Quadra 700 is a dead-end Mac, with little room for expansion. The fact that Apple decided not to create an upgrade kit to convert it to a new Quadra 800 shows this limited appeal clearly. If you seek a powerful Mac for the long term, sell your Quadra 700 and replace it with a Centris 650 (which is just as powerful but much more expandable) or consider a Quadra 800 (which seems designed for a long future). If you decide these options cost too much, consider the following upgrades to make the most of your Quadra 700.

**Acceleration and Caching** You will not find an accelerator board per se for a Quadra. Instead, you have two options: an overdrive processor or a cache card. An overdrive processor runs the Mac's processor faster than its rated speed by accelerating the clock that controls the processor. A static-RAM cache card provides the processor a high-speed scratch pad to store commonly used data and instructions. Macworld Lab tests show that the cache-card option is the better bet. For example, DayStar's $299 FastCache Quadra 128K cache card caused the Quadra 700 to perform about 1.17 times as fast, making it almost as fast as a Quadra 950. (DayStar also sells a $449 FastCache that works on all Quadras; the $299 version works just on the Quadra 700 and 900.)

By comparison, the $435 VSO-700 accelerator from Newer Technology boosts the Quadra 700 to about 1.14 times the speed. An overdrive processor also requires the user to experiment for the best speed through a control panel (if set too fast, the processor can cause the Mac to crash). If you want to install both the FastCache Quadra and the VSO-700 (which offer only a little extra performance when used together), you'll need to use the $449 version of the FastCache Quadra.

**Fast Storage** Your best bet on the Quadra 700 is the PLI QuickSCSI board ($502), in conjunction with a fast, SCSI-2 hard drive.

**Slot Expansion** While you can get around the Quadra 700's limited drive-bay capacity by adding external SCSI devices, you'll need a third-party product to get around the limit of two NuBus slots. Second Wave's two Expanse chassis do just that. One offers four additional slots ($1295); another offers eight ($2295). If you're considering the four-slot version, consider instead replacing the Quadra 700 with a Quadra 800, which offers three slots, runs faster than a Quadra 950, and will probably be supported longer than the 700.

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**Putting Together the Ultimate Mac**

How do you build the ultimate Mac for color publishers, multimedia developers, or product developers? Here's what we recommend (prices are list prices).

1. **Basic System** Start with a Quadra 950 ($5609). Add 16 of Newer Technology's 16MB SIMMs to bring the total memory up to 256MB ($10,800).
2. **Video Display** Add 1MB of VRAM ($318) to bring the total VRAM to 2MB, which lets the Quadra's built-in video generate 24-bit display. Attach a 14-inch Apple monitor ($589) or an NEC 3FGx monitor ($749) to the internal video. Add a SuperMac Thunder/24 and SuperMatch Two-Page Color display ($5998 together). This setup lets you view image and layout files at full size while keeping tool palettes and other elements on the smaller monitor.
3. **Application Acceleration** Add a SuperMac ThunderStorm board ($999) to speed up Photoshop and other image-editing applications.
4. **Storage** Install a DayStar FastCache Quadra cache card ($449) and a MicroNet Raven/040e drive array ($4590). Install a MicroNet Q9i-D8000 tape drive ($2495) for backup. Add Pioneer's DRM 604-CD ROM drive ($1795), ShirtPocket Software's SpeedyCD for caching ($70), and pinnacle Micro's Recordable CD RGD-202 write-once CD ROM drive ($3995).

Total cost: $37,707 (system pictured below).
**Quadra 900 and 950**

The biggest Macs in terms of size have few upgrade options, which is not surprising if you consider the processing power and expansion capabilities that are built into them. Most options make the Quadra 900 into a Quadra 950.

**Strengths** Both Quadras offer sufficient expansion for high-end users who need lots of storage and NuBus boards.

**Weaknesses** The design of the internal bays limits a user's possible configurations by having only two drive bays accessible for removable media; the other two bays can be used only for hard drives.

**Strategies** If you have a Quadra 900, use a cache card to bump its speed up to that of a Quadra 950. A Quadra 950 owner need worry only about optimizing the Quadra's performance.

**Logic-Board Replacement** Apple's $1899 upgrade that makes a Quadra 900 into a Quadra 950 is overpriced. Bypass it in favor of system acceleration.

**Acceleration and Caching** Just as with a Quadra 700, the two acceleration options are an overdrive processor and a static-RAM cache card. And here, too, the cache card makes the most sense. For the Quadra 900, DayStar's $299 FastCache Quadra is cheaper than Newer Technology's $435 VSO-900, and the FastCache delivers better speedup (1.18 times as fast with the cache card versus 1.14 times as fast with the overdrive processor). For the 950, the only option is a cache card. Day-Star's $449 FastCache Quadra boosts the 950's speed by 1.2 times according to Macworld Lab tests. (The Quadra 950's fast system bus requires the more expensive version of the FastCache Quadra than does the Quadra 900's slower bus.)

**Network Server** For people seeking a fast network server, Apple has announced the Apple Workgroup Servers, which are based on the Centris 610, Quadra 800, and Quadra 950. You can upgrade a Quadra 900 or 950 to the Apple Workgroup Server 95 by adding a PDS board ($2499) that turns the Quadra into an accelerated 950 and includes two direct memory access (DMA) SCSI channels, which let you connect as many as 20 SCSI devices to the server. Among the five other upgrade options announced is a $4399 kit that includes a PDS board and a 4mm tape drive, which adds from about 4GB to 6GB of storage. Sold separately is AppleShare Pro, a fast network operating system based on A/UX 3.01 (a new version of Apple's Unix operating system), included in the Apple Workgroup Server 95. Apple's upgrades are set for release this spring (see "Apple Finally Steps into Server Market, Introduces Speedier AppleShare," Macworld News, May 1993).

**Fast Storage** In tests of storage systems based on drive arrays, the MicroNet Raven/040c screamed through both the real-world and raw tests. It uses both built-in SCSI ports in the Quadra 900 or 950, and the results show the advantage (and cost savings) of that approach. The PLI MiniArray 040 uses a similar technique, and also had standout results. Of the storage systems tested that used a SCSI-2 board, the Storage Dimensions Data Cannon PDS board with a MachStor Array had the best real-world performance; when used with PLI's QuickSCSI board the MiniArray performed equally well. Overall, the $4590 Raven/040c drive array had the best price-to-performance ratio.

**Slot Expansion** With five NuBus slots, expansion is unlikely to be an issue for even the most high-end users. But if it is, Second Wave offers the $1295 four-slot NuBus expansion chassis and the $2295 eight-slot version.

**Case Expansion** For Quadra 950 users seeking a tower design with the kind of storage capacity found in traditional Unix and DOS tower workstations, Sixty Eight Thousand offers the $2500 Dash 40Q, which replaces the Quadra 900 or 950's case with one that supports up to ten half-height drives (six of which are accessible for use with removable media), and up to 512MB of RAM (using proprietary 32MB SIMMs that cost $1990 each). Both a SCSI-2 Fast controller and a SCSI-2 Fast and Wide controller are available as options. A 400w power supply replaces the Quadra 950's 300w supply. Sixty Eight Thousand also sells the Dash 40Q with a Quadra 950 logic board already installed; prices start at $8800. The company has announced an accelerator option for the 40Q (expected this spring).

**Quadra 800**

The newest Quadra is the best designed, but its newness means there are almost no upgrade options for it. Still, it appears to be designed for the long term.

**Strengths** The Quadra 800 runs faster than a Quadra 950; supports up to 136MB of RAM; and includes three NuBus slots, three drive bays that can hold removable media, and another bay that holds up to two hard drives.

**Weaknesses** The only significant

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**SYSTEM PERFORMANCE**

(times as fast as a Classic)

Use the rankings under the heading Common to compare your Mac system against all Mac systems (both standard and accelerated) throughout this issue's upgrades articles, to help decide between replacing or accelerating your Mac. Use the rankings under Scientific only if you do rendering or scientific work.

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**Common**

We timed typical business tasks in Microsoft Excel and Word that use the Mac's processor, drives, and video display.

**Scientific**

We added to the common tasks several scientific calculations that use floating-point math.

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**Products are ordered by type of Mac (bold names) from fastest to slowest. Within each type, products are ordered from fastest to slowest.**

**= Fastest result in class for each test.**

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**Mac Quadra 800**

<table>
<thead>
<tr>
<th>Speed</th>
<th>Rank</th>
<th>Acceleration</th>
<th>Speedup</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>standard Quadra 800 (33MHz 040)</td>
<td>13.4</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
</tr>
<tr>
<td>Mac Quadra 950</td>
<td>14.6</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>with DayStar FastCache Quadra (128K cache)</td>
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<td>-</td>
<td>1.00</td>
<td>-</td>
</tr>
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<td>11.5</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
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<td>Mac Quadra 700, 900</td>
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<tr>
<td>with DayStar FastCache Quadra (128K cache)</td>
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<td>-</td>
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<td>Mac IIfx</td>
<td>8.1</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
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<tr>
<td>with Fusion TokaiMacIFX33 (33MHz 040)</td>
<td>6.6</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
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<tr>
<td>with Impulse Performance/040 (33MHz 040)</td>
<td>6.6</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
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<tr>
<td>with Newer VSO-IFX (55MHz overdrive)</td>
<td>6.6</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
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<tr>
<td>with Impulse Performance/040 (25MHz 040)</td>
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<td>-</td>
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<td>standard IIfx (40MHz 030)</td>
<td>6.6</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
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</table>

* The Quadra 700 was tested with 70ns RAM, and the IIfx with 60ns RAM; the actual overdrive speed will vary based on RAM speed

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**Longer bars are better.**

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**Mac Quadra 800**

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<thead>
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<th>Rank</th>
<th>Acceleration</th>
<th>Speedup</th>
<th>Price</th>
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<td>Mac Quadra 700, 900</td>
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<tr>
<td>standard Quadra 700, 900 (25MHz 040)</td>
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<tr>
<td>Mac IIfx</td>
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<td>1.00</td>
<td>-</td>
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<tr>
<td>with Fusion TokaiMacIFX33 (33MHz 040)</td>
<td>13.7</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>with Impulse Performance/040 (33MHz 040)</td>
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<td>-</td>
<td>1.00</td>
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<tr>
<td>with Newer VSO-IFX (55MHz overdrive)</td>
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<td>-</td>
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<td>-</td>
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<tr>
<td>with Impulse Performance/040 (25MHz 040)</td>
<td>15.9</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
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<tr>
<td>standard IIfx (40MHz 030)</td>
<td>13.7</td>
<td>-</td>
<td>1.00</td>
<td>-</td>
</tr>
</tbody>
</table>

* The Quadra 700 was tested with 70ns RAM, and the IIfx with 60ns RAM; the actual overdrive speed will vary based on RAM speed.
With the mail-order price of a 2GB hard drive hovering around $2300, large amounts of storage—tons of gigabytes—remain very expensive. But there are other options.

**Optical-Drive Jukebox**  This device uses optical drives and a robotic disc changer to shuttle read-write optical discs in and out of the drives. Data-transfer rates are similar to those of standard hard drives, and disc changes occur in less than 10 seconds. Most of the larger-capacity systems we looked at use their own software, but are based on a drive mechanism manufactured by Hewlett-Packard. Systems with 10GB to 90GB of storage are available with prices starting at around $10,000.

**CD ROM Jukebox**  If you need to keep multiple CDs accessible, the $1795 Pioneer DRM 804-X jukebox uses a single drive with a six-disc changer, and offers a rotational speed four times that of standard drives.

**Write-Once CD ROM**  If you have data that remains the same but you still need to access it on a regular basis, consider purchasing a write-once CD ROM system. Several vendors produce easy-to-use systems, with prices starting around $4000. These vendors include JVC, Kodak, Meridian Data, Optical Media International, and Pinnacle Micro. Add either a CD jukebox system or a fast CD ROM drive.

**Double-Speed CD ROM Drive**  The latest generation of CD ROM drives offer greatly improved performance. Toshiba's XM-3401B drive spins a CD twice as fast as a standard drive. This, coupled with a lighter, faster split-optics head, produced phenomenal test results on preproduction units. Compared with the older XM-3301 series drive, the sustained read speeds went from 144K per second to 315K per second, and the average access time went from 356ms to 219ms. Expect several vendors to offer double-speed CD ROM drives based on mechanisms from Toshiba and other manufacturers this summer, with prices of around $700.

**Caching Software**  To gain even better results in retrieving data from a CD ROM drive, use a CD ROM caching program like ShirtPocket Software’s $70 SpeedyCD or PWB’s $79 CD ROM Toolkit. These programs cache the directory structure of the CD on your hard drive, greatly decreasing the access times for data.

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**EDITORS’ CHOICE**

*QuickSCSI*  Although this SCSI board does not support SCSI-2, it still turned in the best results overall at the lowest cost for the SCSI accelerator. Company: PLI. List price: $502.

*FastCache Quadra*  This 128K static-RAM cache card boosts a Quadra’s performance to about 1.2 times for a low cost. Company: DayStar Digital. List price: $299 for Quadra 700 and 900, $449 for Quadra 800 and Quadra 950.

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**Building a Better High-End Mac**

ULTIMATELY, UPGRADING YOUR HIGH-End Mac means tailoring it to your needs. Speed is just one factor in creating an optimal system. By balancing all the system components, you will get a turbocharged Mac for the long term. Think of it as holistic computing for the power-hungry.

Matthew Leedes is the technical-services manager for a major software developer.

Macworld Lab testing supervised by Mark Hurlow.

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**HIGH-END-MAC ACCELERATOR PERFORMANCE**

*(in seconds)*

<table>
<thead>
<tr>
<th>Processor</th>
<th>Drive-Access</th>
<th>Video-Display</th>
<th>Floating-Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adobe Photoshop, Aldus FreeHand, Claris FileMaker, Microsoft Excel, Microsoft Word, and QuarkXPress</td>
<td>Adobe Photoshop, Microsoft Excel, and Microsoft Word; disk-based sorts in Claris FileMaker; and file saves and color separations in QuarkXPress</td>
<td>Microsoft Excel and Microsoft Word.</td>
<td>Microsoft Excel, and rendering in Specular Infini-D.</td>
</tr>
</tbody>
</table>

*Also sold by Applied Engineering as the TransWarp 040 and by TechWorks as the 68040 NuBus Accelerator.*

weaknesses of the Quadra 800 are that it requires a video-display board to support 24-bit color and that it supports only one 5½-inch drive in its bays, which won’t affect most users. (You can always use external drives of that size once you’ve filled that internal bay.)

**Strategies**  This is the Quadra to upgrade to by selling your old Quadra. Until the next generation of Macs arrives and provides companies opportunities—and technologies—to upgrade the Quadra 800, your upgrade strategy will be mainly to optimize performance.

**Caching**  A static-RAM cache card, such as DayStar’s $449 FastCache Quadra, should make the 800 run at about 1.2 times its regular speed.

**Fast Storage**  The Quadra 800 is similar to the 700 in that it has a single SCSI port, so you can’t use a dual-port drive array as in the 900 series. Your best bet is to start with a fast hard drive and add a SCSI board if you need more speed. The $502 PLI QuickSCSI board is your most cost-effective choice.

**Slot Expansion**  If you need more than five NuBus slots, consider Second Wave’s Expanse chassis. The $1295 Expanse NB4 adds 4 slots, while the $2295 NB8 adds 8 (16 is the maximum number of slots supported by NuBus). However, most people will find the Quadra 800 to be fine just the way it is.

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Matthew Leedes is the technical-services manager for a major software developer.

Macworld Lab testing supervised by Mark Hurlow.
**Buyers' Guide to Upgrades**

by Suzanne Courteau

<table>
<thead>
<tr>
<th>Company</th>
<th>List Price</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Engineering</td>
<td></td>
<td></td>
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<tr>
<td>TransWarp</td>
<td>$349-$958</td>
<td>16MHz, 25MHz, 33MHz, 40MHz, 50MHz 68030</td>
<td>Supports: SE, Classic, Iici. Warranty: 1 year. Notes: FPU available; 16MB maximum on-board RAM (TransWarp Cl uses system RAM).</td>
</tr>
<tr>
<td>Extreme Systems</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dove Computer Corporation</td>
<td>$499-$599</td>
<td>16MHz, 33MHz 68030</td>
<td>Supports: Plus, SE, Classic, II, Warranty: 1 year. Notes: FPU available; dealer installation recommended; no 30-day moneyback guarantee.</td>
</tr>
<tr>
<td>MacProducts USA</td>
<td>$149-$199</td>
<td>20MHz 68030</td>
<td>Supports: LC. Warranty: 1 year. Notes: FPU available.</td>
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<tr>
<td>MicroMac Technology</td>
<td>$290-$523</td>
<td>16MHz, 25MHz, 32MHz 68030</td>
<td>Supports: Plus, SE. Warranty: 1 year. Notes: FPU available; 16MB maximum on-board RAM; requires $40 adapter.</td>
</tr>
<tr>
<td>Mobile Technologies</td>
<td>$399-$599</td>
<td>16MHz, 25MHz, 33MHz 68030</td>
<td>Supports: SE, Classic, II. Warranty: 3 years. Notes: FPU available; maximum 16MB on-board RAM; Classic requires $50 adapter.</td>
</tr>
</tbody>
</table>

**Accelerators**

Unless otherwise noted, all the accelerator boards listed below support virtual memory (VM) through either System 7 or Connectix's Compact Virtual 3.0 and come with a 30-day money-back guarantee. Math coprocessors are indicated as FPU.

<table>
<thead>
<tr>
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<tr>
<td>Brainstorm Products</td>
<td>$249-$289</td>
<td>16MHz 68000</td>
<td>Supports: Plus, SE. Warranty: 1 year. Notes: No VM support; accelerates both the processor and the system bus to 16MHz; dealer installation recommended.</td>
</tr>
<tr>
<td>DayStar Digital</td>
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<tr>
<td>Fusion Data Systems</td>
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<tr>
<td>Impact 030</td>
<td>$479</td>
<td>32MHz 68030</td>
<td>Supports: LC, LC II. Warranty: 3 years. Notes: FPU available.</td>
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<td>Vandal</td>
<td>$699-$999</td>
<td>33MHz, 40MHz, 50MHz 68030</td>
<td>Supports: SE. Warranty: 3 years. Notes: FPU included; 16MB maximum on-board RAM; free installation on request.</td>
</tr>
<tr>
<td></td>
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<td>Dove Computer Corporation</td>
<td>$499-$599</td>
<td>16MHz, 33MHz 68030</td>
<td>Supports: Plus, SE, Classic, II, Warranty: 1 year. Notes: FPU available; dealer installation recommended; no 30-day moneyback guarantee.</td>
</tr>
<tr>
<td>MacProducts USA</td>
<td>$149-$199</td>
<td>20MHz 68030</td>
<td>Supports: LC. Warranty: 1 year. Notes: FPU available.</td>
</tr>
<tr>
<td>MicroMac Technology</td>
<td>$290-$523</td>
<td>16MHz, 25MHz, 32MHz 68030</td>
<td>Supports: Plus, SE. Warranty: 1 year. Notes: FPU available; 16MB maximum on-board RAM; requires $40 adapter.</td>
</tr>
<tr>
<td>Mobile Technologies</td>
<td>$399-$599</td>
<td>16MHz, 25MHz, 33MHz 68030</td>
<td>Supports: SE, Classic, II. Warranty: 3 years. Notes: FPU available; maximum 16MB on-board RAM; Classic requires $50 adapter.</td>
</tr>
</tbody>
</table>
Newer Technology
316/685-4904, 800/678-3726
Variable Speed Overdrive (VSO).
Warranty: 2 years. Notes: Uses Mac's own processor and FPU; 50MHz minimum guaranteed speed on Quadra 700 and 900, 33MHz on Iifx.

NewLife Computer Corporation
613/592-5080, 800/663-6395

Novy Systems
904/427-2388, 800/638-4784
ImagePro. List price: $549-$1248. Description: 25MHz, 33MHz, 40MHz, 50MHz 68030. Supports: Plus, SE, Classic. Warranty: 2 years. Notes: FPU included; 16MB max. on-board RAM.

Cache Cards
Apple Computer
408/996-1010

Applied Engineering
214/241-6060, 800/554-6227

DayStar Digital
404/967-2077, 800/962-2077

DayStar Digital
404/967-2077, 800/962-2077

Logic-Board Ugrades
These upgrades require installation by an authorized Apple service provider and come with a 1-year warranty.

Apple Computer
408/996-1010
Macintosh IIfx Logic Board Upgrade. List price: $1799. Description: Converts Ii or Iix to IIfx. Notes: Requires 4MB of DRAM (not included).

Newer Technology
316/685-4904, 800/678-3726

Logic/Board Upgrades
These upgrades require installation by an authorized Apple service provider and come with a 1-year warranty.

Power Supplies
Standard power supply is 25.6 watts in the LC and LC II; 190w in the IIx, and Iifx; 90w in the Iicx and IIX; and 95w in the Quadra 700.

Logika Research
512/836-2168, 800/880-0988
Logica FPU. List price: $599. Description: 16MHz 68882. Supports: LC, LC II.

MacProducts USA
512/499-0888, 800/623-3475
Magic 68882 Math Coprocessor. List price: $599. Description: 16MHz 68882. Supports: Classic II.

Newer Technology
316/685-4904, 800/678-3726
Voyager 030. List price: $1899. Description: Converts Mac to LC II.

Cache Cards
Apple Computer
408/996-1010

Math Coprocessor (FPU) Boards
Apple Computer
408/996-1010

Applied Engineering
214/241-6060, 800/554-6227

Power Supplies
Standard power supply is 25.6 watts in the LC and LC II; 190w in the IIx, and Iifx; 90w in the Iicx and IIX; and 95w in the Quadra 700.

Logika Research
512/836-2168, 800/880-0988
Logica FPU. List price: $599. Description: 16MHz 68882. Supports: LC, LC II.

MacProducts USA
512/499-0888, 800/623-3475
Magic 68882 Math Coprocessor. List price: $599. Description: 16MHz 68882. Supports: Classic II.

Newer Technology
316/685-4904, 800/678-3726

SCSI Accelerators
Unless otherwise noted, all the SCSI accelerators listed below are NuBus boards and support the Macintosh II series, the Centris 650, and the Quadra series; offer improved array performance through simultaneous use of both SCSI ports; support DMA; and have no RAM cache. The maximum sustained throughput is listed in megabytes per second (MBps).

ATTO Technology
716/688-4259
BUYERS’ GUIDE TO UPGRADES

Conley Corporation
212/797-8824

Dynatek
416/636-3000

FWB
415/474-8055

Lovel Computer Corporation
612/989-6880

MacProducts USA
512/499-0888, 800/622-3475

Mass Microsystems
408/522-1200, 800/522-7979

MicroNet Technology
714/837-6033

PLI
510/667-2211, 800/288-8754
QuickSCSI. List price: $502. MBps: 5.0. Warranty: 5 years. Notes: No DMA support.

Promcom Technology
714/852-1000, 800/800-8600

Storage Dimensions
408/954-0710

Slot Expansion

DGR Technologies
512/476-9855, 800/235-9748
Max. List price: $349. Supports: LC, LC II. Warranty: 1 year. Description: Expanded case; 40W power supply; internal bay for second hard drive; 3 PDS slots.

Second Wave
512/343-9661
Expand. List price: $899 - $2995. Supports: SE/30, IIx, IIGS, IIfx, IIfs, IIGS. Warranty: 1 year. Description: 4 or 8 NuBus or PDS slots.

Sonnet Technologies
714/261-2800, 800/945-3668

Video-Display Enhancement

Unless otherwise noted, display boards listed support 24-bit color and offer QuickDraw acceleration, hardware zoom, extended desktop, and on-the-fly resolution-switching.

E-Machines
408/245-2202, 800/227-2795

Lapis Technology
510/748-1600, 800/435-2747

Radius
408/434-1010, 800/227-2795

SuperRanger
408/562-4200, 800/729-2656

Nearby Technologies
415/474-9661

PaintBoard

SuperMac Technology
408/245-2202, 800/334-3009

Thunder.

Other Upgrades

Apple Computer
408/996-1010

Macintosh FDD Upgrade Kit.

Macintosh IIsi 030 Direct Slot Adapter Card.
List price: $199. Supports: IIsi. Description: Allows installation of one PDS or NuBus board.

Applied Engineering
214/241-6630, 800/554-6227

Quadrailink.

Axion
408/522-1900, 800/829-4661
Axison Switch. List price: $159. Supports: All Macs. Description: Serial port expander uses one serial port to provide three software allows switching between ports.

Connectix Corporation
415/571-5100, 800/950-9880

ModeZ2.

Optima/128. List price: $175. Supports: Any Mac with PAMU. Description: Implements 32-bit addressing under System 6.0, allowing Mac to access up to 128MB of RAM.

Newer Technology
316/685-4904, 800/678-3726

PLI
510/667-2211, 800/288-8754


Sixty Eight Thousand
408/438-1777
Dash Workstation. List price: $2500 - $3000. Supports: IIfx, Quadra 900, Quadra 950. Description: Combines a drive-bay tower with the Mac's logic board in one case; IIfx upgrade also increases acceleration to 50MHz.
OT EVERYBODY IS NATURALLY ORGANIZED, especially when it comes to tracking personal finances. Take me, for example. For years I wrote details of my check transactions on scraps of paper that I stuck in my wallet before entering them in my checkbook. My tax-preparation file consisted of a shoebox into which I deposited receipts, check stubs, and invoices. At tax time, I would dump the contents of the shoebox onto the kitchen table and begin the yearly, harrowing ritual of figuring out where all the money went. For someone who likes puzzles, it would be a lot of fun—the problem is I hate puzzles.

After purchasing personal-finance software last year, my accounting practices changed radically. Now I write checks, chart expenses, and set up for the tax man, all in the time it once took to scribble on those scraps of paper and record the transactions in my check register. I also have transferred my investment-portfolio information to the Mac, which makes it easier to access and organize information about stocks and mutual funds. From day to day, I know how much I’ve made (or lost) and what I’m worth. Even before 1992 was history, I knew how much I owed Uncle Sam.

Almost all personal-finance software will help organize your books. The key is to find a product sophisticated enough to meet your needs, but intuitive and simple enough to make personal accounting easy and fun. I looked at Aatrix Software’s CheckWriter 4.0 and Aatrix Hi Finance 4.0, Andrew Tobias’ Managing Your Money (MYM) 5.0 from MECA Software, DacEasy’s DacEasy Light 2.0, Business Sense’s Dollars and Sense 5.0, Survivor Software’s MacMoney 3.53, and Intuit’s Quicken 3.0. All these programs create checking and savings accounts, write checks, reconcile statements, and figure your net worth. The eighth program I evaluated, Reality Technologies’ WealthBuilder 2.01 by Money Magazine, tracks your financial portfolio and offers investment strategies but does not have check-writing features.
Tracking Your Pot of Gold
WHAT ALL THE CHECK-WRITING PROGRAMS HAVE in common is that they enable you to follow the money trail. At any point during the year, you can see where your money comes from and where it goes. Every dollar has a source and a destination. For example, if you write a $75 check for your telephone bill, you subtract that amount from your checking account and assign a $75 expense to a category you might call "telephone expenses." By doing this simple form of accounting, you can track your money to create a budget, follow your income, or calculate your expenses. It also makes tax preparation a breeze.

Check Writing
CHECK WRITING IS THE MOST BASIC TASK OF ANY personal-finance package. The programs differ in ease of setup and operation and the ability to track your income and expenses.

Quicken is the best-selling personal-finance program, probably because simple tasks are easy to master. A beginner can learn how to write checks, make deposits, and reconcile bank statements in a matter of minutes. I like Quicken's graphic presentation. The Quicken check template looks just like a check, and the Quicken check register looks just like those registers where you once dutifully recorded your checks (see "Familiar Look"). With any of the check-writing programs, you no longer need a handwritten check register. One cautionary note, however: If you write checks away from your computer, make sure you transfer the information to your personal-finance program as soon as possible. (Carry a piece of paper in my wallet to jot down the check numbers and amounts for all checks I write away from home.)

If you are concerned about other people accessing your checking accounts or other financial records, you should note that all the programs except MacMoney offer password protection at the program level. Some also let you add a password at the transaction level, to restrict who can modify transactions.

Like all its competitors, Quicken automatically enters the date of your check. Then you simply tab to the check number space, where hitting the plus (+) key advances the check to the next number. To complete the check, you tab to payee, payee's address (which you need if you're printing checks and using window envelopes), amount of check, memo (if any), and expense category.

Quicken does not require you to allocate an expense to a specific category. This may seem great to the newly initiated, but if you track your expenses to prepare for tax day, it's freedom enough to hang yourself. Of course, you can keep tabs on your expenses simply by assigning each debit to an expense category. Another major problem with Quicken is that the list of expense categories appears in a separate window from the check register. So if you need to look at the list of categories to decide where to allocate your expense, that adds a step to the process.

If you do categorize your expenses (which I strongly recommend), MYM, MacMoney, and CheckWriter make your task much easier. None of these programs require a separate window for categorizing expenses (see "One Window Does All"). Categories appear in the same window as the check template or in a separate window alongside the check. As with Quicken, you simply click or double-click on the expense category to record it in the register. All the programs reviewed here let you add or delete expense categories so you can tailor record-keeping to your financial and tax needs. But the various programs handle expense categories differently.

Doing the Splits
SAY YOU WRITE A CHECK FOR $1000 TO MASTERCard for your February bill and you want to itemize the expense categories for each of 15 different transactions on the bill. You can't do that with DacEasy Light, MacMoney, CheckWriter, or Hi Finance, which limit the number of splits per transaction to 5, 8, 10, and 10, respectively. (Survivor Software says it will add support for 25 splits in MacMoney 4.0, which was scheduled to ship in the second quarter of 1993.) A large number of splits, however, is not a problem for Dollars and Sense, which can accommodate 23 splits per check; or for Quicken and MYM, both of which allow an unlimited number of expense distributions for each check.
Say good-bye to needless reentering of recurring data and hello to automatic bill reminders

Electronic Payments
BOTH QUICKEN AND MYM ALSO OFFER A DIRECT link to CheckFree (call 800/882-5280 for information and sales), CheckFree Corporation's online bill-payment service that makes electronic payments or issues paper checks in your name to any number of payees you designate. The monthly charge is $9.95 for the first 20 payments and $3.50 per additional 10 or portion thereof. (In most cases, the service, which you access via modem, is more expensive than printing and mailing your own checks.) Besides being offered as a module within Quicken and MYM, CheckFree also has stand-alone software, CheckFree 2.0. When I used CheckFree's software to send an electronic payment, the check was issued promptly and accurately.

Several banks also offer online bill-payment and banking services. The Bank of America Homebanking service (800/792-0808) works with Lundeen and Associates' (800/255-0996) Express CheckIt software. Wells Fargo On-Line (800/729-3557) lets you access your bank accounts via Prodigy or through software licensed from Chemical Bank of New York, which offers a similar service to its customers and to several banks nationwide.

Two warnings to heed if you use an electronic payment service: If a merchant does not accept electronic transfers, the service must print a check and mail it, which takes more time than writing and mailing it yourself. Also, electronic payments can be more difficult to trace than checks since you typically get monthly statements instead of canceled checks.

Reconciling the Differences
ALL THE REVIEWED CHECK-WRITING PROGRAMS will reconcile your checks, although for pure ease of operation, Quicken is the winner here. With Quicken, you simply enter the new balance from your check statement, add any interest and service charges not already noted in your electronic register, and mark cleared transactions from your bank statement. The software automatically reconciles the account or tells you how much you're off. CheckWriter, Hi Finance, MacMoney, and MYM do the job almost as easily, although I found Quicken to be more intuitive, perhaps because graphically it's so closely modeled after a standard check-writing register.

All the reviewed check-writing programs handle recurring bills such as monthly mortgage or rent payments. For this job, I found CheckWriter, MYM, and Quicken required the least effort. Once you've recorded the initial transaction with these check-writing programs, selecting the payee's name in a database will enter the entire transaction on your check. All the programs also let you have more than one recurring transaction to the same payee; in MYM and Quicken, you can use the memo field in the recurring-transaction window to differentiate between a car insurance payment and a house insurance payment to the same company. Say good-bye to needless reentering of recurring data. Also, these programs remind you when a bill is due.

The same three programs—CheckWriter, MYM, and Quicken—also offer the best search functions; you can call up previous transactions by criteria such as payee, memo, or expense category. CheckWriter's search function is the most powerful and requires the fewest steps: you can use the Find command to define your search by payee, memo, check number, amount, date, budget category, or any combination of those. Say you're charting your utility expenses and want to find out when your gas and electric bill topped $90 a month. In a dialog box, you simply name the payee under Description, specify “over $90” in the Amount box, and indicate the date range and/or budget category you want (see “Powerful Search”). CheckWriter then locates all transactions that meet your search criteria. Check-

Taking Stock of Online Services
If you want a seamless online link for stock, bond, and mutual-fund quotes and information, WealthBuilder 2.0 by Money Magazine is the easiest option. If you already subscribe to an online service such as CompuServe or America Online, you can save money by using Aatrix's Hi Finance to download quotes directly from your service. Or you can reach the online services yourself and transfer the data manually to your investment portfolio. However, that might take a lot of time if you have a large number of holdings. Leading services with online financial data include:
- America Online, 800/827-6364; $7.95 per month including two hours online
- CompuServe, 800/848-8199; $8.95 per month for standard services, with unlimited quotes
- Dial Data, 718/522-6886; $15 minimum per month, with quotes 3.5 cents to 1 cent each, depending on volume
- Dow Jones News/Retrieval Service, 800/522-3567: $25 per month for unlimited quotes
- Prodigy, 800/776-3449; $14.95 per month for unlimited quotes
- For other financial reports and stock analyses, prices vary.

The best clearinghouse of information for the online investor is the nonprofit American Association of Individual Investors (AAII, 312/280-0170). It publishes a newsletter, Computerized Investing, 5 times a year and a 500-page book, The Individual Investor's Guide to Computerized Investing, every November. AAII membership costs $49 a year. The newsletter subscription, which includes the book, is $30 a year for AAII members, $60 a year for others.
Writer also allows you to search multiple checking accounts at the same time and to specify whether you want to see cleared checks, uncleared checks, or both. CheckWriter is the only program that displays the results of your search in your account register; other programs perform similar searches but display the information in report format that requires a separate window and takes additional time.

**Budgeting the Bucks**

Budgeting is rarely fun, but personal-finance software makes this onerous job a little easier. All the reviewed personal-finance programs let you set up monthly budgets by expense categories, which then can be compared with actual spending. MYM and MacMoney's month-by-month displays of actual versus budgeted expenses are particularly easy to follow, making it very clear when you are deviating from your budget (see "Over Budget"). If you bust your self-imposed limits, CheckWriter offers an optional warning that gives you one final chance to cancel your check transaction before descending into the depths of profligate spending. Sinners beware.

**Check Printing**

Besides charting your expenses for both budgetary and tax review, personal-finance software can eliminate the drudgery of check writing. You can print all, none, or some of your checks. Since most of my transactions occur away from my office and computer, I still prefer to hand-write my checks and record the information later in my electronic check register. Sooner or later, I'll probably relent and use my printer. Personal checks issued by my bank cost about 5 cents apiece for an order of 200. Checks for laser or ink-jet printers range from 11 cents to 20 cents apiece for quantities up to 500. If you don't want to get hooked into buying higher-priced computer checks, CheckWriter allows you to print on a personal checkbook check; you can move data fields for date, payee, amount, and memo to any position you desire on the check. Using the check-design software that comes with CheckWriter, I printed a personal check on my HP DeskWriter. As you can judge from "Print on Your Own Checks," it worked well.

Only DacEasy Light allows you to print invoices, although Survivor Software offers an add-on package for MacMoney that provides this function.

**A Taxing Proposition**

Beyond easing the hassles of check writing, account reconciling, and budgeting, personal-finance software's biggest advantage is simplifying tax preparation to help you save on your annual contribution to Uncle Sam. The standout performer here is MYM. Without relying on separate tax software, MYM can take your expenses at any point during the year and estimate what you owe the federal government. The MYM Tax Estimator fills out an abbreviated Form 1040 and Schedules A, B, C, D, E, F, and SE. For those who have to pay estimated taxes or just want to know where they stand, the tax estimator is a wonderful function. In one hour in early November, I projected my tax liability for the coming April and determined whether I owed estimated taxes. The MYM tax estimator also can play the "what-if" game. What if my book earns a $50,000 advance? What would my taxes be then? What if the stock market crashes and I have to sell my stocks at...
You can cancel a check transaction before descending into the depths of profligate spending

rock-bottom prices? What would that do to the capital gains taxes I anticipated earlier in the year? The "what-if" game opens the door to countless hours of intriguing and entertaining scenarios. What if Ed McMahon knocks on my door and gives me a million dollars? What if I spend all my time playing "what-if" games?

WealthBuilder also includes a tax estimator. Because WealthBuilder does not offer check-writing capabilities and therefore cannot track your daily tax-deductible expenses, I found its tax estimator to be of limited use. If you want to use it, you have to transfer all your data from another personal-finance program. If you go to that much trouble, why not go all the way and export the data to a full-fledged tax-preparation program like ChipSoft's MacInTax (619/453-8722, federal version $79.95, state version $49.95), or MECA's TaxCut (203/256-3000, Federal version $79.95, state version $49.95)? If you have Microsoft Excel 2.2 or a later version, another tax-

### YOUR GUIDE TO PERSONAL FINANCE

<table>
<thead>
<tr>
<th>Product</th>
<th>Aatrix HI Finance 4.0</th>
<th>Andrew Tobias Managing Your Money 5.0</th>
<th>CheckWriter 4.0</th>
<th>DacEasy Light 2.0</th>
<th>Dollars and Sense 5.0</th>
<th>MacMoney 3.53</th>
<th>Quicken 3.0</th>
<th>WealthBuilder 2.0 (by Money Magazine)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company</td>
<td>Aatrix Software</td>
<td>MECA Software</td>
<td>Aatrix Software</td>
<td>DacEasy</td>
<td>Business Sense</td>
<td>Survivor Software</td>
<td>Intuit</td>
<td>Reality Technologies</td>
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<tr>
<td>List price</td>
<td>$129</td>
<td>$79.95</td>
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<td>Automatic check numbering</td>
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<td>Number of expense distributions per check</td>
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<td>10</td>
<td>5</td>
<td>23</td>
<td>8</td>
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<td>Electronic bill transfer</td>
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<td>Prints checks</td>
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<td>Prints personal checkbook checks</td>
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<td>Exports to Excel and MacInTax</td>
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<td>Exports text files</td>
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<td>Imports Quicken 3.0 transactions</td>
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<td>Imports invoices</td>
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<td>Program access password</td>
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<td>Transaction modification password</td>
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<td>Retirement planning</td>
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<td>Generates reports</td>
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<td>Amortized loan schedule</td>
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<td>Income vs. expenses</td>
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<td>Pie charts</td>
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<tr>
<td>Downloads stock and mutual-fund quotes</td>
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<td>Stock and mutual-fund database</td>
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<td>Calculates stock splits</td>
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<td>Analyzes open positions for each security</td>
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<td>Estimates taxes</td>
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* = yes; O = no; NA = not applicable. ¹ Must hit plus (+) key. ² Imports CheckFree data. ³ Imports budget report only. ⁴ Add-on module required. ⁵ Required not optional. ⁶ Black-and-white only. ⁷ Except for options quotes.
software option is Heizer Software's Heizer Tax Series ($510/943-7667, $49 plus $19 per state form).

Import and Export

ALL THE SOFTWARE PACKAGES EXCEPT WEALTHBuilder can export data in tab-delimited format, which can be read by most spreadsheets and tax-preparation programs.

Transferring your financial transactions from one program to another is a tedious process that discourages most people from shifting software in midyear, if ever. Fortunately, Quicken is emerging as a common language among personal-finance software users. Within Quicken, you can use the import function to transfer transactions from one Quicken file to another. You can also export transactions from Quicken 3.0 to CheckWriter, Hi Finance, and MYM. I transferred almost a year's worth of transactions from two accounts in Quicken 3.0 to both CheckWriter and MYM. The data-transfer from Quicken to MYM was perfectly smooth. The Quicken transfer to CheckWriter produced only a few hitches. CheckWriter incorrectly read a few Quicken transactions where I had split expenses into two or more categories. CheckWriter also had trouble transferring a few budget items. Unfortunately, MacMoney 3.53 does not import Quicken 3.0 data, although Survivor Software says MacMoney 4.0 will have that capability. WealthBuilder can import budget data from both Quicken 3.0 and MYM 5.0 but does not support the importing of check-transaction data or stock-portfolio information. That oversight cost me hours in tedious data entry time when I wanted to transfer my stock and mutual-fund transactions from MYM to the more sophisticated investment-portfolio program in WealthBuilder.

Managing Your Portfolio

IF YOU OWN SECURITIES AND YOU WANT TO track them, MYM, Hi Finance, and WealthBuilder have the most to offer. For example, they can track the stock and mutual-fund shares that you own as well as the ones that you've sold, known in the trade as analyzing open and closed positions.

MYM offers an investment menu where you can record your security purchases or sales, stock splits, dividends, and price updates. MYM also computes your percent gain or loss in both numerical and bar graph form (see "Tracking Your Gains"). A pie chart depicts your stock, bond, and cash diversification. You can also compare your individual stock or portfolio performance against any market index you choose. However, you have to find the market-index information from your own sources and manually enter the numbers. For the serious investor, a big downside of MYM is its lack of an online linkup for automatically updating stock, bond, or mutual-fund prices—a feature that MECA has offered for some time in its DOS version of MYM.

Unlike MYM, Hi Finance downloads stock and mutual-fund prices through whatever online service you choose (see "Taking Stock of Online Services"). The program offers the same check-writing and budgeting features as its cousin, CheckWriter, but also creates accounts specifically set up for stocks, bonds, annuities, and mutual funds. A downside of Hi

Finance is its inability to track percent gain, percent loss, and total and annualized return—features found in MYM and WealthBuilder.

Two features that set WealthBuilder apart from its competitors are its extensive database of market performance and its smooth downloading of quotes for stocks, mutual funds, and options. For automatic price updating, you only need a modem and the willingness to pay a monthly fee. For $9.95 per month through the Gold Plan, you have online access to a research database from Morningstar of more than 2500 mutual funds and 15-minute delayed stock quotes from the New York and American Stock Exchanges and NASDAQ. For $17.95 per month through the Platinum Plan, you get an additional online database from Standard & Poor's, which follows more than 5000 stocks and 6000 bonds. The service gives you 59 data points on each stock, including high and low price, price/earnings ratio, and cumulative returns. However, because of licensing agreements between Reality Technologies and the providers of online stock and mutual-fund quotes, WealthBuilder cannot export downloaded quotes into another program, such as a spreadsheet or word processing program. If you want to follow prices of a particular stock or mutual fund over time, you must print copies of the data. The lack of export capability is a significant downside to WealthBuilder.

To help with your buying or selling decisions, WealthBuilder can sort stocks by 16 criteria including yield; price/earnings ratio; price/book ratio; volatility; profit margin; and cumulative return over year-to-date, 3-year, and 5-year periods. It can sort...
The tediousness of transferring transactions from one program to another discourages software changes

bonds by 7 parameters including maturity date, current yield, and S & P rating. The program can rank mutual funds by 10 categories including year-to-date, 3-year, and 5-year returns; risk; and volatility (see “Mutual-Fund Screening”). WealthBuilder also features a color pie chart that shows the allocation of your investments among equities, bonds, metals, and cash. Be forewarned that WealthBuilder is a hard-drive space hog requiring up to 10.4MB for the Platinum Plan. If you run out of room, jetisoning the help, animation, and tutorial files helps relieve the space crunch by 1.7MB.

Reports
ALL THE PERSONAL-FINANCE PROGRAMS THAT I evaluated generate net worth and income versus expenses reports. Only MYM, MacMoney, and WealthBuilder offer color pie charts, line graphs, and bar graphs (see “Cutting Up the Pie”). CheckWriter and Hi Finance create only black-and-white pie charts, which are difficult to read. (Aatrix says it will add color support to both CheckWriter 5.0 and Hi Finance 5.0, scheduled to ship in the second quarter of 1993.) If you want to print amortized loan schedules personalized for your loan’s interest rate, principal, and term, only CheckWriter, Hi Finance, MYM, and MacMoney offer this feature. It’s a toss-up as to which program produces the best-looking reports, but the winner for the most omnibus report is WealthBuilder, which blatantly advertises itself on every report you print.

Financial Planning
WEALTHBUILDER OFFERS THE MOST ROBUST financial-planning features, providing tools to help plot your investment strategy for college education, a dream home, or retirement. Flexible assumptions account for inflation and life expectancy. A time line graphically depicts how your progress measures up to your financial goals. MYM offers a similar financial-planning module with bar graphs to chart how you are doing. MacMoney, CheckWriter, and Hi Finance calculate the savings required to meet your financial goals. If you are looking for the quick way to Easy Street, CheckWriter can randomly generate up to 20 “lucky” numbers for use in a lottery (guarantee on winnings not included).

Technical Support
MOST OF THE PERSONAL-FINANCE SOFTWARE packages that I evaluated include unlimited free support. The exceptions are DacEasy Light and Dollars and Sense, which charge $25 and $89.95 per year, respectively. The Dollars and Sense package includes free upgrades during the year and two newsletters. MYM includes free unlimited technical support, but the $49.95 Plus Plan includes an annual upgrade, extended tech-support hours during evenings and Saturdays, a money-related book “chosen” by Andrew Tobias, and a quarterly MYM newsletter.

I called the free technical-support lines for CheckWriter, Quicken, MYM, MacMoney, and WealthBuilder and got prompt service from all except for MECA’s MYM. At MECA, only DOS technicians were immediately available, but a Macintosh-trained technician called back twice within the next 24 hours, once reaching my answering machine and the second time getting through to me. Intuit’s Quicken technicians were helpful in confirming that a color flash that occurs when I launch Quicken on my NEC MultiSync 3FGx monitor results from a Quicken incompatibility problem with 16-color displays. A technician I spoke with says Intuit is aware of the problem but does not have a fix at this time. Aatrix’s CheckWriter technicians were available on several occasions when I called, and I was never put on hold.

Summing It Up
NO INDIVIDUAL PROGRAM WILL SATISFY ALL YOUR personal-finance needs. If you simply want an electronic version of your old checkbook with check-printing capabilities, Quicken and MacMoney are adequate, but MYM and CheckWriter are my favorites—they’re smooth, fast, and easy. I especially like CheckWriter’s ability to print on personal checkbook checks and its powerful search capabilities. If your primary interests are financial planning and portfolio management, consider WealthBuilder because of its strengths in those areas. Aatrix’s new entry, Hi Finance, tries to take the middle ground with its combined check-writing and stock-price-updating capabilities, but it’s far less powerful than WealthBuilder. If you want to settle on one program for both check-writing and investment management, then currently MYM is your best choice. MYM will be even better if and when it includes online stock and mutual-fund price updating.

MW
EDITORS’ CHOICE

CheckWriter 4.0 This well-designed program is easy to use and has powerful search and check-printing capabilities. Technical support is superb.

Andrew Tobias’ Managing Your Money 5.0 Short of downloading stock and mutual-fund quotes, this program does everything from writing checks to analyzing your stock portfolio to estimating your taxes. A solid package of software.
Company: MECA Software. List price: $79.95.

TOM LINDEN, M.D., the anchor of “Physicians’ Journal,” which airs Sundays on Lifetime Television, still stores his expense receipts in shoeboxes, but for his new company, MedWorld Productions, he got a bigger one.
For an all-around scanner offering high-quality color and black-and-white images, true 400-dpi resolution, and good basic scanning software, HP's ScanJet IIc can't be beat!
To test the HP ScanJet IIc, we used the same set of tests we used for our most recent color-scanner lab report. The results showed HP's new scanner to be the best in its class in both hardware and software. The ScanJet impresses from the moment you open the box. Other scanners use a removable screw that locks the scan head for shipping, but HP uses a locking lever that's built into the scanner itself. There's no screw to lose, and the lever is so easy to use that you'll find yourself locking the scan head more often, thereby increasing its life span.

WINNING COMBINATION

We'd hate to brag. So we'll let the Mac press do it for us.

Macworld awarded both the HP ScanJet IIc and IIp their World Class Award, and named the HP ScanJet IIc as the Best Color Scanner for 1992, and the HP ScanJet IIp as the Best Black & White/Gray-Scale Scanner. While MacWeek gave their prestigious Diamond Award to the HP ScanJet IIc.

Speed. Simplicity. And accuracy were all applauded. It's no wonder. HP's single-pass scanning delivers both lightning-fast speed and precise color registration. TWAIN support allows scanning without having to switch between applications. And HP AccuPage technology with 400-dpi resolution can tackle the toughest OCR challenges. What's more, capabilities this advanced have never been this affordable. List price on the HP ScanJet IIc is just $1,599. The HP ScanJet IIp is just $879. And right now, the HP ScanJet IIc includes Adobe Photoshop LE.

Impressed? Don't just take our word for it, or even the Mac press's. Attend one of our scanning seminars that will be held April through September, 1993. To find out more about the HP ScanJet IIc and IIp or seminars in your area, call 1-800-SCANJET, Ext. 7364.

And judge for yourself.
Macintosh Centris 610

**PROS:** Inexpensive; has drive bay; small size saves desktop space; offers built-in Ethernet and video-display circuitry. **CONS:** NuBus expansion limited to one 7-inch board that requires a $99 adapter; math coprocessor upgrade is expensive. **COMPANY:** Apple Computer (408/996-1010). **LIST PRICE:** $1859 for base model (4MB of RAM, BOMB hard drive, 512K of video RAM).

Macintosh Centris 650

**PROS:** Moderately priced; fast 040 system; has three expansion slots and one drive bay; has built-in Ethernet and video circuitry (except for base model); has built-in math coprocessor (except for base model). **CONS:** One of the three NuBus slots is blocked if PDS is used. **COMPANY:** Apple Computer (408/996-1010). **LIST PRICE:** $2699 for base model (no math coprocessor, 4MB of RAM, 80MB hard drive, 512K of video RAM).

A 040 ON EVERY BUSINESS DESKTOP.

That's the promise of the new Centris Macs, the slim-design 610 and the full-size 650. Apple has said that it intends to compete with the low-price Windows PCs that dominate the business market, and the Centris prove Apple is serious.

For about the same price as a Mac IIfi or IIXx, you can now buy a Centris 610, which is 1.8 times as fast (see "Rating the Centrises' Speed"). Spend a thousand dollars more and you get a desktop Mac (the 650) as powerful as the recently discontinued Quadra 700. *Macworld* previewed these new Macs in the April 1993 issue ("Centris 610 and 650") after looking at prerelease models. We've now spent time with the shipping versions and are pleased to see that what you can buy is as impressive as what we first saw.

Expansion Pros and Cons

**IN FORM, THE CENTRIS 610 CARRIES ON the role of the discontinued Mac IIfi: a small computer that sacrifices expansibility for lower cost. The 650 likewise carries on the tradition of the discontinued IIfi: a large computer that can handle almost any business expansion need.

This means that the Centris 610 has only one NuBus slot—one limited to 7-inch NuBus boards, of which very few were shipping at press time—that requires an optional $99 adapter. The 650 has three NuBus slots, enough for most users. It also has a Processor Direct Slot, but if that slot is used, it blocks a NuBus slot, and vice versa.

Trading limited expansion for a lower price is fine, but doing it in so limiting a way is not. For example, while I would prefer a 12-inch board for the Centris 610, I realize that means the case would have to be 5 inches deeper. But then to have to pay $99 more just to use a NuBus board when I find one that fits adds insult to injury.

Both Centris come with a 5.25-inch drive bay in which you can add a SyQuest, CD ROM, or other storage device.

Processing Power

**THE CENTRIS 610 IS LESS POWERFUL than the 650: the 610 uses a 20MHz 68LC040 (the LC means there is no internal math coprocessor) compared with the 650's 25MHz regular 040. (The base 650 model—with 4MB of RAM and an 80MB hard drive—also uses the LC040.)

The processors' speed difference translates into a 20 percent difference in performance: a Centris 650 is about 2.5 times as fast as a IIfi, while a Centris 610 is about 1.8 times as fast. Both are speedy enough for most business users.
Rating the Centris' Speed

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<tr>
<th>OVERALL</th>
<th>SPECIFIC TASKS*</th>
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<tr>
<td>Longer bars are better</td>
<td>Times are in seconds. Shorter bars are better</td>
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<tr>
<td>Processor Tasks</td>
<td>Drive-Access Tasks</td>
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<tr>
<td>Quadra 800</td>
<td>Windows PC</td>
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<tr>
<td>Times faster than a Classic</td>
<td>13.5</td>
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<tr>
<td>Times to run</td>
<td>13.2</td>
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<td>650</td>
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<td>Centris 610</td>
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*For an explanation of these tests, see page 112 of "Centris 610 & 650," in Macworld April 1993.

The use of these 72-pin SIMMs also means that Apple can put fewer slots on the logic board (there are two on the 610 and four on the 650), which saves engineering and production costs. Even with just two slots, you can get 68MB in a Centris 610 by adding two 32MB SIMMs (about $2000 each) to the 610's 4MB of base RAM. You can get 136MB in a Centris 650 by adding four 32MB SIMMs to its 8MB of base RAM. (Note that some Centris 650 models have 4MB of base RAM; these are limited to 132MB total.)

Math Processing Trade-Offs

THE 610’S (AND BASE 650’S) LACK OF A math coprocessor won’t affect most people. The math coprocessor is used for rendering, certain image transformations, trigonometric calculations in science and engineering, and similarly high-powered floating-point calculations.

My only quibble over the lack of a math coprocessor is that there is no slot in which to add a coprocessor later—instead, you must replace the LC040 processor with a regular 040—figure about $400, and make sure you include a heat sink. Fortunately, the processor is socketed, so it’s not hard to do. To be fair, Motorola doesn’t offer 940s on which a coprocessor can be added later, as Intel does for its 80486SX processors (whose internal math coprocessor is disabled)—but Intel’s add-on coprocessor also doubles the processor’s internal speed.

Better Memory

BOTH CENTRIS MACS USE THE NEW 72-PIN SIMMs developed originally for IBM PS/2s, Compaq DeskPros, and other premium-brand DOS PCs. (This means you can swap SIMMs among these machines—great for multiplatform corporations.) Compared with the standard 30-pin Mac (or DOS SIMMs), expect to pay about $15 more per megabyte (about $190 for a 72-pin 4MB SIMM compared with $125 for a 30-pin version), and expect an initial shortage of these SIMMs.

The 72-pin SIMMs offer worthwhile advantages, however. First, they eliminate slot and bank rules. With 36-pin SIMMs, you need to have two SIMMs in a bank (and more on some Macs). With 72-pin SIMMs, a slot is a bank, so gone are those arcane placement rules. Just put SIMMs of whatever capacity you want in any slot you want. One caveat: make sure your SIMMs are 4MB or greater in capacity, since the Centris don’t support smaller-capacity SIMMs.

The Centris 610 can be made to run as fast as a 650, although this is not an Apple-sanctioned upgrade. If you replace the clock crystal (about $40) that controls the 610’s processor with a 25MHz version, the 610 will run at the same speed as the 650. I know several dealers who have done this. Apple has not tested such a system, but engineers recommend that you add a heat sink to a souped-up 610. (This is basically the approach used by Newer Technology’s VSO overdose products for the IIIx and Quadra 700. There is a debate over whether this approach wears out the processor faster because of the extra heat generated, but it is fairly common among PC makers.)

Minor Flaws

IN TESTING THE CENTRIS, WE FOUND only a few minor problems.

The most troublesome is Apple’s unfortunate decision to optimize the System for each model through the use of enablers—model-specific extensions. If your Centris (or Quadra 800 or LC III) has a system crash or the System Folder is damaged, you won’t be able to use the emergency start-up disk provided by Norton Utilities or another recovery program. The new Macs won’t run on anything older than System 7.1 (or the System version the new Mac came with). You can restart with Apple’s Disk Tools disk, but you can’t then eject the disk to run your recovery program. The Disk First Aid program on the Disk Tools disk is OK, but not up to the standards of a dedicated recovery program. You can make your own emergency start-up disk by copying the Disk Tools disk and putting your recovery software on it, but chances are that there’s not enough room for both the System and the recovery software.

Picking a Centris

ACCORDING TO MY SURVEY OF DEALER prices, a fully loaded Centris 610 costs about $7700, which includes a 230MB hard drive, 12MB of RAM, 1MB of video RAM (which gives you 16-bit color on 16-inch or smaller monitors), built-in Ethernet, an extended keyboard, the new Apple mouse, and a name-brand multi-sync monitor, like an NEC 3PGx or a Sony CPD-1304. (The Apple 14-inch monitor’s quality is not as good as these, or even as its 13-inch predecessor. The 14-inch monitor also has a smaller active screen area than the earlier 13-inch model. Go figure.) Add about $1000 for a similarly equipped Centris 650.

For Macs, these are great deals considering their computational abilities. That’s still $800 to $1000 more than comparably equipped (and faster) Windows PCs. Apple needs to find other ways to trim costs without trimming quality so it can compete effectively in the business market that it is clearly targeting.

Though the Centris 610 should fill most people’s needs, I’m concerned about the 610 as a long-term investment; both coprocessor and NuBus expansion are expensive, and total expansion is limited. But if you don’t plan to expand your system much, go for it. How can you tell if you need to expand? Look at the NuBus boards and expansion options you now have, subtract from that number the number of features built into the Centris (like 8-bit or 16-bit video display and Ethernet), and see what’s left. If you need more than one NuBus board, don’t get a 610.

If your IICi’s slots are full and you dream of doing rendering, 24-bit color image editing, or aircraft design, go for a 650 (or better yet, the new Quadra 800). But beware the 650 base model: it lacks Ethernet and a math coprocessor, and has only 4MB of base RAM soldered onto the logic board. The slight savings for the base 650 is not worth the cost of adding Ethernet or a math coprocessor later.

If you just use Microsoft Word and Excel all day long, consider a 68030-based LC III—it’s the same speed as a IICi and priced at about $2400 for a well-outfitted system. Otherwise, look forward to a Centris on your desk.—GALEN GRUMAN
LaserWriter Pro series

**PROS:** Superb output quality of scanned images and text; excellent paper-handling features; reasonably priced; LaserWriter Pro 630 accepts internal and external hard drives and includes Ethernet port. **CONS:** No front-panel mode switches or status display; no resolution enhancement in 600-dpi mode; no emulation-sensing features. **COMPANY:** Apple Computer. **REQUIRES:** Mac Plus, System 6.0.5. **LIST PRICE:** LaserWriter Pro 600 $2099; LaserWriter Pro 630 $2529.

The LaserWriter Pro 600 and LaserWriter Pro 630 are the latest members of the distinguished LaserWriter line, the printers that have popularized the PostScript page-description language and helped fuel the electronic-publishing revolution. From their paper-handling to their print quality, the LaserWriter Pro 600 and LaserWriter Pro 630 are Apple’s best printers yet. Their prices are even reasonable: $2099 for the LaserWriter Pro 600; and $2529 for the LaserWriter Pro 630, which has additional connection ports but is otherwise identical to the 600.

The LaserWriter Pro series replaces the LaserWriter II line. What’s new? Just about everything, starting with the print mechanism itself. The new printers use Canon’s EX print engine, which prints up to 600 dpi, versus the 300-dpi resolution used by the LaserWriter II series and many other laser printers. Like the LaserWriter II printers, the LaserWriter Pros print a maximum of 8 pages per minute.

The EX print engine is Canon’s best yet. Character edges are crisp and clean, with none of the toner scatter that was common with older Canon engines. Toner scatter occurred because of stray electrical charges generated by a relatively imprecise corona wire, the component that attracts toner from the photoconductive drum to the paper. In the new EX engine, the corona wire is replaced with a roller that makes physical contact with the drum, eliminating stray charges.

The LaserWriter Pros are easy to set up. Remove some packing materials, open the printer’s lid, slide a disposable toner cartridge into place, and close the lid. In earlier Canon engines, the toner cartridge installed in the pop-up lid itself, and you had to use some force to close the lid. Over the years, this hood-slamming could cause the engine’s optics to become misaligned, diminishing print quality. In the new EX engine, the cartridge slides into the engine itself, and the lid closes with a light touch, so there’s less chance of the printer’s optics becoming misaligned after years of use. As with its previous printers, Apple includes with each toner cartridge a prepaid shipping mailer for returning the cartridge for recycling.

Another welcome new feature the EX engine provides is a so-called multipurpose tray—a second, 100-sheet paper tray that is built into the printer. The LaserWriter Pros also include a conventional, slide-in paper cassette that holds 250 sheets. Available paper-handling options include an envelope feeder and a 500-sheet feeder (each retails for $399).

To take advantage of both trays, the LaserWriter Pros include a new version of the LaserWriter printer driver. The new driver, version 7.2, provides a Print dialog box containing a pop-up menu that lets you select the paper source for a given document. The new driver also lets you choose between 300- and 600-dpi resolution as well as control the printers’ PhotoGrade and FinePrint output-enhancement technologies.

### LaserWriter Pro Times

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<tr>
<th>Font</th>
<th>300 dpi</th>
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<td><strong>All Times in seconds. Shorter bars are better.</strong></td>
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<tr>
<td><strong>Multiple Fonts</strong></td>
<td><strong>Courier</strong></td>
<td><strong>MacDraw Pro</strong></td>
</tr>
<tr>
<td>Print speed for a typical multiple-font document. We used a seven-page Microsoft Word 5.0 document containing a variety of fonts, sizes, and styles.</td>
<td>Print throughput for a two-page Microsoft Word 5.0 document containing double-sized 12-point Courier text in plain, bold, and italic.</td>
<td>Print speed for complex drawings without many special effects. We used a graphic containing more than 2000 simple objects and several layers of Hewlett-Packard text.</td>
</tr>
<tr>
<td><strong>Hewlett-Packard LaserJet 4M</strong></td>
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<tr>
<td><strong>Apple LaserWriter Pro 600</strong></td>
<td>142.3</td>
<td>146.1</td>
</tr>
<tr>
<td><strong>Apple LaserWriter IIg</strong></td>
<td>142.3</td>
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*In the FreeHand and PageMaker tests performance was slightly slower with PhotoGrade on.*

Tests were conducted on a Mac IIfi running System 7.1, with a cache card installed, 8MB of RAM, a Quantum Pro 80 internal hard drive, AppleTalk on, and background printing off if possible.
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Grade and FinePrint output-enhancement technologies. (PhotoGrade improves the appearance of scanned images; FinePrint enhances text and line art.) Apple improved the PhotoGrade technology to provide 91 levels of gray, compared with the 67 levels provided by the LaserWriter IIg.

Both PhotoGrade and FinePrint are available only when you've chosen 300-dpi resolution. By contrast, the resolution-enhancement technology provided by the LaserJet 4M works at both 300 and 600 dpi. As a result, the LaserJet 4M produces slightly sharper text—but you may need a loupe to see the difference. As for scanned images, there's no clear-cut winner: in my tests, some images looked better printed at 300 dpi with PhotoGrade, while others looked better printed at 600 dpi.

As for ports, the LaserWriter Pro 600 has LocalTalk, Centronics parallel, and serial connections—the LaserWriter IIIf and IIg lacked the Centronics port, which is most commonly used to attach DOS PCs. (Both printers include Microsoft Windows driver disks.) The LaserWriter Pro 630 adds an Ethernet port as well as two SCSI ports to which you can connect a hard drive for storing fonts and boosting performance. One of the 630's SCSI ports is internal, making this the first machine without flicking switches. Unfortunately, the LaserWriter Pros do not support emulation sensing—they don't monitor incoming data and switch between, say, PostScript and HP LaserJet emulation modes. Emulation sensing is becoming commonplace among printers in this class; the absence of it makes the LaserWriter Pros less desirable for mixed-platform offices than printers from other firms such as HP, Compaq, and QMS.

Like the LaserWriter IIF and IIg, the LaserWriter Pros sport an all-ports-active design—you can connect a DOS PC to the parallel port and a Mac to the LocalTalk port, and print from each machine without flicking switches. Unfortunately, the LaserWriter Pros do not support emulation sensing—they don't monitor incoming data and switch between, say, PostScript and HP LaserJet emulation modes. Emulation sensing is becoming commonplace among printers in this class; the absence of it makes the LaserWriter Pros less desirable for mixed-platform offices than printers from other firms such as HP, Compaq, and QMS.

I have one more nit to pick: the lack of a front-panel status display and options for adjusting paper sources, resolution, and other settings. Both are common in other printers, but Apple continues to rely on blinking status lights and on the LaserWriter utility, which runs on the Mac. But these are minor flaws in otherwise excellent printers. The LaserWriter Pro 600 and 630 aren't just Apple's best printers ever; they're among the best printers available in their price range.—Jim Heid

The program's disk-repair features are very good, although like all disk-repair programs, Public Utilities repairs some problems that other programs cannot, and vice versa. In my tests, Public Utilities fixed most hard drives with damaged directories, and did a good job restoring files, especially files that had been tracked by Prevention as deleted. The program worked well at fixing damaged floppy disks, either by repairing the directory so that the disk could be mounted, or by salvaging the text of seriously damaged floppies. One unique feature of Public Utilities is the ability to restore files even after a disk optimization. Another plus is that optimizing is a safe process; with other optimizing programs, if the process is interrupted, data can be lost.

Launch Pad lets you install application icons into its floating icon palette and launch files by double-clicking on installed icons. You can attach documents to a program icon and access that document via a 3-key combination. But Launch Pad doesn't work well with multiple screens that are set at different bit depths. It assumes the bit depth of the main monitor, and uses a window and icon view appropriate to that monitor's setting. Problems occur if you move the Launch Pad window to a screen with a different bit-depth setting. For example, if your main screen is set at 8-bit color, and you move the Launch Pad window to a black-and-white screen, the window doesn't change to the black-and-white configuration; the window becomes all black and the icon buttons are invisible.

Fifth Generation's technical support is a true cut above—way above—the rest. First of all, the tech-support number is toll-free. Someone is available 24 hours a day, 7 days a week, except for major U.S. holidays. And best of all, the tech-support representatives know their stuff. FGS also maintains support forums on CompuServe and America Online, as well as offering a money-back satisfaction guarantee. If you need a replacement disk, or an upgrade to a current product, FGS sends it via overnight courier. Another great policy: if you own four FGS products, the fifth product is free.

Public Utilities doesn't have the bells and whistles of its competition, but its tight focus on disk repair and optimization, along with great tech support, deliver solid value. Prevention's proactive approach to disk diagnosis makes Public Utilities a good choice for anyone who wants a protection program. Considering that I bought a computer to get my work done more efficiently, it's good to find a program that lets my Mac keep an eye on itself.—Tom NeGrino

**Public Utilities for the Macintosh 1.0**

**PROS:** Automatically scans hard drives for problems; can restore files after disk optimization; excellent technical support. **CONS:** Slow disk optimization; Launch Pad utility deals poorly with multiple screens. **COMPANY:** Fifth Generation Systems (604/291-7221).

**REQUIRES:** Mac Plus; System 6.0.2. **LIST PRICE:** $149.

**HE FIELD OF DISK- AND FILE-RECOVERY packages is already well represented with Symantec's Norton Utilities for Macintosh and Central Point Software's MacTools 2.0. These packages also include utilities for backup, disk editing, and virus protection. Fifth Generation Systems' (FGS) Public Utilities sticks to the basics of disk diagnosis, disk repair, and file optimization—and does a good, and in some cases a unique, job.

Public Utilities consists of the Public Utilities repair and optimization application; the Prevention control panel; and Launch Pad, a file- and application-launching utility.

The Prevention control panel scans your hard drive, looking for a wide range of problems, including directory damage, bad blocks, and excessive fragmentation. If Prevention finds a problem, a dialog box asks if you want to fix it. The Prevention scan can be at start-up, shutdown, or while your Mac is idle. Prevention also creates invisible files that assist in restoring files that have been thrown away. When I added a new hard drive to my system, Prevention automatically began scanning the new drive for problems.

The Public Utilities application window has five buttons that access the main features of the program. Repair Disk scans for directory damage and problems such as bad file dates, and fixes them if found. Repair File is maimed, as it doesn't fix damaged files; it recovers any data that it can from a damaged file that contains text, lets you view the result, and filters out any nonprinting characters. Undelete File uses the Prevention deletion record or scans the drive to restore deleted files. Optimize Disk defragments files and consolidates free space, thus making file access faster. Although Public Utilities' optimizing works well, it takes considerably more time than Norton's Speed Disk program. The last button launches the Prevention window.
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Adobe Photoshop 2.5

PROS: Variations feature; simplified mask editing; previews for Distortion filters; improved brush- and path-editing capabilities; faster redraw.

CONS: Magic wand needs work; lacks image previews; no HSB and HSL edit modes; rubber-stamp tool and pressure-sensitivity altered for the worse.


REQUIREMENTS: Mac II; 4MB of RAM; hard drive; System 6.0.7. Recommended: 8MB of RAM; 24-bit video board; color monitor, System 7. LIST PRICE: $895.

Since its arrival on the scene, Photoshop has been the darling of the Macintosh design community. No graphics program is so universally loved and so downright deserving of user loyalty. Version 2.5—Photoshop's first upgrade in a year and a half—builds on its predecessor's wide range of capabilities; it also ignores some minor weaknesses that have begun to peek through the chinks in the great program's armor. And in a move I can only describe as bizarre, Adobe has slightly changed a variety of features in ways that will mystify devotees of Photoshop 2.0 while providing no measurable benefit to new users.

Helping Hands

Photoshop 2.5 introduces three enhancements. First, the Variations command lets you test color corrections by selecting from a series of thumbnails. You can move the selected area toward blue, magenta, or another primary color. You can also change the lightness of an image in incremental steps. Unlike Assist Mode in Caere's Image Assistant, Variations doesn't let you adjust focus or apply special effects, but it does offer greater control over color correction by allowing you to selectively adjust shadows, highlights, and midtones.

The second image helper is Quick Mask mode, which simplifies image-masking by letting you edit selection outlines with painting tools. Actually, you've always been able to do this by saving the selection to an independent color channel, but many artists shy away from channel operations because of their perceived complexity. The Quick Mask function eliminates this barrier by creating temporary channels on the fly. A translucent layer of color shows the areas that are not selected, and therefore masked. You paint with black to subtract from the selection, and paint with white to add to it.

The third assist feature is entirely undocumented but is worth mentioning. After you implement a little trick—pressing the option key while choosing the Displace filter from the About Plug-Ins submenu—Photoshop adds slider bars, grids, and image previews to many of its Distortion filters. Suddenly, you can predict the outcome of these filters.

Many of Photoshop 2.5's most powerful features are relegated to floating palettes, which provide greater convenience but also take up screen space. In addition to enhancing the Info and Color palettes, version 2.5 sections off channel operations and expands brush shapes and paths. Brush size is no longer limited to a 19-pixel circle. You can edit the size and hardness of a brush shape, make it elliptical instead of round, rotate it to a specified angle, and save and load customized brushes. With the Brushes palette, Photoshop 2.5 exceeds just about every other paint program except Fractal Design Painter in creating free-form images.

Photoshop's expanded Bezier-based path tool is both powerful and less convenient. You can now convert points in an existing path, create open and closed paths, and force brushstrokes to follow the course of a path (to blur around the edges of an image, for example). But the Paths palette's greatest improvement doubles as its most confusing. You can save paths for reuse within an image, which is ideal if you need to reselect details. But while in version 2.0 you could simply draw an outline and click inside it to convert it to a selection, in 2.5 you must first save the path and name it, then convert the path by choosing a command.

Sophomore Slump

Photoshop is not without its weak points. The magic-wand tool, for example, is the same old tired feature Photoshop introduced nearly five years ago. Similar tools in Painter and Timeworks' ColorIt easily outpace it. In Painter 2.0, for example, you can dynamically change the range after you click in an image to adjust the boundary of the selection. You can also limit the range in terms of hue, saturation, and brightness, which means that you can select only the blues in a sky, the deep tones in a face, or the bright colors that exceed the CMYK print values. In Photoshop, it's still a click here and a shift-click there.

Some convenience tools remain untapped. Photoshop has yet to introduce image previews in the open dialog box, a feature that is almost universally accepted among other paint programs. You can save icon previews, but those are far too small to be of any use. And while version 2.5 lets you assign your own keyboard equivalents to commands, it arbitrarily limits you to function keys, which most experienced users have long ago assigned to other purposes.

While version 2.5 retains the HSB (hue, saturation, brightness) metaphor in its color editor, you can no longer edit image colors in the HSB or HSL color modes. Adobe's logic is that its new Lab color mode fills this void, but in fact it does not. The L in Lab stands for "luminosity," just as in HSL the L stands for "lightness"; but a and b each represent color-opposite axes. Lab provides no equivalent for saturation, which means you can't downplay or highlight selective portions of an image as effectively as you could in version 2.0.

The rubber-stamp tool and pressure-sensitive input are damaged compared with previous incarnations. Now any changes you make affect the tool as you use it. If you aren't careful, you end up cloning and reselecting areas, which results in obvious patterns that betray retouching. You can now specify that changes in stylus pressure affect the size, color, and/or opacity of the cursor. However, whereas you can easily create strokes that taper to a fine point in Photoshop 2.0, version 2.5 rounds off the edges prematurely and makes light strokes translucent, even if the opacity option is not active.

Taken as a whole, it's unlikely that these minor problems will squelch your enthusiasm for the program. Indeed, there are gobs of enhancements. Version 2.5 redraws the screen image more quickly, it lets you paint and select without waiting for the screen to refresh, it retains selections after you change color modes, it performs any operation in the background under System 7 except launching, and it remembers preference settings and palette positions between sessions—just to name a few. But considering the reputation of previous versions of Photoshop, it may come as a shock that 2.5 is anything but perfect—Deke McClelland
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Circle 2 on reader service card
artWorks 1.0

PROS: Multiple bitmapped and object-oriented layers; blends between multiple objects; antialiased lines and text; feathered selections; supports Photoshop plug-ins; custom filter creation; supports wide range of file formats.

CONS: Badly implemented Bézier-curve tool; only two colors per gradient; doesn't support QuickTime JPEG; poor image-editing tools; Smart Memory function impedes Finder operations.

COMPANY: Deneba Software (305/996-5644).

REQUIRES: Mac Plus; 2MB of RAM; hard drive; System 6.0.5; 32-bit QuickDraw for color.

LIST PRICE: $149.

Despite its new name, artWorks 1.0 is the latest installment of UltraPaint, the combination paint and draw program from Deneba, maker of Canvas. Like UltraPaint, artWorks competes directly with SuperPaint, the popular low-end graphics program from Aldus Consumer Division. While artWorks outperforms SuperPaint 3.0 on most levels, artWorks occasionally manages to disappoint, especially when compared with slightly more expensive image editors such as TimeWorks’ Color It.

Filter by the Numbers Never one to shy away from ridiculously complex features, artWorks lets you edit many of its filters by entering numbers into a matrix. It’s a valuable feature, the kind of thing you expect to see only in high-end image editors like Adobe Photoshop, but you need algebraic reasoning skills to get to first base with it. artWorks would be a better program for the entry-level user if it concentrated more on its low-end image-editing capabilities.

Regardless of file format, artWorks isn’t smart enough to size a document in keeping with the opened image. Every new image lands on a letter-size page. Meanwhile, artWorks doesn’t let you scroll off the page, so if you want to view, say, a horizontal image, you have to change the page size, a leap of logic that few initiated users are likely to make.

The image-editing tools perform significantly below what I expected. Even at their highest settings, the smudge and blur tools provide uniform results only if you drag extremely slowly. Otherwise, the tools perform sporadically, delivering discontiguous blots of smeared color that do more to spoil an image than to fix it. It’s also worth noting that the fill tool fails to take transitional edges into account, so if you try to fill an antialiased outline, artWorks creates a jagged halo around the interior color.

artWorks is the first Deneba program to include Smart Memory, a function that purports to dynamically adjust the amount of RAM occupied by the application. Under System 7 (or System 6 with MultiFinder), you don’t have to change the amount of memory assigned to artWorks using the Get Info command. Instead, artWorks merely usurps portions of the available RAM whenever you open large documents or perform memory-intensive operations. Under System 7.1, however, I found that artWorks didn’t communicate as effectively with the system software. Frequently, I couldn’t perform simple operations at the Finder level—opening folders, copying files, accessing control panels—because artWorks had gobbled up memory that the system thought it was using. Smart Memory is a nice idea, but unless it works 100 percent seamlessly with other open applications—including the Finder—this is one feature that can be downright dangerous to the stability of your Mac.

If you were expecting another graphics dynamo like Canvas, artWorks will leave you a little cold. Its draw capabilities don’t approach those of Canvas, and many of its paint tools lack clear purpose and implementation. Still, like Canvas, artWorks comes equipped with a wide range of import and export filters; you can open and save PICT, TIFF, EPS, GIF, MacPaint, and Adobe Illustrator files and even create start-up-screen documents.

artWorks is nothing if not a mixed bag. Despite its lack of pizzazz and its occasional flaws, the program provides enough low-end and midrange capabilities to make it one of the best graphics programs under $200. And let’s face it, artWorks is by any account a better value than SuperPaint. —Deke McClelland
First the Knoll Brothers created Adobe Photoshop...

"The new Pinnacle Optical drives are excellent companions to Photoshop."
John Knoll

"The PMO-650 is the ideal storage device for large images."
Thomas Knoll

...and now they store it on Pinnacle Optical Hard Drives.
(Mom would be proud.)

Circle 238 on reader service card
CD ROM TECHNOLOGY PROMISES A LOT—interactive access to large databases of information and graphics, animations, video clips, and QuickTime movies, all backed with simultaneous sound. The hitch lies in the word access. Waiting many seconds for a motion segment, or for a sizable graphics file to load into memory, many a CD ROM user has lost both patience and interest.

But there is hope: The AppleCD 300 belongs to a batch of new CD ROM drives that spin their discs at twice the previous speed—a linear velocity of 300 kilobytes per second as opposed to 150 Kbps. Still slower than hard drives, double-speed CD ROM drives are 20 to 70 percent faster than their predecessors, according to Macworld Lab tests. Plus you can now view and edit images from multisession Kodak Photo CD discs; you can listen to audio CDs in the background; and you can share CD ROM files over a network. (Expected noticeable slowdowns when more than one person is accessing a CD ROM, however.)

Plug and Play
SETTING UP AN AP PLECD 300 IS FAIRLY SIMPLE. Simple, that is, if you remembered to purchase separately the cable that connects to your Mac, a cable terminator, and a peripheral interface cable if you plan to chain your CD ROM player with other SCSI devices. The drive comes with a CD caddy, power cord, easy-to-follow documentation, and two floppy disks. One disk contains installation files, a CD Remote DA (an on-screen mock-up of a remote-control device that controls audio-only play), and a SpeedSwitch control panel device for switching between the 150 KB/s display, in which case you will see no enhancement at all. And don't forget, the faster the main processor in your Mac, the faster you'll see refreshed pixels on your screen.

Finally, if you are using System 7's file-sharing with the CD ROM player, note that users accessing discs over the network won't hear the audio portions.

Speed-o-rama
PICTURES AND SOUND ARE ALL VERY WELL, you might say, but is the AppleCD 300 really any faster? At the 300 Kbps setting, there are speed improvements of up to 60 to 75 percent when opening large, high-resolution color files such as those found on Photo CD discs. Operations that access smaller blocks of information, such as searching a database or navigating from one scene to another, however, may not be noticeably faster. QuickTime movies run the same length of time, but you'll probably see more frames per second at 300 Kbps—unless the CD ROM has been optimized for 150 Kbps display, in which case you will see no enhancement at all. And don't forget, the faster the main processor in your Mac, the faster you'll see refreshed pixels on your screen.

Is the AppleCD 300 worth it? I think so; I'm buying one. Its list price is only $50 more than the old AppleCD 150, the software utilities are well designed, overall performance is at least a little faster, and I'm looking forward to working with multisession Kodak Photo CD files. I don't mind the idea of donning headphones to listen to a little grunge rock or Gregorian chant while I work, and I like knowing that I can share files in a network setting. Thinking ahead, I look forward to QuickTime applications that will take advantage of the enhanced transfer rate to show faster frame rates in larger windows. —SUZANNE STEFANAC
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OU THOUGHT YOU'VE HEARD THE
last of integrated software pro-
grams? Well, think again. WordPerfect
Works (WPW) is a revised version of
BeagleWorks, an innovative but buggy
integrated program that Beagle Bros
WordPerfect claims that in addition
to renaming the program and updat-
ing the documentation, it has squashed
"a few hundred" bugs. WPW is indeed a
substantial improvement over Beagle-
Works 1.1 in the bug department and
is ready for prime time, although some
problems remain.
WPW consists of seven modules:
word processor, database, spreadsheet,
chart, draw, paint, and communications.
It uses System 7's publish and subscribe
to integrate the modules; however, under
System 6, it can also publish and subscribe
its own documents. This method is dif-
ferent from that of other integrated pro-
grams in that WPW actually creates a
new, separate document, or edition, and
links it to the document that you are
working in. For example, to add a draw-
ing to a report created in the word pro-
cessor, you use WPW's frame tool to draw
a box in the word processing document.
The program prompts you for the type
of frame you want (draw, paint, spread-
sheet, or chart), and then a window
appears within the word processing doc-
ument. Clicking in the draw frame allows
in-context editing, which means you can
modify the draw document from within
the word processing document.
Common to all WPW modules is the
floating tool bar, whose tools and menus
change depending on the module you're
working in. An advantage to the publish-
and-subscribe approach is that several
documents can be linked to one edition;
changes to the edition automatically up-
date all of the documents. A disadvantage
is that all this opening and linking takes
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Publisher: ASD Software
UT0335
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**StyleWriter II**

**PROS:** Small footprint; good-looking gray-scale printing; sharable over network; improved paper capacity and handling; improved type quality. **CONS:** Gray-scale printing is slow.

**COMPANY:** Apple Computer (408/996-1010). **LIST PRICE:** $359.

I've always liked Apple's StyleWriter. It wasn't the fastest, or even the cheapest, ink-jet printer available. But it was always the best-designed ink-jet and the one that fit best on my small desk in my home office. The new StyleWriter II is even better. It retains the best features of its predecessor, fixes some problems of the original design, adds new features that make it more versatile, and costs less than the old StyleWriter.

**Faster by Far**

Apple used a new print engine for the StyleWriter II, one based on Canon's bubble-jet technology that averages 2 pages per minute in Canon's tests, twice as fast as the 1 ppm rating of the original StyleWriter. In Macworld Lab's benchmark tests of font-intensive documents (with multiple fonts, Courier fonts, or TrueType fonts) the StyleWriter II was much faster than the original; the II printed the test documents in 45 percent to 83 percent of the time it took the StyleWriter to print the same documents.

It doesn't just print faster, the type looks better. By redesigning the printer's paper-handling path, Apple engineers were able to move the engine's print head closer to the paper, put more tension on the paper itself, stretch it tightly over a larger roller, and move the print head in smaller increments down the page. The combination of a flatter paper surface and a closer print head means that the ink doesn't spread as much when it hits the paper, sharpening edges and creating crisper type at 360-dpi resolution.

Even better, you're not limited to printing just text and black-and-white images anymore. Apple's new Quick-Draw printer driver, GrayShare, adds the capacity to print up to 100 levels of gray with an 85-line screen, producing beautiful gray-scale images. While I don't recommend using a StyleWriter II for high-end photographic reproduction, GrayShare provides great-looking images for invitations, newsletters, postcards, and letters. Although gray-scale takes much longer to print, GrayShare is smart enough to examine pages first and do only gray-scale calculations if there are images on the page, saving time on multipage documents.

GrayShare also provides the ability to share a StyleWriter over a network. When you select the StyleWriter II in the Chooser, a Setup button allows you to publish the printer on the network, password-protect it, and keep a log of printer usage. When someone wants to print to the shared StyleWriter, the print job is processed in the background on the connected Mac. This processing causes a slowdown on the host Mac, but it is a nice solution for a small office or for backing up when a shared laser printer goes out of service.

**Improved Design**

The StyleWriter II also sports a sleeker and sturdier look than its predecessor, which seemed slightly flimsy to me. The external power supply has been integrated into the body of the printer, adding an extra pound (although the printer is still less than 7 pounds). The two-part body has been fused into one, making it easier to feed them in automatically through the paper tray, rather than manually.

**Ink-Jet Competition**

The StyleWriter II's main competitor is Hewlett-Packard's DeskWriter. In the past, the DeskWriter was the ink-jet printer of choice for those who wanted speed or to share the printer over a network. Now you can share a StyleWriter II over a network too, and the StyleWriter II narrows the performance gap almost to a draw (although the DeskWriter retains a slight edge); benchmark tests show the StyleWriter II to be faster than the DeskWriter on the multifont Word and PageMaker tests and slower on others, like the FreeHand and MacDraw tests. The big difference between these printers today, however, is in print quality. The StyleWriter now surpasses the DeskWriter, producing sharper type and line art, and superior gray-scale images. The competition between two such good printers is bound to be good for consumers; the winner of this round is Apple's StyleWriter II. —Liza Weiman

**How Fast Is the StyleWriter II?**

Tests were conducted on a Mac II running System 7.1, with a cache card installed, 8MB of RAM, a Quantum Pro 80 internal hard drive, AppleTalk on, and background printing off if possible.

<table>
<thead>
<tr>
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<th>Aldus FreeHand 3</th>
<th>Aldus PageMaker</th>
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<td>499</td>
<td>344</td>
<td>294</td>
<td>226</td>
<td>705</td>
</tr>
<tr>
<td>Apple StyleWriter (best)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>705</td>
<td>705</td>
</tr>
</tbody>
</table>

Tests conducted on a Mac II running System 7.1, with a cache card installed, 8MB of RAM, a Quantum Pro 80 internal hard drive, AppleTalk on, and background printing off if possible.
**MicroMac Plus Upgrade System**

**PROS:** Speeds up the Plus dramatically.

**CONS:** Requires Plus system board to assemble the MicroMac. **COMPANY:** MicroMac Technology (714/362-1000). **REQUIRES:** Mac Plus; 4MB of RAM; hard drive. **LIST PRICE:** $998.

---

The MicroMac Plus Upgrade System from MicroMac Technology for the Mac Plus is not a board that fits inside the Mac, it's a system case into which you put your Mac Plus's system board and floppy disk drive. The MicroMac System that I assembled also came with MicroMac's full-page monochrome monitor and ZeroSlot video board. MicroMac's 68030-based 25Mhz MultiSpeed Accelerator, and Connectix's Virtual RAM-disk software.

To assemble the MicroMac System you remove the Mac Plus's logic board and floppy disk drive, remove the components that are shipped inside the MicroMac System, and then reassemble the Plus and MicroMac parts in the MicroMac system case. You now have a low-profile Macintosh, with a slightly larger footprint than that of a Plus. The monochrome full-page display (included with the bundle I tested) can sit on top of the system case. The opening for the floppy disk drive is on the front right of the MicroMac case, where you'll expect it. MicroMac will buy the Plus case (currently for $30), reducing the incremental cost of the upgrade system. (For additional upgrade options, see "Expanding a Compact Mac," in this issue.)

Although the kit comes with most of the necessary tools, it does not include an antistatic wrist strap, which is used to prevent an electrical charge from possibly blowing out any of the components on the circuit boards. In the list of tools you need, the manual mentions an antistatic wrist strap, but doesn't say why you need the device. (You can buy one inexpensively at most dealers.) Be sure to use a wrist strap, or an antistatic mat. On a more important point, the manual was quite clear about the potential for harm to the installer from the high-voltage wire, a part of the Mac Plus's display system that can deliver a dangerous electrical charge even long after the Plus has been turned off and unplugged.

Once I had gone through the manual completely and laid out all the parts, installation was fairly straightforward and the instructions were clear. The photographs in the manual were a little murky and sometimes didn't show as much detail as I wanted, but I was still able to install everything and get things up and running. Although the assembly process took a little longer than the hour stated in the manual (I recommend at least an hour's study of the manual before you begin), once the computer was put together in the MicroMac system case, it worked well. The overall speed improvements were impressive, and the MicroMac system worked with all the software I tried except one game that does not follow the Apple guidelines for software development. The full-page monitor is also a big improvement over the small screen of the Mac Plus.

So, would I recommend the MicroMac Plus Upgrade System? Overall, I recommend you look at the prices of some of the new low-end Macs and think about whether I needed a full-page monochrome monitor. If you want to stick with a monochrome system, the MicroMac System is fine as an accelerator and it lets you add an external monochrome monitor. But if you want to move up to color, I suggest you buy an LC II or LC III for just a little extra money.—TOM MORAN

---

**Now Up-to-Date 2.0**

**PROS:** Reminder control panel enables you to add and edit calendar events without launching program; fully customizable display; plentiful keyboard shortcuts. **CONS:** Some conflicts with Reminder. **COMPANY:** Now Software (503/274-2800). **REQUIRES:** Mac Plus; hard drive; System 6.0.5. **LIST PRICE:** $99; five-user package $449; ten-user package $799.

With the release of Now Up-to-date 2.0, Now Software has brought us one giant step closer to the ultimate calendar program. Not only does this update address the inadequacies of version 1.0, but it also provides outstanding enhancements to many of the program's already admirable features. The result is a calendar utility that is almost irresistible.

The new version still offers brisk performance and multiple views of your schedule in graphically pleasing monthly, daily, and weekly formats. But now there are more and better ways to organize your data—whether you're a private user or part of a group sharing calendar information over a network.

For example, in the new List view, all calendar events can be viewed in a text-based list format. The view can include events from a single day or for any number of days, weeks, or months you define. You can sort your list by event type, date, priority, or any of ten other possible criteria simply by clicking on the appropriate field heading.

Another dramatic enhancement is the addition of several new designations for calendar events, including a To-Do category for items that are not time-specific. There's also a new Undated To-Do designation for general to-do items that don't carry a specific deadline. To-do items automatically carry over to the next day until they are checked off (which can be done with a keyboard command.)

The monthly calendar view has been greatly improved. Text in calendar events now wraps within each date cell, so titles aren't abruptly cut off. And you can scroll through multiple entries for a certain day by clicking on arrows within the date cell. In the Event Info dialog box, descriptions can be up to 32K of comments, and they appear in a scrollable window.

In the daily view, you can use a keyboard shortcut to zoom into the day's graphical time line. You can view the continue
To Viruses It's Like A In Front Of AN ELECTRIFIED AND, Totally Surrounded BY A Moat FULL OF.
Pro and Con lists

EXECUTIVE EDITOR

By Joseph Schorr

In 1990, when the Reminder program was first reviewed in MacWorld, no one offered an up-to-date calendar, without launching an entire day from midnight to midnight or a single hour, in minute-by-minute increments. This is a major advantage over version 1.0.

Probably the best of the new features is the updated Reminder control panel, a separate component that enables you to add, delete, or modify any event on your Up-to-Date calendar, without launching the program itself.

When Reminder is installed, a clock appears on the menu bar, regardless of which application you’re running. Clicking on the clock produces a pull-down menu containing all the day’s appointments, to-do items, and so forth. By selecting New Event or Edit Event from the menu, you can edit calendar items and set alarms to notify you of upcoming events through an alert dialog box or a flashing message on the menu bar.

Better still, you can define a hot key to open the Reminder dialog box at any time to modify calendar events. Some users have reported minor conflicts with the Reminder INIT, but Now Software says an update is in the works to fix any minor bugs that have been discovered.

Networked users can edit Public Categories, calendar entries shared over a network, while offline; the entries update automatically when you reconnect to the Public Events Server. And even non-networked users can define categories for events and assign each category a unique style and color. In any view, items can be filtered by category or by groups of categories. You can also override the style and color of a category for a particular item to make it stand out.

The program has been beefed up with more and better shortcuts and prints options in all the standard organizer formats. In addition to data export, there’s a new archiving function that not only exports data to a text file, but also automatically deletes the exported items from your calendar file to save space.

All in all, Up-to-Date’s striking flexibility, ease of use, and streamlined operation are a winning combination. This is one upgrade that is definitely worth the price.—JOSEPH SCHORR

### MovieWorks Software

**MovieWorks 1.1**

**PROS:** Includes modules for editing graphic, text, and sound elements; button links allow for interactive presentations.

**CONS:** Unbearably sluggish performance; crude editing tools.

**COMPANY:** Interactive Solutions (415/377-0136).

**REQUIRES:** Mac LC; 5MB of RAM; 256 Colors; System 6.0.7; QuickTime. Recommended: 8MB of RAM. **LIST PRICE:** $395.

**MOST MULTIMEDIA AUTHORING TOOLS are designed to integrate pre-existing graphics, sounds, animations, and QuickTime movies into a cohesive production. MovieWorks, an entry-level multimedia package, goes one step further, giving you the tools to actually create and edit the sounds, graphics, text, and movies you want in your production.**

This all-in-one approach has some merit—it means you can produce multimedia presentations without owning other graphics- or sound-editing software. But, as it turns out, MovieWorks is too sluggish and awkwardly designed to be worthy of recommendation.

MovieWorks has four separate modules. You use the main application, Composer, to assemble and play back presentations. The Paint, Sound, and Text modules are used to create and modify the graphics, digitized recordings, and lines of text that appear within a presentation.

Under System 7, the paint, text, and sound editors can be launched from within Composer, though this requires 8MB of RAM—twice the amount needed to run Composer by itself.

Alternatively, you can import sounds, pictures, text, and movies created with third-party applications into Composer. The program supports PICT graphics, PICS animations, QuickTime movies, and sound in AIFF or snd formats.

Once you import a new source file (called a track), you can position it anywhere on the presentation stage, or background, and you can apply any number of transitional and animation effects to control each element’s entrance and exit.

The Tracks menu provides access to 14 different transition effects, such as dissolve, wipe, and blinds (Macromedia’s Action provides 30 transitional effects; Passport Designs’ Passport Producer offers 18). There’s also a scaling function, to zoom objects in and out to a predetermined size for dramatic effect.

To add even more zip to a production, you can animate graphics or text tracks, moving them across the stage in a selected path. The tool palette offers five different kinds of paths. For example, you can have a title fly in from off screen along a straight path, or make a graphic element travel in a circular or rectangular path along the perimeter of the screen. Objects can also accelerate along a path and decelerate as they stop. This Ease In and Ease Out effect makes for natural-looking animated movement on screen and is one of MovieWorks’ unique features.

You can string together MovieWorks presentation segments sequentially, or you can insert buttons into the presentation so that a segment plays only when a user clicks on a particular button. This allows you to create self-running interactive presentations.

To adjust the timing of events within each segment, you can view your presentation in the TimeView window, in which each presentation element is represented as a bar on a time line. You drag the bars to set the timing of entrances, exits, transitions, and so on.

Once you’ve painstakingly imported each element; set animated paths, transitions, or other effects; and precisely set the timing of each event, you’ll want to play back the results. This is where things really bog down.

MovieWorks records each segment of a presentation in QuickTime movie format, so you must compress each sequence before you can play it back with accurate timing. The compression takes a long time and you must compress frequently—even minor modifications won’t show up without recompression. If your presentation is made up of numerous sequences, you spend a lot of time waiting.

But even when you’re not waiting, the program offers inferior performance. The sound, graphics, and text editors are particularly weak. The Text module offers no tools for kerning text, while the Paint component is painfully slow and lacks the polish of a full-scale paint program.

The first release of MovieWorks was horribly bug-ridden. With version 1.1, the company claims to have fixed more than 100 bugs, but problems persist. For example, a command that is supposed to remove the menu bar from your screen when in Play mode simply doesn’t work.

For now, MovieWorks is a good idea poorly executed. It makes assembling a presentation far too time-consuming, and it makes you work too hard to get satisfactory results. The paint, sound, and text editors aren’t worth the trouble. Other packages, such as Action and Passport Producer, contain many of the same features, but operate smoothly and are easier to learn.—JOSEPH SCHORR

---

**Sorting It Out**

The new List feature presents your to-do items and appointments in an organized text-based format.
No wonder the competition is running for cover.

Our new accelerators deliver all the speed theirs do. Plus a lot more features. At a much better price.

Take our new 25 MHz SE/Classic Accelerator. For about half the price of DayStar's entry-level accelerator, it more than doubles the speed of your SE or Classic. And at $349, our 25 MHz LC Accelerator is another spectacular value.

But that's not all. Only our accelerators feature expansion options for EtherNet and enhanced video capabilities. So when you plug them in, you can still add high-speed networking and a full-page display.

Get GREATER EXPANDABILITY AT A BETTER PRICE WITH AN APPLIED ENGINEERING ACCELERATOR.

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<td>Yes</td>
<td>Yes</td>
<td>$349</td>
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</table>

Ask about our complete line of upgradeable accelerators!

Plug in a DayStar (or any other brand) and you're out of options.

And when you're ready for more speed, our Step-Up program lets you move all the way up to Quadra-level performance by simply upgrading to one of our faster accelerators.

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4TH DIMENSION IS THE MOST POPULAR RELATIONAL DATABASE FOR THE MAC, BUT ITS PERFORMANCE IN MULTUSER MODE WAS A LONG-STANDING SOURCE OF COMPLAINT. THAT'S ALL BEEN FIXED NOW. 4D SERVER USES THE INGENIOUS MULTITASKING SITE (SEE "SIGN-UP SHEET"). WITH A 5-USER $1495; SIX USERS $2495; TEN USERS $3495.

VARIOUS PROS: SIMPLE INSTALLATION AND ADMINISTRATION; DISTRIBUTED MULTITASKING; FAST MULTITUSER PERFORMANCE. CONS: DOESN'T INCLUDE BACKUP OR SQL CONNECTION; EXPENSIVE; ONLY ONE OPEN DATABASE AT A TIME; HARDWARE-KEY COPY PROTECTION.

COMPANY: ACI US (408/252-4444).

REQUIRES: MAC PLUS; 2MB OF RAM (PLUS 130K PER USER); HARD DRIVE; LOCAL TALK, ETHERNET, OR TOKEN RING NETWORK USING APPELTALK; SYSTEM 6.0.5. LIST PRICE: FOR UP TO THREE USERS $1495; SIX USERS $2495; TEN USERS $3495.

150 June 1993 MACWORLD
RUN 1.44 MB MAC AND DOS DISKS ON YOUR MAC PLUS, SE OR II.

Now there's an affordable way to add SuperDrive compatibility to your older Mac. Just plug in a PlusDrive* from Applied Engineering.

Instantly, you'll be able to exchange floppies with newer Macs. Reading and writing to high-density 1.44 MB disks, as well as 800K and 400K disks.

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you type one space after the period.

Both programs can teach you the Dvorak keyboard layout, a reorganization of the traditional keyboard layout meant to increase your typing speed. (The layout was designed by August Dvorak, no relation to John, in 1930.) MacPlay says a future DOT update will include a file allowing you to use the Dvorak keyboard in all applications. Mavis doesn’t work with actual Dvorak keyboards, but the company expects future versions to be compatible. Mavis shows how to position your hands and displays a diagram showing how typists should sit to reduce the physical strain of repetitive motions.

DOT’s interface is ugly and DOS-like, though MacPlay promises a redesign. Mavis is more colorful. DOT takes up a whopping 5MB of hard drive space, compared to Mavis’s 2MB.

You can select one of three characters, including Dvorak himself, to be your tutor, who comments when you’ve completed a lesson (it was hard to believe my tutor’s remark, “I wish I could type that fast,” when I typed 23 wpm). I found the voice irritating, not to mention insincere.

Both programs offer a game when you tire of lessons. In DOT, typing faster encourages a knight to attack a warrior. It’s more an animated display than a game, since there’s no real objective and no way to win; you can’t even watch the action, because you have to read which letters to type.

Mavis includes two games—one for typing lessons and one for the ten-key; both are a lot of fun. For typing lessons, you’re driving a race car: the faster you type, the faster you go. If you’re working on numbers, Mavis provides you with a temporary job as a grocery clerk. You type in the price of food as it moves along the conveyor belt. If you’re correct, the food lands in your recycled paper (not plastic) bag; if you’re wrong, it falls to the floor.

If being entertained while learning to type interests you, choose Mavis. It costs the same as DOT, but provides varied environments, interesting lessons, and good games. For $49.95, Mavis is too good a deal to pass up.

—JOANNA PEARLSTEIN

**MultiDisk 150**

**PROS:** A whopping 150MB disk capacity with speed to match fixed hard drives; handy floppy-based cartridges can withstand abuse unthinkable with SyQuest removable; fast, reliable formatting software.

**CONS:** Media cannot be partitioned; difficult to seat SCSI cables.

**COMPANY:** Iomega Corporation (801/788-1000). **REQUIRES:** Mac Plus; System 6.0.5. **LIST PRICE:** $1225; Macintosh Interface Kit $49; 150MB disk $245; 105MB disk $169; 65MB disk $125; 35MB disk $79.

**nm**

Iomega’s Bernoulli removable drives have long played second fiddle to SyQuest technology in the Macintosh world. I’ve always wondered why, since Bernoulli cartridges seem better suited to transportable use. Because the read-write heads float above the media in Bernoulli drives, the cartridges are virtually free from head crashes, unlike SyQuest cartridges, which require careful handling.

The MultiDisk 150 uses a new line of cartridges with capacities of 35MB, 65MB, 105MB, and 150MB. (The existing 90MB cartridge can be used, but write speeds are rather slow, and the 44MB disk can be read but not written to.)

Hookup differs little from other SCSI drives. The MultiDisk’s rear panel includes switchable internal termination, SCSI ID selector, two 50-pin jacks, and an on/off switch. The only glitch I observed in hooking up the drive was the difficulty in seating the SCSI cable onto the jack. It was a snug fit, and the clamp came off the jack but was easily reattached. This was only a minor annoyance.

The printed Read Me setup sheet is simple to follow but suggests that the Bernoulli performs to its maximum potential if it’s the last physical item on the SCSI chain. I tried the ‘Transportable in the first, third, and last (sixth) position on the SCSI chain of a Mac IIci, and I found no measurable change in performance.

The 5½-inch Bernoulli cartridges are slightly thinner and much lighter than their SyQuest counterparts. They look like overgrown floppy disks, with a large disk shutter at one end, and a write/no write button on one corner. Iomega’s sales literature claims “Bernoulli disks are the equivalent of an 8-foot drop.” To test this statement, I dropped a cartridge from the ceiling to a hard tiled floor—about 8 feet. True to the company’s claim, a full suite of disk tests with Iomega’s Workshop formatting utility showed the cartridge to be in perfect working order. While in theory Iomega’s floppy-based disks are not as long-lived as the SyQuest cartridges (the difference between floppy-based media and hard, metal platters), the Iomega disks carry a five-year unconditional warranty.

All Bernoulli cartridges come preformatted and need only be initialized with Workshop’s Erase Disk function. It takes just a few seconds to get the cartridge up and running. Workshop offers some unique features including Verify (which cuts write speed virtually in half, but is recommended to ensure data integrity), Auto Flag, and an Auto Sleep mode, which powers down the drive after a specified interval of inactivity. There is also a display showing estimated disk and formatting life of the cartridge. To speed up cartridge performance, Workshop allows you to set aside RAM as a cache. Like the disk cache in System 7, the MultiDisk cache stores frequently used data in RAM to speed up read performance.

The MultiDisk 150 is fast. Both La Cie’s Time Drive and FWB’s BenchTest utilities showed sustained read/write speeds of 1050K per second and more, about 15 to 20 percent faster than my SyQuest 88. Though access time never approached the 18 milliseconds claimed by the Iomega manual (I got an average seek time of around 18ms, but access time was much higher), this was only noticeable when deleting a large number of files, where there seemed to be a slight delay as files were removed from the disk. Since the read-write heads have less area to cover on the 35MB cartridges, overall speed increased another 10 percent or so.

Workshop was fast, reliable, and seemingly bug free. The only downside is that disks cannot be partitioned. The drive itself makes a whirring sound not unlike a floppy drive on helium, and is much more pleasant than the grating sound typical of SyQuests. Customer service is a toll-free phone call, and responses were always friendly and informative.

Despite the higher price for the drive, Iomega has brought the price of its removable cartridges down to a more competitive basis with SyQuest disks (especially if you purchase Iomega disks in three-packs). The MultiDisk 150 is a viable contender in the removable-drive market. It is fast, reliable, and most important, the cartridges are extremely resistant to mishandling. In a busy production environment, where damage of a removable cartridge (and the loss of valuable data) is always possible, this may be the strongest reason of all to choose Bernoulli. —GENE STEINBERG

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**Removable Cartridge Drive**

**OMEGA’S BERNOLI REMOVABLE drives have long played second fiddle to SyQuest technology in the Macintosh world. I’ve always wondered why, since Bernoulli cartridges seem better suited to transportable use. Because the read-write heads float above the media in Bernoulli drives, the cartridges are virtually free from head crashes, unlike SyQuest cartridges, which require careful handling.**

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OUR NEW POWERBOOK MODEM LEAVES GLOBAL VILLAGE SPEECHLESS.

Stop! Don't do it! Don't buy an everyday modem when for a few dollars more, you can get the one that turns your PowerBook into a complete communications center.

Applied Engineering's DataLink PB® lets you send and receive data and faxes, just like Global Village's PowerBook modem. But only the DataLink gives you a powerful competitive edge where you really do business on the telephone.

When you're making calls, your PowerBook becomes a turbo telephone/speakerphone. Right on the screen is your personalized phone number listing with quick dial and a point-and-click keypad. You can take online notes or check files and records as you talk. Your PowerBook will identify callers as calls come in® and keep complete records of all your calls. It's like having a personal secretary right in your PowerBook.

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APPLE'S OLDEST AND LARGEST DEVELOPER SINCE 1979

Circle 310 on reader service card
Interactive Training for Director

**PROS:** Easy to use; self-paced; unintimidating; includes quick-reference card for Director.

**CONS:** Hard to replay some segments.

**COMPANY:** Media In Motion (415/621-0707).

**REQUIRES:** Mac II, 4MB of RAM; 13-inch, 8-bit color monitor; hard drive; System 6.0.7; Macromedia Director 3.0.

**LIST PRICE:** $199.

---

MathCAD 3.1

**PROS:** Incorporates some of Maple's symbolic-computation capabilities; improved graphing; coordinated with equation handbooks.

**CONS:** Needs more documentation on symbolic math; slow scrolling of most documents.

**COMPANY:** MathSoft (617/577-1017).

**REQUIRES:** Mac Plus; 5MB of RAM; 10MB of free hard drive space; System 6.0.5.

**LIST PRICE:** $495.

---

Numerical and Symbolic Computation

Previously, MathCAD was a sort of giant scientific calculator and equation solver, competing with TK/Solver and the now-defunct Eureka as an engineering tool. Now, MathSoft has acquired rights to Maple, a symbolic-computation program from the University of Waterloo, Iowa, that is one of the few packages with the scope of Mathematica (the leading symbolic-computation program from Wolfram Research), and incorporated a selection of the most useful symbolic processing routines into MathCAD. The program is not as fast at numerics as Bimillenium's HQ is, and it offers only a fraction of the symbolic routines available in Mathematica or the full version of Maple, but MathCAD works.

It's far easier to print a nice-looking four-page report on a calculation in MathCAD than in any other math package. Equation editing is now easier and more intuitive (there are still awkward bits of the programs' DOS and Unix heritage sticking out), and version 3.1 can handle nine open documents, greatly facilitating equation-swapping. Graphs now incorporate more presentation-style features, and can be modified quickly through a single, simple graph-format dialog box. Because a MathCAD page can contain many "live" elements calling for recomputation or replotting, scrolling is often slow, but MathCAD is more convenient than equation processors (certainly more convenient than the equation editor in Microsoft Word 4.0).

MathCAD 3.1 uses Maple routines for Fourier transforms, linear and nonlinear equations, and matrix algebra. Maple is fast, and fortunately the MathCAD interface doesn't slow it down much—in practice you can invert a 10 by 10 symbolic matrix with about a 20-second wait on a 1-IIe, and routine jobs such as factoring polynomials and expanding expressions are handled quickly. For larger jobs (say, dealing with complicated differential equations) Maple V or Mathematica are better choices, but the addition of basic symbolic computation makes MathCAD much more useful, despite only 30 pages of documentation of symbols. Finally, MathCAD offers $99 electronic handbooks that work with version 3.1, covering statistics, electrical engineering, mechanical engineering, chemistry, and physics. If you have a handbook for a favorite topic, you can simply pull live equations and graphs into your MathCAD document. It doesn't get much easier.

MathCAD is easy to learn and easy to use, produces good reports, and is now much more powerful than earlier versions. It still doesn't compete in scope with the largest math programs, but for most science and engineering tasks it's the fastest way to get problems solved.—Charles Seiter
6 steps to healthy computing

1. Curtis Custom Glare Filter —
   Relieves eye strain and fatigue, cuts glare up to 99%, and reduces VLF radiation up to 98%.

2. Curtis Monitor Arm —
   Positions and adjusts monitor to optimum viewing angle to reduce glare and improve posture. Both arm and platform swivel 360°.

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   Keeps supplies in reach and relieves tired, aching wrists with built-in wrist rest. (Wrist rest also available separately.)

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5. Curtis Wrist Rest —
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Circle 20 on reader service card
Safe & Sound

**PROS:** Clean, simple interface; low price.

**CONS:** Incomplete set of utilities for some users; documentation includes no explanation of technology.

**COMPANY:** Central Point Software

**(502/690-8090).** **REQUIRES:** Mac Plus; 2MB of RAM; System 6.0.5. **LIST PRICE:** $49.95.

**REVIEWS**

**Documentation includes no explanation of Sound fits on a single disk.** The six-page documentation clearly instructs you on the use of all the product's features, and the product is an outstanding first disk utility for a novice user.

Safe & Sound is an emergency recovery tool when you're not getting a "clean boot," that is, when your computer's start-up routine is not executing normally. You power up the machine with the utility's floppy disk in the drive for problems such as the blinking question mark on the disk icon, the cryptic Mac icon (the "sad Mac"), or the Finder telling you it can't recognize your drive. The disk launches the utility using its own System file and immediately starts scanning the hard drive. This requires no sophistication on your part.

But Safe & Sound does do some sophisticated disk testing and remediation. Its analysis covers a lot of ground. It checks boot blocks, which contain the references that enable the Macintosh to find the Finder and System files. The program checks the volume information block, which keeps track of critical information, including type of drive format and number of files and folders. It analyzes the catalog tree, which keeps track of the file information you get when you choose Get Info from the Finder, and the extents tree, which keeps track of where the pieces of fragmented and cross-linked files are. And Safe & Sound checks for bad blocks, sections of your hard drive that don't meet the program's specifications for integrity.

Safe & Sound offers a number of other maintenance options and lets you choose which ones to run. During a maintenance sweep, the utility scans for viruses, although it doesn't continually keep an eye open for them in the background. It checks for multiple System files on the disk, which can cause Macs intermittent and unpredictable problems. It marks bad dates for files (before 1970 or off in the future) and changes them to the current date. It checks for the attribute that allows file icons to display properly. And the program alerts you if you have more than a specified number of fragmented files or files you haven't backed up since they've been revised.

Safe & Sound doesn't back up or defragment your files, nor is it a proactive virus checker, one that intercepts a virus. Central Point Software advises you to buy other Central Point products if you want to back up files, defragment your hard drive, or run a vigilant antivirus program. Because these functions aren't as universally useful as the disk-repair functions, it makes sense for many people to do without them, but the stripped-down nature of the Safe & Sound utility set may be lacking for some users. In exchange for stone-cold simplicity, you have to trade off depth of features and exhaustive completeness.

Power users and people who want an all-in-one package should look at Central Point's MacTools or the recent Public Utilities from Fifth Generation, but for the vast majority of users, Safe & Sound's "less is more" philosophy makes sense, providing a compact, useful product that's easy to run and master, without the clutter of most bloated utility packages.

—Jeffrey Gordon Angus

Magnetooptical Disk Drive

**Infinity Optical 3.5**

**PROS:** Compact removable media hold 120MB; medium is unaffected by stray magnetic fields; has external termination and SCSI-address switches; includes control panel for reading DOS-formatted cartridges.

**CONS:** Costlier than other removable-media drives; slow performance when writing.

**COMPANY:** Peripheral Land

**(510/657-2211).** **REQUIRES:** Mac Plus; System 6.0.5. **LIST PRICE:** With one cartridge $1999; additional cartridges $70 each.

**REVIEW**

**T's refreshing to find a program, especially a utility program, that has stripped out all the clutter for the benefit of the user.** Central Point Software's Safe & Sound is a limited but useful disk protection and salvage utility.

A scaled-down version of Central Point's MacTools software package, Safe & Sound fits on a single disk. The six-page documentation clearly instructs you on the use of all the product's features, and the product is an outstanding first disk utility for a novice user.

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—Jeffrey Gordon Angus

The Infinity 3.5 provides rear-panel SCSI-address and termination switches that eliminate the need for a SCSI terminator—a convenient touch. The drive also includes a control panel that enables you to transfer files from MO cartridges formatted on DOS machines. The DOS Transfer control panel does not enable DOS-formatted cartridges to appear on the Mac's desktop, however; for that, you need a utility such as Dayna Communications' DOS Mounter.

In Macworld Lab tests of 3½-inch drives, the Infinity 3.5 was among the fastest Sony-based machines, which were as a group slightly slower than 3½-inch MO drives built around a MOST mechanism. In the bigger picture, MO drives are generally slower than hard drives and SyQuest and Bernoulli drives but much faster than floppies, which use enhanced floppy disk technology to store 21MB per cartridge.

If you want removable media that perform as fast as a fixed hard drive, you should consider a SyQuest drive or one of Iomega's new Bernoulli MultiDisk 150 drives, whose cartridges hold 150MB. Both the Bernoulli MultiDisk 150 and PLI's SyQuest-based Infinity 88RRWV4+ retail for less than $1100. But if you need the extra measure of permanence that magneto-optical storage provides—or you want a compact alternative to bulky cartridges—the Infinity 3.5 deserves a look.—Jim Heid

156 June 1993 MacWorld
Imagine the reaction to our new PostScript Level 2 printer.

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<td>List Price</td>
<td>$1,199</td>
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No matter what the competition says about our DEC Laser 1152, you'll swear by it. Call 1-800-DECINFO, ext. 849 to place your order or get the name of your local distributor.
Software Emulator

SoftPC with Windows

PROS: Preserves the tiniest Windows details; convenient Mac-managed Setup menu.

CONS: Slow; cumbersome installation.

REQUIRES: Mac Quadra or other 68040 Mac; 8MB of RAM; hard drive; System 6.0.5. Recommended: 16MB of RAM.

LIST PRICE: $499.

FOFTPC WITH WINDOWS IS AN AMAZING ACCOMPLISHMENT. Insignia's original product, an emulator for DOS, carried out a much simpler task; DOS is a non-graphical operating system and makes minimal demands on computing resources. Windows, on the other hand, is the most egregious resource-hog ever to find widespread commercial acceptance, and producing a Windows emulator is a severely daunting programming challenge.

What you get is a window on the Mac desktop that behaves like a window on a 286-based AT-compatible PC with Windows 3.1 and DOS 5.0 installed (a 386 or 486 emulation would have been preferable, but one hasn't been done yet). The display emulates CGA, EGA, or VGA, and can show 256 colors at maximum resolution, 1280 by 1024. With the addition of Insignia's $149 SoftNode, this emulated PC also has Novell NetWare access, and the software includes Microsoft CD ROM driver software. It is just like having a Windows PC hiding inside your Macintosh—you can install any Windows-based program by following the original instructions, with no modifications or tricks. The installation of SoftPC with Windows itself is authentically as annoying as a real Windows installation; if you want to change the size of your CD hard drive (really just a file area on your Mac hard drive), you must slog through nine floppy disks, just as if you were changing a real piece of hardware. Other installation parameters, fortunately, can be changed through SoftPC's Setup menu, which rides above the Windows window.

The only difference between your emulated Windows PC and a 25MHz 386SX system (street price about $900) is performance. Dreamlike languor is one way of characterizing the execution speed; scrolling a document in Microsoft Word for Windows makes one wonder about the performance of Charles Babbage's mechanical computer. Specifically, on a Quadra 950, SoftPC with Windows is about three to six times slower than on a 25MHz 386SX, with (for some reason) Microsoft's own programs running slower than anyone else's.

That observation, however, leads us to the actual point of the product. You'd have to be balmy to run Excel for Windows this way; any Mac program will outperform its Windows equivalent running on an emulator. The reason for SoftPC with Windows is access to Windows software developed in-house (accounting systems or customized databases, for example) or for specialized vertical markets. A Centris-plus-SoftPC system, for about $3000, would give you a fast Mac and reliable, if slow, Windows capability—in short, access to most of the software worth using on the planet today. It's not cheap and it's not fast, but SoftPC with Windows is a reasonable solution to special software access problems.

—CHARLES SEITER

Hypermedia Publishing Program

Expanded Book Toolkit 1.0.1

PROS: Lets nonprogrammers produce sophisticated hypermedia books. CONS: Ability to customize basic templates is limited.

COMPANY: The Voyager Company (310/451-1383).

REQUIRES: Mac Plus; 2MB of RAM; hard drive; System 6.0.7; HyperCard 2.1.

LIST PRICE: $295.

PUBLISHING A BOOK IS HARD WORK.

Producing a multimedia, hypertext book is a downright herculean labor, requiring programming, layout, and design skills, as well as lots of time and patience. Now, however, with Voyager's Expanded Book Toolkit, even average mortals can create functional, elegant multimedia books in a fraction of the time it would take to do the job unassisted.

Toolkit is essentially an interface that shields users from the nuts and bolts of HyperCard. To begin a new book, you select a template and then import text files. The Toolkit automatically creates new pages, flows the text, and handles such chores as laying out chapter openers and producing a hyperlinked table of contents.

Forging your own multimedia links is a simple matter of highlighting text and then clicking on buttons in the annotation dialog boxes. Annotations can jump a reader from one page of your book to another, and they can also call up floating text boxes, pictures, recorded sounds, QuickTime movies, and other electronic books.

Toolkit books automatically contain all the functionality of Voyager's commercial Expanded Books. Features include word-search, excellent navigation tools, tools for marking text and making notes, and online help (see "The Complete Annotated Alice," Reviews, June 1992).

Various tools augment HyperCard's rudimentary text-handling functions and generally make an on-screen publisher's life livelier. If you edit text after importing it, for example, Toolkit refloows the pages to fill in gaps. The Find functions let you define and search for widows and orphans, as well as search by font, text size, and text style. Keep and Revert give HyperCard a proper Undo function.

While Toolkit is a leap forward by HyperCard standards, desktop publishers should know that this is no QuarkXPress. Fundamental formatting functions such as tabs or justification are nonexistent, and many tools are primitive compared with those of even a basic word processor. For example, block indents are created by a tool that adds carriage returns and spaces (another tool strips them out). And if you insert a new annotation, Toolkit won't go back and renumber the old ones.

Another difference between HyperCard publishing and print publishing is that while anyone can alter a PageMaker template, only HyperCard aces should try to tinker with the Expanded Books' basic design. Expanded Books are one part document, one part finely tuned machine. While it's OK to swap fonts and add graphics, moving, say, to a two-column format could disable some or all of the book's features. A final surprise for some print publishers will be the small licensing fee Voyager charges for commercial projects.

All in all, however, Expanded Book Toolkit is an excellent program for teachers, documentation producers, and anyone interested in seeing what multimedia is all about. I wouldn't recommend it to people with absolutely no HyperCard experience—or no interest in gaining such experience. Multimedia is tricky by nature, and even Toolkit's friendly design and helpful manual can't produce a fail-safe environment. But if you're willing to thrash around a bit and can live within Toolkit's design limitations, this program can save you a lot of time and trouble.—JOE MATAZZONI
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KidDesk 1.0

**PROS:** Easy to use and set up; childproofs adults' data; good documentation.  
**CONS:** Under System 6, Kid's Documents and Time Reminder are disabled; scanning feature disables certain KidDesk accessories.  
**COMPANY:** Edmark Corporation  
**REQUIRES:** Mac Plus; 2MB of RAM for color; hard drive; System 6.0.7  
**LIST PRICE:** $39.95

If your young children love to experiment with your Mac, you may know the frustration of losing files or finding them renamed with mystifying labels like **eksvnrijstkej**. That makes you a candidate for KidDesk, a desktop environment designed to appeal to children while protecting their parents' data from the havoc that curious little fingers can wreak.

KidDesk replaces the Finder's desktop with one of six desks, each with nine accessories: Name Plate, Picture Frame, Lamp, Pencils and Pens (or Paints), Clock, Calculator, Calendar, Phone, and Recorder. On Macs equipped for sound input, you can record sounds and messages with the Recorder for your child to play back on the Phone; otherwise, the Phone plays messages built into the program.

The Adult Section is where you add, remove, or customize desks. For each child's desk icon, you can choose one of the icons provided, create or modify one with KidDesk's icon-editing tools, or import a PIC file. You can also choose your child's exit option: shut down, quit to the Finder, or keep KidDesk running.

Normally, any application you add to KidDesk appears on all desks, but the Limit Applications feature lets you hide a program from a selected child's desk, making it inaccessible. You can also turn on and off any KidDesk accessory, and remove them from or return them to the desk.

Under System 7 KidDesk adds documents your children create to their individual desktops. You can also add existing documents to a child's desk, and detach documents, making them inaccessible from KidDesk. Also under System 7, Time Reminder lets you type in a message to appear at a specific time or at set intervals.

Under System 6.0.7 and 6.0.8, you can't use MultiFinder with KidDesk—and you must quit KidDesk to access the Finder.

KidDesk's scanning mode is useful for very young children and those with disabilities. With Scanning turned on, most KidDesk accessories automatically highlight in a regular sequence, making them accessible with a single mouse-click, a touch screen, or a single-switch device (a special input device for those physically incapable of accessing a mouse, keyboard, or touch screen). However, Scanning mode turns off Time Reminder and Recorder, and substitutes an abbreviated Calendar display.

Occasionally KidDesk did not open at start-up, leaving my files vulnerable. Edmark traced the problem to two antiviral utilities, SAM and Virus Checker (part of MacTools 2.0). It only happens with System 6 so you can either disable the offending utility or upgrade to System 7.

Cute accessories aside, KidDesk's main advantage is its practicality. It provides an easily navigable play environment for young children while safeguarding their parents' files and applications.—CATHY ABAS

---

Peace of Mind 1.2.2

**PROS:** Performs exhaustive diagnostics and benchmarks; normal and power-user modes; good documentation.  
**CONS:** Provides no comparative test history; minor bugs.  
**COMPANY:** Polybus Systems Corporation  
**REQUIRES:** Mac Plus; 2MB of RAM; System 6.0.5  
**LIST PRICE:** $149

**PEACE OF MIND IS A HANDY DIAGNOSTIC tool that runs exhaustive batch, interactive, and benchmark tests on virtually all major Mac hardware components, including RAM and ROM chips, monitors, internal and external hard drives, the CPU, sound chip and speaker, mouse, keyboard, floppy disk drives, printers, and serial ports.**

Peace of Mind's normal, default mode has a simple icon-palette interface. The power-user mode's more flexible interface closely resembles the System 7 Finder's list view. The palette interface is straightforward and simple to use, but die-hard propeller heads may be drawn to the wide array of test choices in power-user mode.

In the normal mode, two rows of buttons identify the tests available for your particular machine. (When you launch Peace of Mind, the program checks the hardware configuration and dims the buttons that are not applicable.) You can press a button to run only the tests for that component, or click on the Start button to sequentially run all the available tests. You can toggle between Quick Test, which takes about 5 minutes for all components, and All Tests, which takes approximately 45 minutes.

Peace of Mind displays a progress bar during each test, along with buttons that let you skip the current test or abort the test run completely. (Unfortunately, the skip and abort options are not available in power-user mode.) As each test is completed, a single status line reports the results. Complete test results are kept in a log window that you can display at any time or save to a text file for archiving.

Optional interactive tests let you check monitors for color, convergence, and linearity; the mouse for the accuracy of click and drag; keyboards for failing, stuck, or bouncing keys; and the speaker and sound chip for sound production.

You can also use Peace of Mind to perform extensive CPU, screen, and disk benchmarks, the results of which are presented in a convenient horizontal bar graph. Again, this information can be saved to a text file, but the program lacks a comparative test history feature, making comparisons between test runs a rather inconvenient manual chore.

In testing, all interactive tests worked fine on a Mac IIfx with an Apple 13-inch RGB monitor, but some screens were clipped on the bottom when displayed on the Classic's 9-inch monitor. Also, the interactive keyboard tests didn't work at all on the Classic; instead the program unexpectedly quit. Peace of Mind also intermittently had trouble remembering to run interactive tests on either the IIfx or the Classic unless the appropriate option was permanently set in the preferences.

On the other hand, I simulated several common hardware errors through various SCSI shenanigans (such as removing the terminator and assigning the identical SCSI ID number to two devices) and SIMM tweaking. Peace of Mind did an excellent job of diagnosing the problems. The manual really shines here, offering several possible solutions and recommendations.

Unlike Symantec's Norton Utilities, Peace of Mind is a tool you probably won't run regularly, since most hardware errors surface on their own in one way or another. However, it can help you narrow your search for a failing component, whether you perform your own hardware maintenance or just want to save needless diagnostic hours at your local repair shop. —GARY KATZER
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Circle 320 on reader service card
FASTAT 2.0

PROS: Carefully selected, carefully explained set of statistical tests; good assortment of graph types.
CONS: Not significantly easier to use than SYSTAT; graph appearance needs work.
COMPANY: SYSTAT (708/864-5670).
REQUIRES: Mac Plus; 2MB of RAM; hard drive; System 6.0.2. LIST PRICE: $495.

The giant statistical analysis program SYSTAT is available in two smaller and less expensive forms. MYSTAT, a student disk-plus-textbook package, is limited to modest data sets but costs less than $20. FASTAT, a program oriented toward professionals who are not statisticians, can handle real-world data sets (150 variables, unlimited number of cases).

The new version of FASTAT now includes the complete SYSTAT set of non-parametric statistical tests, stepwise regression capability, and some smoothing functions that represent a modest step in the direction of time-series analysis. There are also a few new standard business-chart types (pie charts and several types of bar charts), but from an analytic standpoint the most important new feature is rotating 3-D graphics. For data sets of three to ten variables and a few hundred cases, the combination of 3-D plots and scatterplot matrices (SPLOM) is probably the most efficient way to look for relationships in data, so the addition of 3-D to FASTAT's already good SPLOM facility is important. To check your conclusions, you can invoke an automated multiple linear-regression option that includes most of the features of the full-scale option in SYSTAT. The procedures not included in FASTAT are cluster analysis, nonlinear regression, and advanced time-series analysis (Fourier and autoregressive methods). The selection basis for tests in SYSTAT versus FASTAT appears to be fairly straightforward; if it's a test you encountered in a one-year college statistics class, it's in FASTAT, and if it's a test from advanced statistics, it's in SYSTAT (along with all the basics). Particularly useful is FASTAT's somewhat simplified version of multivariate table generation.

While the selection of statistical tests is quite generous, FASTAT needs some improvement in graphics. There are certainly enough graph types, including stem-and-leaf, box-and-whiskers, and Dot plots (and QuickTime movies of plots, for that matter)—the problem is that they require an unconscionable amount of labor to be rendered suitable for a real presentation.

Bar-Coding Software

MacBarcoda 2.24

PROS: Clean interface; EPS files are small; check-digit verification; professional version saves in EPS or Illustrator 1.1 format.
CONS: Separate DA required for each type of bar code; cannot automatically create serial codes.
COMPANY: ComputaLabel (508/462-0993).
REQUIRES: Mac Plus. LIST PRICE: Three-code version $349; single-code professional version $495; six-code professional package $895.

MacBarcoda is a versatile, easy-to-use desk accessory that creates bar codes in either EPS or Adobe Illustrator 1.1 format. It has options for enlarging or truncating the bar code to fit and for correcting for the slight thickening that can occur in printing. The six-code package includes EAN, ITF-US, Code 39, UPC, ISSN, and ISBN. The company also sells codes individually and in a three-code package.

Creating bar codes with this program is extremely simple. Each installed type of bar code DA (many users will need only one) appears separately under the Apple menu (for System 6 users, that means using Font/DA Mover for each one). You begin by choosing the code you want; say, EAN, a 13-digit numerical bar code used mainly in Europe for retail products. An EAN menu appears in the menu bar and a dialog box pops up for you to enter the numbers—a 2-digit country code, a 5-digit manufacturer number, a 3-digit product number, and a check digit based on the preceding 12 digits. If you enter an invalid check digit, an alert box lets you choose to cancel or have MacBarcoda automatically correct the invalid digit just this one time. If you paste in an incorrect check digit MacBarcoda will fix it, unlike Bar Code Pro from Synex. When you've entered all valid digits, you can click on the Draw button in the dialog box for a preview of your bar code.

You can use the arrow keys in the dialog box to scale the code in 5 percent increments or manually change the size. You can also change the code's height by adjusting its values (in millimeters). ComputaLabel suggests you compensate for the thickening of the bars that can occur in printing, particularly if you print to film. You can make corrections, in 5-micron increments, through the Settings dialog box. I found figuring the compensation a bit confusing at first (there's a chart to help you out); but fear not, if you have trouble you can just send ComputaLabel sample output and the company will do the numbers for you.

After saving your bar code in either EPS or Illustrator 1.1 format, you're ready to import it into any application that supports those formats, such as Aldus PageMaker or QuarkXPress, for printing (you can't print directly from MacBarcoda). A nice feature is that MacBarcoda saves the file with a name made up of the type of bar code and the digits in that code. MacBarcoda cannot automatically create sequential bar codes; each code is a single file that, for convenience, you can save to a folder and import into your application.

ComputaLabel's technical support is good (although, strangely, the company's phone number is not listed anywhere in the manual). The manual needs to be updated to reflect System 7 (the program is compatible). Nevertheless, this compact, simple-to-use program gets the job done and does it well.—DANNY LEE
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**Skill Game**

**Jewelbox 1.5**

**PROS:** Well designed and executed; Intuitive; nice music and colors. **CONS:** None. **COMPANY:** Varcon Systems (619/563-6700). **REQUIRES:** Mac II; 2MB of RAM; System 6.0.5 (6.0.7 for background music); 13-inch color monitor in 256-color mode. **LIST PRICE:** $49.95.

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**Arcade Game**

**Maelstrom 1.03**

**PROS:** Fast; detailed animation; fun sound effects; user-configurable controls. **CONS:** Can't switch to other applications. **COMPANY:** Ambrosia (P.O. Box 23140, Rochester, NY 14692-3140). **REQUIRES:** 3MB of RAM; 12-inch or larger 8-bit-color or gray-scale monitor; System 6.0.7; Color QuickDraw. **LIST PRICE:** $15 plus $5 shipping and handling.

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**Pros**
- Well designed and executed
- Intuitive
- Nice music and colors
**Cons**
- None
**Company**
Varcon Systems
**Requirements**
- Mac II
- 2MB of RAM
- System 6.0.5 (6.0.7 for background music)
- 13-inch color monitor in 256-color mode
**List Price**
$49.95

**Cons**
- Fast
- Detailed animation
- Fun sound effects
**Company**
Ambrosia
**Requirements**
- 3MB of RAM
- 12-inch or larger 8-bit-color or gray-scale monitor
- System 6.0.7
- Color QuickDraw
**List Price**
$15 plus $5 shipping and handling

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**If you’re partial to games that are easy to learn but take a lot of playing to master, and if you like the Tetris genre, you’ll probably enjoy Jewelbox.** Worth successors to Tetris are rare; besides Super Tetris there haven’t been any, in my opinion. Now Varcon Systems, maker of the elegant Arkanoid-type game Diamonds, has come up with a beautiful game that resembles Tetris quite a bit, but not too much. Jewelbox is a strong game on its own—an homage to Tetris, not just derivative.

Tetris players can probably jump in and start playing; others might want to spend a moment consulting the manual to see what’s what. In about a minute you’ll get the hang of it. The playing area (the jewelbox, match) is a rectangle, and jewels fall from the top in groups of three. The three jewels are always stacked vertically; your goal is to align and match individual jewel types (rather than fit together geometrical arrangements, as in Tetris). The J key moves the jewels left, L moves them right, and K rotates the stack vertically, so that what was the bottom jewel becomes the top.

Points are awarded for any row of three or more matching jewels—horizontal, vertical, or diagonal. When you make such a match, those jewels disappear and the remaining ones drop into their spaces. Sometimes this creates new matching rows, which in turn disappear. When you’ve matched 50 jewels, the next level starts, and the jewels start dropping faster. Every 100,000 points earns you an extra life. You start with three lives and three wild cards (you invoke wild cards with the I key); a life ends when the jewels reach the top of the jewelbox.

The jewels are topaz, diamond, ruby, citrine, emerald, amethyst, pink ice, and sapphire, all of which differ in shape as well as in color. Besides those eight, there are several kinds of special jewels (slightly reminiscent of Super Tetris’s bombs and treasures): 1000-point black onyxes, wild cards, and others that add a life, speed up or slow down the falling jewels, and zap entire rows and columns.

Because you’re lining things up rather than fitting them together (and making diagonal lines takes some practice), the focus is different from that of Tetris. Jewelbox has one more big difference: the music. It’s a pleasant, hypnotic, lulling yet perky MIDI-beat, and each time you create a matching row the little pink sound magically fits into the rhythm. The whole experience is quite relaxing. (Despite this, the usual warning applies: Don’t play this or any game requiring repetitive motion for hours without taking frequent breaks.)

Jewelbox is a gem. I’m tempted to suggest a few more games that Varcon Systems might consider paying homage to.

—FELICITY O’MEARA

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**Arcade Game**

**Maelstrom 1.03**

**PROS:** Fast; detailed animation; fun sound effects; user-configurable controls. **CONS:** Can’t switch to other applications. **COMPANY:** Ambrosia (P.O. Box 23140, Rochester, NY 14692-3140). **REQUIRES:** 3MB of RAM; 12-inch or larger 8-bit-color or gray-scale monitor; System 6.0.7; Color QuickDraw. **LIST PRICE:** $15 plus $5 shipping and handling.

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**Maelstrom**

**PROS:** Fast; detailed animation; fun sound effects; user-configurable controls.

**CONS:**
- Can’t switch to other applications.

**COMPANY:** Ambrosia

**REQUIRES:**
- 3MB of RAM
- 12-inch or larger 8-bit-color or gray-scale monitor
- System 6.0.7
- Color QuickDraw

**LIST PRICE:**
- $15 plus $5 shipping and handling

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You play Maelstrom in waves. After each wave, you get a short break as bonus points are added. Extra ships are awarded at every 50,000 points. The early waves are easy, with just a few large asteroids. Successive waves are progressively more difficult, with more asteroids and other hazards.

You control your ship through the keyboard. With the configurable controls, you can rotate clockwise or counterclockwise, apply thrusters, engage the force shield, and shoot your plasma cannon. The controls are extremely responsive, so you can’t blame your Mac when you buy the farm.

In addition to three sizes of asteroids, you must also avoid steel asteroids. These piggies usually ricochet off into space when shot, but occasionally they turn into insidious heat-seeking missiles that hunt you down unless you shoot them repeatedly. And be on the alert for enemy ships. When you’re between a rock and a hard place, you don’t need somebody shooting at you, too. Finally, keep your eyes open for novas and vortexes that materialize from nothing to send you spinning out of control.

All is not doom and gloom; good things also appear. To get comets (bonus points) and multipliers (which double, triple, quadruple, or quintuple your bonus points), shoot them before they disappear. But don’t confuse them with stranded ships (extra lives) and supply canisters (items such as shield power, retrothusters, luck, and cannon enhancements), which you collect by running over them with your ship.

Maelstrom has speed, colorful animation, rich sound effects, and enduring appeal. The artwork and animation were done by Ian Gilman and Mark W. Lewis under the guidance of programmer Andrew Welch, a photojournalism major at Rochester Institute of Technology.

If you obtain Maelstrom from a user group or online service, please honor the shareware system to encourage Andrew to write more great games. Or, if you prefer, send $20 directly to Andrew Welch at Ambrosia. —OWEN W. LINZMAIER
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Place the image you want on the scanner. ScanMaker II has built-in features to make the transformation easy. The results will be astonishing.
**Educational Adventure Game**

**The Secret Island of Dr. Quandary 1.0**

**PROS:** Clever pictures and sounds; builds problem-solving skills. **CONS:** Slow; limited skill levels; no rewards. **COMPANY:** MECC (612/566-1566). **REQUIRES:** Mac Plus; 2MB of RAM and a SuperDrive for color; hard drive; System 6.0.7; 32-bit QuickDraw.

**LIST PRICE:** $49.95; teacher's edition $69.

A child could easily lose track of time tooling through Dr. Quandary's mysterious island, gazing at the gorgeous landscapes and bebooping to the catchy tunes that accompany each change of scenery. But then he or she might miss the chance to match wits with characters like Louis "Saxmo" Headstrong, William Ape-speare, and Dr. Q himself in arcade-game puzzles—all while getting a good workout in reading, math, and logic skills.

Dr. Quandary focuses on problem solving rather than math or reading drills. To get off the island, you must first discover and then solve several puzzles, while acquiring the items you need to complete a recipe.

Some puzzles require you to build objects using templates and geometric shapes or to perform some tricky hand-eye maneuvers with the mouse or keyboard. In others you must identify mathematical factors. One has you figure out a combination lock aided by winks and grins from a man in shackles. If a puzzle becomes too frustrating, the Run Away command moves you to a different area. Alternatively, you can take a time-out or save the game and return to it later.

Dr. Quandary is intended for ages 8 to adult and has three levels of play (choose B. Ginner, O. D. Nary, or D. Feculent for your on-screen persona). Since only one person can play at a time and the vocabulary of the prompts and dialogues is quite sophisticated, Dr. Quandary is better suited to home use, where children can get one-on-one attention, rather than to a classroom.

The overall presentation is good. In 256 colors Dr. Quandary is a visual feast, but it works on monochrome Macs. On-screen prompts are clear and plentiful, and play is leisurely. A funny pamphlet and a Cheat Sheet are all you get for printed documentation. No matter. Half the fun is in discovering how to play the game. If something on the screen catches your eye, click on it and follow the clever dialogue that appears. To move through the puzzles, point and click or use the arrow keys.

Educational software shouldn't be too flashy or it distracts from the learning process; nor should it be overly assertive—the player should be in control of the program, not the other way around. Dr. Quandary is good in this regard, integrating sight and sound so that they entertain without disrupting. However, all is not perfect. To allow players time to read the abundant dialogue, the action is slow, as are transitions from one puzzle to another (you can speed up play slightly by clicking on dialogue as it appears). And since it has only three levels—and no rewards—this game may lose its appeal sooner than some others.

That said, parents and their kids can have fun—and hone their logic skills—playing together on Dr. Quandary's island.

—Jeff Glorfeld

**Reading Skills Game**

**Stickybear's Reading Room 2.2a**

**PROS:** Bilingual (English/Spanish) operation; includes progress-assessment aids; easy to use. **CONS:** Weak user feedback. **COMPANY:** Optimum Resource (803/785-7441). **REQUIRES:** Mac Plus; 2MB of RAM; System 6.0.7; hard drive. **LIST PRICE:** $29.95.

Some educational programs entice the user with arcade-style action, so that learning becomes almost subliminal behind the game's entertaining munchers and crunchers. Stickybear's Reading Room takes a more sedate and direct approach to building primary-school-level reading skills.

Of Stickybear's four modules, Word Bop is closest to an arcade game. The left- and right-arrow keys and spacebar work a cannon that shoots at several pictures as they scroll across the screen. Hit the picture and its word replaces it. Shoot the word and the picture returns. Hit the picture again and it disappears. Word Bop has six levels of speed.

Word Match presents the player with either a word and six pictures or a picture and six words. Given a picture of a door, students must click on the appropriate word. Given an instruction—"Find the lion," for example—they must click on the correct picture.

Word Find presents three animated objects, an incomplete sentence, and a choice of three words with which to complete the sentence. For example, "Stickybear skips behind the ___" appears over an illustration of our host bear, a clown, and a tree; the word choices are bulldozer, pig, and down.

Sentence Builder offers three subjects, three verb phrases, and three nouns from which to make a sentence. After you choose one of each, the program pronounces the sentence aloud and plays an animated sequence of, for example, "The penguin dances with the pumpkin." If the microphone option is on, students are asked to read the sentence out loud, and then hear themselves played back.

Stickybear's Reading Room is right on the mark for its target audience of children from four to eight years old. The activities are unhurried, with plenty of clear verbal instructions, enjoyable sound effects and music, and simple but engaging graphics. All four modules let you switch easily between English and Spanish.

The excellent user guide provides concise instructions, lists the nouns and verb phrases in the various activities (in English and Spanish), and suggests supplemental classroom activities.

Teachers and parents may also find the assessment tools helpful for monitoring students' progress. Word Match and Word Find can operate in test mode, recording scores on a report card that you can display on screen or print out (Word Bop automatically records on the report card). Sentence Builder stores and prints students' completed sentences.

A few areas still need improvement, particularly the user feedback. In Word Find and Word Match, you can choose every wrong option and each time be given the message "Try again." When you finally guess your way to the correct answer, the response is an enthusiastic "Great job!" With Sentence Builder's microphone option selected, you can read the sentence correctly or say nothing at all and still be complimented "Super job!" Also, only Word Bop offers students a number of skill levels. The other modules recycle their options interminably.

Early versions of Stickybear's Reading Room require 256 colors. The current version supports both color and monochrome systems, but it is much more appealing in color.—Jeff Glorfeld
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ScreenLink" lets you control another Mac's screen, keyboard and mouse over a network or via modem. ScreenLink works with both System 6.0.4 and later and System 7. Only SuperSet includes remote access and control capabilities.

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APPLE ENGINEERS SPENT sleepless months and countless dollars crowbarring a magnificent, 25-pound, high-horsepower Macintosh into a sleek, flat, 7-pound PowerBook. So they must go ballistic every time some layperson first lays eyes on the Mac laptop and says, “Neat. Does it print out?”

No, the Mac is not a memory typewriter. However, you can do pretty damned well in the way of portable printers. As a matter of fact, there are a bunch of battery-powered ones that go gorgeously with the PowerBook; you can perfectly plausibly perch on the plane, in passage to the shareholders’ meeting, printing the last-minute pages of your big presentation (on, say, the importance of diminishing feature set).

Most of these printers were originally designed to accompany non-Mac laptops. That’s why half of the following products are adapter kits that translate the Mac’s printing instructions into a language these alien printers can understand. Note, too, that there’s no such thing as a portable PostScript printer, so your dreams of rotated text and FreeHand package-design line art will have to go unfilled at least until Mannesmann Tally unveils the MobileWriter PS it’s working on. But with Adobe Type Manager installed ($7.50 from Adobe, or free with the WriteMove II, described below), your PowerBook can make these tray-tabletop printers do luscious things with text that’s parallel to the ground.

Your Favorite Fax Modem

THIS ISN’T A PORTABLE PRINTER PER SE; it’s not even a printer per se. It’s more like a cheap trick per se. Instead of buying a printer, wait until you get to your hotel room. Then use your PowerBook’s fax modem to fax your document to the hotel’s front desk. You get your document on greasy, curly paper, but it’s cheap and it works.

Kodak Diconix 701

BY TODAY’S STANDARDS, THIS BEIGE INK-jet printer ($479, Eastman Kodak, 716/253-0740) gently tugs at the definition of portable; at almost 6 pounds (including the rechargeable camcorder battery), it’s like carrying a second PowerBook. With this thing dangling from one shoulder and a PowerBook from the other, you’ll feel like gravity has doubled by the time you reach Concourse W.

Still, the Diconix 701 is, more so than its rivals, a genuine, full-strength printer. It spews ink droplets at 300 dots per inch—in theory, the same printout quality as a LaserWriter. (In practice, the minuscule droplets splatter some, as droplets are wont to do, so the 701’s printouts aren’t quite as terrific as a laser printer’s; see “Portable Printouts.”) Most important, the 701 is the only printer with a sheet feeder—a great one, at that; you can load the printer with 30 sheets of paper, set it down in your airplane seat, and it’ll keep printing pages while you go to the restroom.

But in the world of miniature electronics, as PowerBook Duo owners know all too well, you traffic in trade-offs. And the price you pay for the 701’s advantages isn’t just weight and size, it’s price: $479 for the printer, and then $79 or $149 for an adapter kit. Frankly, if you can do without the battery operation, with only a couple fewer pairs of socks in your suitcase, you could fit a certain other 6-pound, high-quality ink-jet that’s quieter, faster, prettier, and less expensive: the Apple StyleWriter II.

Kodak Diconix 180si

AS PEOPLE ON DIETS WILL tell you, miniaturization has its price; you always give up some quality of life along with the size and weight. Take the Diconix 180si (Eastman Kodak again) at 3½ pounds (including the rechargeable NiCad batteries), it’s certainly more portable than its big brother, the 701. But the 180si lacks two important features: the sheet feeder—you have to hand-feed one page at a time, or use pin-feed paper—and 108 of the 701’s dots per inch (net dpi: 192). And believe me, you miss those 108 dots; see “Portable Printouts.”

You have to insert, position, and lock down each sheet of paper manually. Worse, you could handwrite your documents faster; a single-page, best-quality Word memo I printed took over four minutes to print.

So if the print is only ImageWriter quality, and it’s slow as a slug, what’s the sales pitch? In addition to this printer’s sheer portability, there’s the price: $329, only about half as much as GCC Technologies’ WriteMove II. (Of course, you still have to buy a $39.95 adapter kit.)

GCC WriteMove II

AT FIRST GLANCE, POUGUE’S THEORY OF Diminishing Features with Increasing Smallness is not clearly supported by the numbers associated with the WriteMove II, the most appallingly tiny printer you’ve ever seen ($599, GCC Technologies, 617/275-5800). For example: 360 dots per inch; 2½ pounds, with battery; 2 inches squares; 11½ inches long. The WriteMove II looks more like a hole punch than a business-quality printer. The rest of the good news: the printouts are incredible; the rich black film ribbon comes very close to creating laser quality. As a matter of fact, the WriteMove does remarkably well with fine gray shades; all the other printers and programs reviewed here either did a dismal dither or declined to do grays altogether.

If you ask me, the rest of the news and numbers aren’t so good. (If you ask another Macworld reviewer, you’ll get a different answer; see Review, Macworld, May 1993.) The battery only lasts for about 15 pages. The printer’s price is a steepish $599. And a ribbon only lasts for 25 pages! (There are two kinds of ribbon: a clothlike one that’s good for about 80 pages, but produces washed-out, suitable-for-drafts-only printouts; and the high-quality, short-lived film ribbon. Both kinds are five for $25.) The 6-inch cable to the PowerBook is too short, and loading the paper—one sheet at a time, of course—is awkward, since there’s no flip-up paper support of any kind.

But the worst news of all continues...
is the WriteMove's speed. Are you lying down? It took five and a half minutes to print that 1-page Word memo, and an agonizing 8 minutes for a 1-page Excel spreadsheet with one graph. Yikes.

I get the point: this is a very, very portable printer for the sales rep or real estate agent who has to print out a 2-page contract in the client's living room. The printer is just too slow; its battery life is too pitiful for anyone else.

Kodak MPower
KODAK, MAKER OF THE TWO DICONIX printers, also makes an adapter kit for each: $79 for the 701 model, and $39.95 for the slimmer Diconix 180si. Each kit contains a Mac-to-Diconix cable, a software driver (a little icon you click on in the Chooser), and a manual. Both kits are hassle-free and work fine—except, as noted earlier, they're not so good at giving graceful grays. And you really do need Adobe Type Manager to get the most out of the Diconix devices.

If you're not used to thinking of Kodak as a Macintosh-product company, this additional point may sound absurd: Kodak's toll-free help line is far better than any other Macintosh-product company's. I've called it five times, both for technical questions and product info; every time, both kinds of questions were answered, technically and helpfully, by the first person who picked up the phone. No callbacks, no Muzak, no transferring to a sales representative. Have you ever heard of such a thing?

PowerPrint
THIS $149 KIT FROM GDT SOFTWORKS (604/291-9121, 800/663-6222) is like Kodak's MPower cable/disk packages, with one exception: instead of just making your PowerBook work with a particular Diconix printer, it makes your PowerBook work with 1000 IBM printers. The additional 999 printers aren't to be taken for granted; a number of other IBM-compatible portable printers—the Canon BJ 200 BubbleJet Printer, for example, or the microscopic Citizen PN-48—suddenly become tempting printer possibilities if you find the trade-offs imposed by the Diconixes and WriteMove too great.

Frankly, I find it simply incredible that such a kit could even work. I would think the electronic and graphics architectures of the Mac and these alien printers would be just too different. But PowerPrint works wonderfully—and, relative to its Grappler rival described below, quickly. The kit actually provides only about 15 Chooser-selectable drivers; a booklet reveals that each one makes the Mac work with dozens of IBM-universe printers, and tells you which driver to use for which printer.

Grappler IIsp
GRAPPLER IIsp IS ANOTHER cable/disk kit for making a Mac work with IBM-style printers ($129, Orange Micro, 714/779-2772). It has three advantages over PowerPrint. It costs $20 less, and it works by disguising every compatible IBM printer as an ImageWriter LQ, so that the Mac feels right at home. The biggest bonus: the software includes something called GrappleShare, so several networked Macs can use the same printer.

I didn't enjoy Grappler quite as much as PowerPrint, however, for two reasons. First, the setup is a little complicated, involving running an installer, selecting an icon in the Chooser, configuring a control panel, and restarting the Mac. Second—and this is the biggie—Grappler is about 45 percent slower than PowerPrint.

Both Grappler and PowerPrint worked fine for me with the Diconix 701. I also had good luck testing both kits with a couple of nonportable non-Mac printers. (Neither works with the smaller Diconix 180si, which requires a different kind of cable.) But unless you need the networking feature, let PowerPrint do your grappling.

Oh, and two postscripts. As this issue went to press Apple announced an IBM-printer adapter kit of its own, called the Apple Print Pack. Not only that, but GDT Softworks just announced a networkable $399 version of PowerPrint. Sorry—I couldn't get either one in time to test.

The Upshot
IF YOU MUST TRAVEL WITH A BATTERY-driven printer, choose your favorite trade-off: (a) high-res and sheet-fed, but big and heavy; (b) compact and inexpensive, but low-res and slow; (c) tiny with gorgeous printing, but expensive and really, really slow. There you have 'em: the Diconix 701, Diconix 180si, and WriteMove II.

I encourage you to look at the following three alternatives, however. If your work on the road finds you sitting in one place for a while (like a week in a hotel room), a cheap, awesome-printing StyleWriter II will make you happier than any of the "portables." Also consider simply delaying printing (see "Print Later").

Finally, consider this concept: don't buy any portable printer. Instead, keep the
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Print Later

On The Road is a new program from Palomar Software (whose staff, one hopes, knows the rules of programming better than the rules about capitalizing a title; $99, 619/721-7000). In any case, this program lets you make faxes or make printouts while you’re in the plane or on the train, when you have no printer or phone line. These faxes and printouts get stored on your hard drive, waiting for their moment.

When you reach your destination and wake up the PowerBook, the program can automatically turn on AppleTalk (if necessary), switch to the appropriate printer in the Chooser (if necessary), and begin printing and faxing (with or without asking you first). Incredibly, the program automatically recognizes not only whether or not it’s hooked up to a network or a printer, but which network or printer: the one at home, the one at work, the one in the New Haven office, and so on.

This isn’t going to make Palomar happy, but guess what? Your PowerBook has a cheap imitation of On The Road built right in. Make an alias of your PrintMonitor icon (which lives in the Extensions folder in the System Folder). Put it somewhere handy: on the desktop or in the Apple menu. When you’re on the plane and ready to print, launch PrintMonitor, and choose Stop Printing from the File menu. Nonsensical though it may seem, now start printing your documents! Obviously, nothing will actually print, but PrintMonitor will spoo the printed files (preserve the printouts in disk form).

When you finally are hooked up to a printer, choose Resume Printing from PrintMonitor’s File menu, and your printouts will start spewing forth. (The same spewing also occurs automatically the next time you turn on the PowerBook.)

PowerPrint disk and cable in your carry-case, and count on the fact that wherever you’re going, in whatever office you visit, chances are good that you’ll find some IBM-compatible printer. And you’ll be ready.

And then, just for the fun of it, on your next flight, go up to somebody using a PC-clone laptop and say: "Cool. Does it print out?"

Contributing editor DAVID POGUE, author of Macs for Dummies (IDG Books Worldwide, 1992) and the Macintosh thriller Hard Drive (Berkley Publishing Group, 1993), lives with a PowerBook and a fax modem in New York City.
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New Products

Edited by Cameron Crotty

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.

Hardware

1200xl Personal Typesetter

This 1200-dpi plain-paper laser printer can handle paper sizes up to 11 by 17 inches. The printer uses a NuBus RISC controller board in the host Mac to cut font downloading and PostScript language interpretation time. The product is networkable and uses a Toshiba print engine. $6995. LaserMaster Corp., 612/944-9930, 800/950-6868; fax 612/944-9522.

Bandit

Digital video and animation recorder compresses digital images and animations and loads them into on-board RAM. From there, files can be recorded directly to videotape (at CCIR-601 video standard) or played to a monitor as full-frame. The product captures images and animations at 640 by 480 pixels (V.32 compatible) or 320 by 240 pixels (V.32bis compliant), and loads them into on-board RAM. Bandit ships in two versions: 10BaseT and 10BaseT thin Ethernet. Product includes management and diagnostic software. Charger with four drives $20,000. Kubik Technologies, 604/273-0400; fax 604/273-7237.

MacFG 24Xp

This 24-bit multiresolution graphics board plugs into a NuBus slot and can switch on-the-fly between three display modes. The product includes QuickDraw acceleration. Requires Mac ll or higher. $599. NEC Technologies, 708/860-9500, 800/388-8888; fax 708/860-5618.

HitchHiker 160

HitchHiker 160

Do good things come in small packages? Check out this 10-ounce, 160MB portable hard drive. The product uses a Quantum mechanism with an average seek time of 20ms, according to the company. The unit connects to the Mac via a 25-pin SCSI port (or to the PowerBook via an optional HDD adapter cable), and draws power from the ADB port. $1099; PowerBook version (including HDD cable) $1149. Matt Microsystems, 408/622-1200, 800/522-7979; fax 408/733-5499.

Kubik 240 CD ROM Changer

This CD ROM changer stores and feeds 240 discs into one or four Toshiba internal half-height drives (multisession Photo CD compatible). The changer plugs into the Mac serial port; drives plug into SCSI port. Package includes customizable control and diagnostic software. Charger with four drives $20,000. Kubik Technologies, 604/273-0400; fax 604/273-7237.

ScanMate 5000

ScanMate 5000

For hard-core graphics users only. This 5000dpi (true resolution), single-pass, color drum scanner can handle transmissive or reflective originals in dimensions ranging from 35mm by 35mm to 9 by 12 inches. The unit connects to the Mac via SCSI port, and ships with an Adobe Photoshop plug-in. ColorQuartet scanning, separation, and color-management software available $45,000. ColorQuartet software $1695. ScanView, 415/378-6360; fax 415/378-6368.

Sony Monitors

Three new Trinitron monitors from the land o'sushi. The CPD-1430 and CPD-1730 have 14- and 17-inch diagonal measurements, respectively. Both have a refresh rate of 72Hz, 1024-by-768 pixel resolution, and a 0.25mm aperture pitch. The GDM-2038 has a 20-inch diagonal measurement, an 80Hz refresh rate, 1280-by-1024 pixel resolution, and a 0.25mm aperture pitch, and controls that allow the user to set the color temperature. All three monitors have digital image controls and meet the Swedish MPR II guidelines for VLF and ELF emissions. Adapter required. CPD-1430 $1029.95; CPD-1730 $1795.95; GDM-2038 $3795.95; adapter $199.50. Sony Computer Peripheral Company, 201/368-3774, 800/352-7669; no fax.

Rand E

ET could turn on his Mac and phone home to this three-port stand-alone AppleTalk Remote Access server that allows Mac owners running System 7 to dial directly into an Ethernet network. Server ships in two versions: 10BaseT only, and 10BaseT, thin, and thick Ethernet. Product includes management software; modem not included. 10BaseT $1299; 10BaseT, thin and thick Ethernet $1399. Focus Enhancements, 617/938-8888, 800/398-8866; fax 617/938-7741.

Video-MUX 3x4

Video-MUX 3x4

Like a video traffic cop, this video router allows software-based switching of up to eight video sources and up to four video outputs (RS-170 black-and-white or NTSC color). The unit plugs into the continues
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(C) Hotel within walking distance of Copley Square shuttle location.
(B) Hotel within walking distance of Boston Common shuttle location.
(H) Hotel is providing its own shuttle service to MACWORLD Expo (check with hotel directly for details).

*MACWORLD Expo Conference sessions are on a first-come, first-served basis with no guaranteed seating, and are subject to change.

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NEW PRODUCTS

Mac serial port and includes controller software. Up to 16 devices can be daisy-chained to one Mac. Requires NuBus-equipped Mac II or Quadra. $129.95. Computer Modules, 408/496-1881; fax 408/496-1886.

SOFTWARE

ArroGlyphs: Environment 1
Product consists of 200 black-and-white EPS images illustrating environmental issues such as recycling, pollution, and the future of life on our planet. Images range in complexity from small clips to detailed illustrations. $199.99. Arro International, 201/746-9620; fax 201/509-0728.

Cumulus
Networkable image-file archiving and indexing software featuring client-server architecture and automatic indexing by thumbnail, file name, resolution, size, color depth, and other criteria. Users can also add keywords, comments, and status information. 2MB min. memory; System 7 required. $295. Canto Software, 415/431-6871, 800/332-2686; fax 415/861-6827.

DesignWorkshop
3-D CAD software features crosshairs extending from x, y, and z planes; editable Object Info box; dynamic view adjustment with an eye tool; and drag-and-drop creation of openings in solid objects. User can also create QuickTime walkthroughs and time-lapse sun studies. 2.5MB min. memory, math coprocessor required. $995. Artifice, 503/345-9553; fax 503/346-3626.

FreezeFrame
An MTV video? No, a graphics utility that lets users read, write, convert, view, and print graphics files in several different formats. The package also features a screen-capture capability and image catalog and retrieval. 1MB min. memory, $89.95. DeltaPoint, 408/648-4000, 800/955-8273; fax 415/961-6990.

FutureBASIC
BASIC editor/compiler can create standalone applications and code resources. Features an in-line assembler, local and global variables; direct access to Toolbox functions, procedures, and data structures; and a source-level debugger. System 7-compatible; supports 32-bit addressing, virtual memory, Apple events, and QuickTime. 1MB min. memory, $299.95. Zedcor, 602/881-8101, 800/482-4567; fax 602/881-1841.

Kappa
Software properly capitalizes text in the Clipboard. Product includes editable exception lists so that proper nouns, acronyms, and prepositions and articles in titles are capitalized correctly. 1MB min. memory; System 7 or System 6.X with MultiFinder required. $69. Skidmark Software, 714/543-5592; no fax.

NEW PRODUCTS

Books That Never Reached Their Full Potential.

The Pretty Good Gatsby
By F. Scott Fitzgerald

(Your PowerBook without Power To Go.)

To prevent a potential tragedy like this from happening to your PowerBook, pick up a copy of Power To Go. The new utility program from Claris Clear Choice will stretch your battery life, increase your hard drive space with file compression, provide security for your files and save your screen. There's even a quick airport security check function.

And at just $69, it's never been easier for your PowerBook to live up to its name.

INTRODUCING POWER TO GO

Call 1-800-544-8554 or visit your Claris dealer. Power To Go comes with a 30 day money back guarantee.

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MacWorld
files. Users can search by file attributes or other predefined criteria, or scan thumbnails at up to 10 per second with the Riffle command. 4MB min. memory. $295. Impage Systems, 619/272-2600. 800/494-4959; fax 619/272-4292.

Logovista E To J
Budding United Nations employees, take note. This product can translate a wide variety of English-language ASCII-text material into Japanese. The system dictionary contains 80,000 entries and can be supplemented with optional technical dictionaries and customized user dictionaries. Product features alternative translation choices and familiarity levels of Japanese output. 6MB min. memory, $1995. Language Engineering Corp., 617/489-4000, fax 617/489-3850.

MacSpotter
Information manager for automated dialogue recording. Allows sound editors to print out cue lists, sorted by character or time, for dialogue recording. Scenes can be moved between reels; time can be displayed in feet, frames, or SMPTE time code; and printed lists can be customized. 1MB min. memory. $495. BKMS, 510/232-2567; no fax.

MacWireFrame
This development tool allows the user to create custom 3-D solid and wire-frame modeling software. The product includes Pascal source-code library of object types and graphic routines and a ready-to-run example application program. The product also includes a fully functional 3-D modeling application that supports hidden-line removal, shaded surfaces, real-time navigation around and through objects, and publish and subscribe. 2MB min. memory; math coprocessor and color monitor required. $399.95. Amplified Intelligence, 916/737-1550; fax 916/454-8350.

Metrics
Application converts between systems and units of measurement. It converts for area, length, liquid, recipe (for example, peach, teaspoon, tablespoon), temperature, speed, Troy weight, U.S. weight, and volume. Most major units of both U.S. and metric systems are represented. 1MB min. memory, $79. ESL, 407/242-0140; fax 407/293-0398.

NetScrap
NetScrap organizes and provides access to Mac files across a network. Users can search for files by name, description, keyword, date, and several other criteria. Supports Communications Toolbox for access via ADSL, ISDN, TCP, and X.25 protocols and for remote queries via modem. Product creates a pointer to preview and thumbnail images stored on a server. 4MB min. memory. Three users $295; unlimited users $995. Everyware Development Corp., 416/819-1173; fax 416/819-1172.

On the Air
"Dr. Johnson, your travel agent is calling on line five." Now, your AppleTalk network can double as an intercom system. On the Air can sample sounds from any microphone-equipped Mac, transmit them across an AppleTalk network, and play them once received. Users can also send other format sounds (AIFF, snd, and SoundEdit). The product also provides a call-blocking feature for a few moments of much-needed quiet. 2MB min. memory; System 7 required. 1 package (2 users) $79.99; 5 to 12 packages $64.99 each; 13 to 24 packages $49.99 each; 25 or more packages $29.99 each or negotiable site license. Digital Eclipse Software, 510/547-6101, 800/289-3374; fax 510/547-6104.

On the Road
Soothing relief for several PowerBook/ network problems. The product defers printing or faxing output until the PowerBook is connected to the proper device or phone line. It also remembers AppleShare volumes for several locations and can automatically enable and disable AppleTalk (to save battery power) based on the presence or absence of a network. 2MB min. memory; System 7 required. $99. Palomar Software, 619/721-7000; fax 619/721-4758.

PixelPlay
It's show time! This screen saver plays QuickTime movies and ships with teeth sking, snowboarding, and windsurfing clips. The product includes an After Dark module and the Apple QuickTime extension. 4MB min. memory. $49.95. Silicon Sports, 415/327-7900, 800/243-2972; fax 415/327-7962.

Stellar 7
This venerable game made its debut in 1983 on the Apple II, and now it's available for the Mac, updated with a new graphics engine, digitized story sequences, and new sound effects and music. Players must pilot the tanklike Raven fighting machine through hordes of vicious aliens to save Earth from Gir Draxon, Supreme Overlord of the evil Arcturan Empire. 2MB min. memory, $34.95. Dynamix, 503/343-0772; fax 503/344-1754.

Story Club
Welcome to the high-tech reading corner. This product presents 15 folktales via video discs, CD-ROMs, audiotapes, books, and lesson guides. The separate continues
components of the system reinforce common language structures and concepts. Kids hear the stories read aloud, explore interactive versions of the stories on CD ROM, and write and illustrate their own stories. Requires 2MB min. memory, Mac II series or higher, 1MB hard drive space, and MacDAC with MacRecorder or Mac microphone. Starts at $4000; includes eight hours of on-site training and network installation if required. Davidson & Associates, 310/793-0600, 800/545-7677; fax 310/793-0601.

TeleFinder
It's back. Now capable of managing up to 32,000 users, this multilane bulletin board system includes a graphical user interface, electronic mail, conferencing, and ZModem file transfers. The multi-server architecture allows users to run separate BBS nodes on networked Macs. Options are available for AppleTalk-based BBS and FidoNet access. 2MB min. memory: System 7 required. $425. Spider Island Software, 714/669-9260, fax 714/669-1363.

TrueType Master Set
Bill Gates's team hits the Mac font market with this package of 102 TrueType fonts. The package includes 35 PostScript equivalents (for example, Bookman, New Century Schoolbook, Times, Courier), fonts from the Lucida family, and 45 display faces. This set of fonts matches all Microsoft TrueType fonts for Windows, ensuring cross-platform document compatibility. $99.95. Microsoft Corp., 206/882-8080, 800/426-9400; fax 206/883-8101.

UPCTools
This collection of Type 1 PostScript fonts and utilities creates UPC version A, UPC version E, Bookland, ISBN, ISSN, EAN-8, and EAN-13 bar codes. The user can create full-height and truncated symbols, with and without bar-width reduction to compensate for ink spread gain on press. Symbols can also be scaled and rotated. Adobe Type Manager 2.X required. $149. Azalea Software, 206/937-5919; fax 206/937-5919.

Weathermac
The more it blows, the more it goes on snowing—this package lets users track Pooh's storm, as well as any other weather patterns that come along. With a subscription to the WSI database, the user can download and view radar pictures and storms moving across the country, worldwide satellite images, and up-to-the-minute National Weather Service forecasts and advisories. 1MB min. memory. Weathermac $499; subscriptions start at $90/hour. WSI, 508/670-5000; fax 508/670-5100.

Zoo Keeper
As zookeeper for a day at Zoo World, children must take care of the zoo and keep all the animals healthy and happy by learning and adjusting for animal habits and habitats. The product features photos and sounds of 50 different animals, courtesy of Zoo Life magazine and the TV show "Zoo Life with Jack Hanna." 4MB min. memory; color monitor required. $59.95. Davidson & Associates, 310/793-6800, 800/545-7677; fax 310/793-0601.

CD ROMS

The Adventures of Pinocchio
Pinocchio comes to life (to speak) in this 270-page talking storybook. The book is divided into 20 chapters with full-color illustrations on every page, reading-comprehension questions for each chapter, and plenty of sound and animation within freely explorable "living pages." 2MB min. memory; color monitor required. $69. Orange Cherry New Media, 914/764-4104, 800/672-6002; fax 914/764-0104.

Dictionary of the Living World
Sharks gotta swim and bats gotta fly, snakes gotta slither, and you'll find out why with this multimedia encyclopedia of life on Earth. Product includes biological terms and articles for over 5000 species, and hundreds of pictures and QuickTime video clips. Software includes an Editor that allows users to assemble specific information and access it quickly by clicking on a custom icon. 4MB min. memory. QuickTime clips require a hard drive. $149.95. Compton's NewMedia, 619/929-2500; fax 619/929-2600.

Multimedia Space Encyclopedia
A wealth of information for students of the final frontier. Product includes a time line of space exploration, hundreds of images and QuickTime movies, biographical notes on space pioneers, overviews of missions and launch vehicles, information on the space shuttle, and more. 2MB min. memory. $129.95. Betacorp Technologies, 416/564-2424; fax 416/564-6655.

Rock, Rap, 'N Roll
Do you have what it takes to be the next jukebox hero? The Rock, Rap, 'N Roll Song-A-Lizer takes prerecorded song loops that you select and sequences them into a song. Next you can add
Instrumentals, vocals, and sound effects using the mouse, keyboard, Mac microphone, or any other sound-input device. The Magic Mixer automatically mixes the tracks; the resulting sessions can be saved to disk. 4MB min. memory. $59.95. Macworld CD Ventures, 415/267-1778, 800/821-1177; fax 415/543-3984.

ACCESSORIES

**AC Power Pack**
Part one of a two-part unit features a lead acid battery rated for 3 amp hours at 12 volts and a cigarette lighter socket. Part two, an inverter module, slides on and provides 120V AC outlet. Unit recharges in four to six hours using the included 120V AC charger. DC cord for charging from car battery via cigarette lighter included. Unit weighs 3 pounds and features a built-in regulator that prevents overcharging. $175. Innova Electronics, 714/241-6800, 800/795-4124; fax 714/432-7910.

**MacFly Joystick**
If you feel the need for speed, this Mac joystick might fill the bill. The product plugs into a serial port but behaves just like an ADB joystick. The joystick automatically relinquishes cursor control when user moves the mouse. The included control panel software adjusts for different screen sizes and resolutions. $79.95. Fru Products, 409/824-3332; fax 409/824-3303.

**MasterPiece Compact**
Surges and spikes begone! This power control center sports four outlets, four switches (including one master switch), a 15-amp circuit breaker, electromagnetic and radio-frequency interference filters, an antistatic button that safely grounds static charges when touched. Five-year warranty covers product replacement/repair costs as well as up to $20,000 toward current market value of damaged equipment. $99.95. Kensington Microwave, 415/572-2700, 800/535-4242; fax 415/572-9675.

**NB 4400**
Hard-side travel case for notebook computers. Product features precut foam bed with optionally removable sections for a custom fit, an 11-by-14-inch compartment for papers and manuals, and smaller compartments for disks and spare batteries. Two smaller cases are aimed at PowerBook users: the NB 3400 lacks an extra paper compartment, and the NB 10005 holds PowerBook only—no accessories. NB 4400: $179.95, NB 3400: $149.95, NB 10005: $69.95. Doublecase, 719/531-5535, 800/475-0707; fax 719/ 594-9331.

**Books**

**Cool Mac Games Plus**
The perfect gift for the antiproducitivity maven. The book includes tips, tricks, and hinds on many popular games as well as sources for Mac games and musings on the state of the Mac game market. Product ships with two 1.44 MB floppy disks of compressed shareware. Written by yours truly, Camron Crotty. 144 pages. $24.95. Hayden Books, 317/573-2500, 800/428-5331; fax 317/573-2583.

**Help! The Mac Answer Book**
Everyone wants a security blanket, especially when the computer gremlins strike. This book guides readers through troubleshooting basic Macintosh glitches and hang-ups, and tells how to recognize larger problems that may need a dealer's attention. Written by Steven Schwartz. 200 pages. $14.95. Alpha Books, 317/573-2500, 800/428-5331; fax 317/573-2583.

**Hot Links: The Guide to Linking Computers**
To some people, connectivity isn't just another overused buzzword. This book begins with the basics of ports, cables, and connectors and builds up to local area networks and alternatives, modems and online services, laptop computers, cellular phones, and more. Written by Mark Epplcy and David Hakala. 254 pages. $29.95. Osborne/McGraw-Hill, 415/549-6600, 800/227-0900; fax 415/549-6603.

To have your product considered for inclusion in New Products, send an announcement with product name, description, minimum memory, peripherals required, pricing, company name, and phone number to New Products Editor, Macworld, 501 Second St., San Francisco, CA 94107. Macworld reserves the right to edit all product announcements.
WHERE WILL YOUR MAC BE FIVE YEARS FROM TODAY?

Sharing shelf space with your old 8-tracks and bowling trophies isn't what you had in mind for your Mac when you bought it. That's why TechWorks offers so many options in performance enhancements.

Accelerators for Maximum Speed!
You don't need to buy a new Mac to gain the speed of one. TechWorks Accelerators let you zip through spreadsheets, full-color graphics, database sorts, sound editing—even faster than a Quadra! Our unique cache design ensures high performance with 100% compatibility.

Easy-Install Memory Upgrades
With TechWorks Memory Upgrades you can take advantage of System 7, run more applications at once, install more fonts and INITs, use print spooling, and more, without spending a fortune.

FPUs, Cache Cards, Video RAM
TechWorks Cache Cards and FPUs let you increase processor speed and math calculations up to 70%. TechWorks Video RAM gives you maximum color for your LC and Quadra.

Outrageous Customer Service and Support
TechWorks stands behind every performance product with the best customer service and support in the business, a lifetime warranty, and no-risk money-back guarantee.

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TechWorks Accelerators

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Questions and Tips from Macworld Readers

BY LON POOLE

YOU CAN MAKE PERSISTENT changes to the Page Setup dialog box of any LaserWriter with PostScript. Use ResEdit, Apple's resource-editing utility, to duplicate the LaserWriter file's PREC 1 resource, and then change the duplicate's ID to 0, as described in January's Quick Tips. George Berendes of Blainville, Quebec, found one vital fact missing from the end of step 1 in that description: after changing Page Setup settings in any application, you must print with those settings. Only then are your settings written to the PREC 1 resource in the LaserWriter file. Incidentally, these settings apply to all documents created by most applications, but not all. Notable exceptions include Microsoft Word and the Finder. Also, this procedure may not work with other printers.

No More Magic

THE MAGIC WORD DOESN'T WORK WITH HyperCard Player 2.1, the version of HyperCard that's been included with all models of new Macs since fall 1992. That is, you can't make the authoring and scripting levels available by going to the Preferences card of your Home stack, displaying the message box, typing the command magic, and pressing the return key. Several readers read about this procedure in the "Letters" section (February 1993) and were puzzled when it didn't work. They even tried typing set userlevel to 5 in the message box, as described in Quick Tips (November 1992), to no avail.

The HyperCard Player sets the user level to 3 (Painting), so you can edit text in unlocked fields, add new cards, and use the HyperCard paint tools. If you want to set the user level to 4 (Authoring) or 5 (Scripting) so you can add new fields, add new buttons, create new stacks, or write scripts, you'll have to buy Claris's $199 HyperCard Development Kit. Owners of HyperCard versions 1.25 and earlier can upgrade to the latest version of the Development Kit for $99; the upgrade is free for owners of HyperCard 2.0 (call Claris at 800/544-8554). The upgrade includes the same disks as the complete development kit but has fewer manuals. (Apple has announced that it will take over development of future versions of HyperCard, but that Claris will sell and support the current version until the next one is released.)

Centering Inside Windows

When I open a WordPerfect 2.1 document, I must click the right horizontal scroll arrow twice to center the text of that document inside the document window, that is, to get equal white space to the left and right of the text. How can I change the default positioning of text within the document window?

Also, is there any way to create a Things to Do item in the Apple menu, which would open my to-do list saved as a WordPerfect document?

Albert Hsia
Somerville, Massachusetts

If you expand the window to show the entire width of the page (for example, by clicking the zoom box at the upper right corner), you will see all of the left and right margins of an 8½-inch-wide page. If you then save the document, WordPerfect remembers the new window size, and when you reopen the document you will again see the entire width of the page, including left and right margins.

This procedure won't work if the monitor is too narrow to show the entire width of the document, as would always be the case on a Mac Classic's screen. To center the text of a WordPerfect document in a window that's narrower than the document, you can use macro utility software such as QuickKeys' (from CE Software, 515/224-1995 or 800/523-7638). You could, for example, create a macro that clicks the right scroll arrow twice. WordPerfect has its own macro capability, but in my experience, it hasn't been able to change horizontal scroll bar settings.

And yes, if you're using any version of System 7 you can add documents, applications, folders, and other items such as control panels, sounds, and fonts to the Apple menu by dragging their icons—or better yet, aliases of their icons—to the Apple Menu Items folder, which is inside the System Folder.

Technical-Information Sources

I found your October 1992 article, "Your Computer Revealed: Inside the Processor," very informative. Do you know of any additional technical information on the Motorola 68040 processor and the Mac Quadras? I am particularly interested in features such as register and program counter configuration, interrupt lines, cache, and so on. [As described in the article, a register is quick-access, scratch-pad memory inside the microprocessor. The program counter is a register that tracks where to find the next instruction the microprocessor must execute. The cache memory inside a microprocessor stores recently executed instructions and data to expedite their reuse.]—L.P.

Jean Aiken
New Ipswich, New Hampshire

Motorola publishes hefty handbooks for its microprocessors, such as 68040 Microprocessor User's Manual (Motorola publication number MC68040UM/AD; $2.45) and 68030 Microprocessor User's Manual (Motorola publication number MC68030UM/AD; $3.50). In addition, the 68000 Family User's Manual (Motorola publication number MC68000FR/AD; $5.40) contains the most important facts about each of the processors in the 68000 family, including the 68040, 68030, 68020, and 68000 models used in Macintosh computers. You can order these books by calling Motorola's Literature Distribution Center at 602/994-6561.

Creating silhouettes in Photoshop, applying colorless icon labels, and more

MACWORLD June 1993 187
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Brace yourself for the fastest 3-D adventure ever made for CD-ROM. Nonstop action immerses you in a virtual reality filled with sci-fi danger and intrigue. You’re in complete control of a robot probe on board a renegade spaceship. Navigate through a visually rich environment consisting of corridors, shafts and chambers, and search for the clues to stop a doomsday weapon—code name Iron Helix. All the while you must elude the ship’s deadly defender robot if you are determined to stop the spaceship and prevent intergalactic war. No click and wait. No load time. Which leaves you free to concentrate on just one thing: staying alive.

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You’ll find technical information about the Quadras in Apple’s Macintosh Classic II, Macintosh PowerBook Family, and Quadra Family Developer Notes (APDA part number R0143LL/A; $25). Other developer notes cover other Macintosh computers and LaserWriter printers introduced since October 1990.

The complete set of developer notes, together with a great deal more technical information, is available on CD ROMS produced monthly by the Apple Developer Group (of which APDA is a part). The APDA Technical Information Mailing (APDA part number C0197LL/A; $250) includes a 12-month subscription to the Developer CD ROM series and more. For much less money you can get the latest Developer CD ROM once each quarter as part of a subscription to Apple’s quarterly technical journal, develop (APDA part number M0929LL/A; $27).

To request an APDA catalog or order a product, call 800/282-2732 in the United States, 800/637-0029 in Canada, or 716/871-6555 from other countries.

Ciphering RTF

We use 4th Dimension for data management and WriteNow for word processing. Because we need formatted data listings in our word processed reports, I have programmed several procedures in 4th Dimension that format the data as a text file in RTF format. We can then open the RTF file with WriteNow to create a formatted document with all the proper ruler settings, font sizes, and styles. This saves us from manually formatting text in WriteNow, and promotes consistency, since there may be hundreds of lines of data that need to be set up exactly the same way.

I've been able to figure out many elements of the RTF format by looking at RTF files created by WriteNow, and my procedures work well, but I would like to know more about the RTF format so that I can solve a few problems and add more features. Is there a specification for the RTF format available, and if so, who publishes it, and how can it be obtained?

Gian Carlo Ceravone
Rochester, New York

Microsoft originated the RTF format, and publishes a complete RTF specification. Contact Microsoft Developer Service Team, RF1, Microsoft Corporation, One Microsoft Way, Redmond, WA 98052-6393, 800/227-4679.

After Dark Randomizer

If you use the Randomizer module in that great productivity tool After Dark, you can have your favorite
Profiling with Photoshop

How do you silhouette, or isolate, part of a photograph with Photoshop? Edna Mintz of Hollywood, Florida, wants to know, and she is especially interested in the kind of silhouetting used in catalog pictures. Here's one method that works with most images, developed with the help of Macworld senior designer Arne Hurty.

1. Select the part of the picture you want to isolate. Use the lasso to trace just inside the edges of the part of the picture you want to isolate, and then use the Grow command in the Select menu to enlarge the selection. As needed, manually add to the selection by pressing the shift key while using the lasso, and manually subtract from the selection by pressing A while using the lasso. Making these adjustments may be easier if you zoom in 2:1 or more. Selecting with the magic wand instead of the lasso can be faster when you're isolating something of fairly uniform color against a contrasting background. You may also want to experiment with isolating part of an image using alpha channels as described in the tutorial manual that comes with Photoshop.

2. Copy the selection, create a new Photoshop document, and paste the selection into it. To remove the unnatural-looking fringe from the edges of the selection, choose Defringe from the Select menu and enter the width of the fringe in pixels; then click OK. If you're not sure of the fringe width, try values between 1 and 6. Use the Hide Edges command to temporarily hide the shimmering selection line and see the effect of the Defringe command, and use Undo if you want to try a different fringe width.

3. After removing undesirable fringe, choose Make Path from the Select menu. This command outlines the selection with a smooth curve and changes the menu bar to display the Pen menu. Choose Save Path from the Pen menu, naming the path whatever you like. Then choose Exit from the Pen menu.

4. Choose Save As from the File menu, and in the Save As dialog box choose EPS from the File Format pop-up menu. After you click Save, the EPS Options dialog box appears. In it, choose the path you saved in step 3 from the Clipping Path pop-up menu, set the other options as you like, and click OK.

5. Your page-layout program may be able to use the clipping path in the EPS file to define the boundary for text runaround, or text wrap. In QuarkXPress 3.2, for example, select the picture box and use the Runaround command to specify Auto Image as the runaround mode. (In PageMaker 4.2 you must manually create a custom text-wrap boundary as described in the reference manual that comes with PageMaker.)
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Here's a related tip from Scott McDowell of Portola Valley, California. You can also use duplicate modules with Randomizer to see multiple variations of a module. For example, you can use duplicated messages module to see different messages appear on the screen. To accomplish this you make duplicates with the Finder, and then use the After Dark control panel to make different settings in each of those duplicates and to select all the duplicates in the Randomizer module.

Transparent Labels

If you've avoided System 7's labels because they discolor your beautiful color icons, wait no longer. You can label a color icon without changing its color if the label color is black, white, or any shade of gray. Those label colors appear transparent when applied to color icons. You can still view Finder windows by label, use labels to designate items that StuffIt SpaceSaver should always compress or never compress, and so on.

To change a label's color, open the Labels control panel and click the color of a label you want to use. The standard Color Picker dialog box appears, with its characteristic color wheel. Set the Hue and Saturation to 0, and then set the Brightness to 65535 for white, 0 for black, or a number between those two for a shade of gray. You can type the three values in the spaces provided, or you can click in the center of the color wheel and adjust the scroll bar.

Leslie Jones
Maryville, Tennessee

On a color monitor, icons with white labels are invisible unless they are selected. —L.P.

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How to/Quick Tips

employees appear more frequently than others, provided you don't mind using up some disk space. Just open the After Dark Files folder (inside the Control Panels folder in System 7; inside the System Folder in System 6) and make duplicates of the modules you wish to appear more often. Sequentially numbering the duplicates is a simple way to give each a unique name, for instance Satori 1, Satori 2, and Satori 3. With ten modules selected in the Randomizer, including three Satoris, Satori has a 30 percent chance of appearing, while each of the other selected modules has only a 10 percent chance.

James Snyder
Anchorage, Alaska

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**Directory Assistance Workset Removal**

In Directory Assistant II, which is part of Norton Utilities for Macintosh 2.0, the Workset Configuration dialog box includes a Trash icon for removing files and folders from a workset. You can also drag a workset icon to the Trash icon to remove the entire workset.

Corrupted or when I may need to reinstall the application, forcing it to create a new preferences file. Restoring the backup file can save a lot of time and effort, especially when I’ve forgotten how I had set up my preferences. Most applications keep their preferences files in the special Preferences folder (inside the System Folder) with System 7, and directly in the System Folder with System 6.

Beckie Pack
Napa, California

You’ll find some preferences files—and in some cases preferences folders—directly in the System Folder even with System 7. Moreover, a few applications keep preferences files in the same folder as the application.—L.P.

**Works 3.0 Conversion Shortcut**

TIP After updating to Microsoft Works 3.0, you may find that converting documents from version 2.0 format one at a time gets pretty tedious. If you have System 7, use the following method to streamline the job. Select a group of Works 2.0 documents in the Finder by shift-clicking them or by dragging a selection rectangle around them; now drag them as a group to the Works 3.0 icon. Works will open and convert them all automatically. Then save and close each converted document in turn.

Roberta Nelson
Chehalis, Washington

**Directory Assistance Tricks**

TIP The manual that Symantec includes with Norton Utilities for Macintosh 2.0 describes how you use the Directory Assistance II utility to create custom worksets for individual applications and projects. But it doesn’t say how to get rid of worksets you no longer need. The solution is to choose Configure from the Workset menu at the right end of the menu...
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menu bar that Directory Assistance II adds to the directory dialog box. This brings up the Workset Configuration dialog box, which includes an icon for each workset and a Trash icon (see "Directory Assistance Workset Removal"). Drag the icon representing the unwanted workset to the Trash icon in the dialog box. Careful! Once you drag a workset to the Trash, you can't get it back.

There's another undocumented aspect of Directory Assistance II. Although the manual describes how to disable Directory Assistance II for individual applications, it does not explain how to reenable Directory Assistance II. A brute-force method is to drag the Directory Assistance Preferences file from the Preferences folder inside System 7's System Folder (or from System 6's System Folder) to the Trash. Unfortunately, this removes all Directory Assistance settings.

J. Hohenstreit
Paris, France

If you have disabled Directory Assistance for an application, you can temporarily activate it by pressing option while choosing Open or Save As from that application's File menu. Then you can reenable Directory Assistance by choosing the third item from the Directory Assistance menu (which is marked by a diamond at the left end of the Directory Assistance menu bar in the directory dialog box) and turning off the Bypass Directory Assistance option. (If Directory Assistance is enabled, pressing option while choosing Open temporarily disables it.)—L.P.

No Stinkin' Badges

TIP Here's a quick and easy way to create professional-looking name badges: print them on clear laser labels (Avery 5660 through 5664 or equivalent), apply each label to a card insert, and slip the assembly into a badge holder.

Michelle L. Blackadar
Cambridge, Massachusetts

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Data-Exchange Techniques

BY JIM HEID

No job specialist always works alone. Sooner or later, everyone needs to collaborate with others to finish a particular project.

No single Macintosh program can do everything, so eventually you need to combine programs to perform a given task. You may want to include a drawing or a bar chart in a word processed report. Or include a logo designed in Adobe Illustrator in a document you’re creating with Aldus PageMaker. Or transfer a list of names and addresses from a database into a word processor to produce a phone directory.

Last month, I showed how you can use disk files to accomplish these and other data-exchange tasks. The Mac provides other ways to exchange data between programs, techniques that are either faster and easier or more sophisticated than exporting and importing disk files.

All mainstream Mac programs provide cut, copy, and paste commands that let you move small amounts of information between documents and between programs. These commands are the keys to the Mac’s Clipboard, the basic data-exchange system for moving text and graphics between documents and programs.

More and more programs also support a richer form of data exchange that is built into Apple’s System 7. Unlike the Clipboard, System 7’s publish-and-subscribe feature makes it easy to update information that you transfer between programs—when the bar graph changes in the original program, the version you included in the word processed document changes, too.

This month, I describe some of the subtler points of the Mac’s Clipboard, and I present some scenarios that show System 7’s publish-and-subscribe features in action in two different settings: in a desktop publishing shop and in an office. I’ll wrap up with a look into the crystal ball at some of the advanced data-exchange options System 7 will soon make possible.

Clipboard Formats

Most of the time, the Clipboard’s operation is straightforward. But there can be times when things you’ve pasted don’t quite look the way you want them to. After pasting some text from one program to another, you might find that the text appears in a different font or size, or that you can no longer edit it. To understand why these formatting problems occur, it helps to step back and examine how the Clipboard works.

When you cut or copy something to the Clipboard, the application program stores the cut or copied material in one or more Clipboard formats. Just as a file format describes how information is organized on disk, a Clipboard format describes how information is stored in memory by the Clipboard.

The Mac provides three standard Clipboard formats. The PICT format stores information (whether text or graphics) as a picture. The TEXT format stores only text, with no font or type-size formatting information. The styl format stores text as well as font and size information. (If you have Apple’s QuickTime system extension installed, a fourth standard format is available: the moov format, which stores the frames from a QuickTime movie.)

Besides these standard Clipboard formats, the Clipboard also supports private data formats—formats defined by a specific program. Private formats are designed to reflect the type of information a particular program creates, and retain more formatting information than do the standard Clipboard formats.

Application programs usually place data on the Clipboard in one or more standard formats as well as one or more private formats. Why so many formats? To increase the odds of being able to retain as much formatting as possible when you paste the information into another program.

When you choose Paste, the receiving program peruses the Clipboard in search of a private format it can understand. If it finds one, it pastes the data using the private format, thereby retaining all formatting information. If the program doesn’t find a private format it understands, it substitutes the standard format—TEXT, PICT, or styl—that is closest to its preferred one. For example, word processors work with text, so they generally choose the styl or TEXT format. Graphics programs work with images, so they generally prefer the PICT format. “Understanding Clipboard Formats” summarizes these formatting follies.

An example may help clarify how programs treat Clipboard formats. Say you’ve just copied several cells from a Microsoft Excel spreadsheet because you want to paste them into a Word document. One of the many Clipboard formats Excel uses is called RTF—short for rich-text format, a format that retains formatting information. (The RTF Clipboard format is very similar to the RTF file format described in last month’s column.)

Microsoft Word can read this format, so when you paste the cells into a Word document, all the cell formatting is retained. But what if you paste the cells into WordPerfect, which can’t read the RTF Clipboard format? In this case, WordPerfect uses a Clipboard format it does understand—TEXT—and accepts the contents of the cells, but without any formatting.

So, when some text you paste loses its formatting, it’s probably because the only Clipboard format both programs support is the TEXT format, which discards formatting information. To retain formatting when using the Clipboard to transfer text between two programs, make sure each program supports either the same private Clipboard format or the styl format. If they don’t, then try using the receiving program’s open or import command to bring in the contents of the sending program’s file. That may be the best way to transfer the text, since both programs probably support at least one file format in common that retains formatting information.

How can you tell which Clipboard formats a program continues...
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Understanding Clipboard Formats

When you cut or copy some information from within an application program, the program usually places it on the Clipboard in several formats (A). When you paste the information into a different program, that program will choose the format it prefers. In (B), the receiving program has chosen the PICT format, which transforms the text into a graphic image. In (C), the receiving program prefers the TEXT format, and accepts the data as text.

Exchanging Data with Publish and Subscribe

When you copy and then paste something from one document to another, there's no connection between the receiving document and the original document. If the information in the original changes, you must repeat the copy-and-paste routine to update the information in documents containing it.

System 7's publish-and-subscribe data-exchange system enables you to link documents so that when information changes in one document, copies of it in other documents update automatically. The publish-and-subscribe system also lets you exchange data between Macs connected over a network—another feat the Clipboard can't match.

Using publish and subscribe involves two basic steps.

1. Select the information you want to exchange and choose Create Publisher from the Edit menu. When you perform this step, the Mac creates a file called an edition, which contains a copy of the information you published. As with the Clipboard, the information may be stored in a variety of formats (indeed, editions support the same standard formats—PICT, TEXT, and styl—as the Clipboard).

2. To put the published information into a document, choose Subscribe To from the Edit menu. The Mac automatically selects the last edition you created.

An optional third step involves telling the Mac when you want new versions of the publisher to be updated. You can specify that information be updated automatically whenever the original document is saved, or only when you explicitly request it (see "Updating Options").

(Desktop) Publish and Subscribe

Say you're a designer using ALDUS PageMaker to create a brochure for some new clients who keep changing their minds about the logo design, which you created in Adobe Illustrator. Rather than go through the work of exporting and importing the logo each time it's revised, you can use publish and subscribe.

How to

In Illustrator, select the logo. Open the Publishing submenu (in the Edit menu) and choose Create Publisher. In the Create Publisher dialog box, be sure the PICT and EPS button is checked. Type a name for the edition file you just created and click on OK. At this point, you can quit Illustrator if you like. If you have enough memory to keep both Illustrator and PageMaker open, you might want to do so in order to see publish and subscribe in action.

In PageMaker, open the Editions submenu (in the Edit menu) and choose Subscribe To. Make sure that the correct edition you want to link to is selected. Then choose Subscribe To from the Edit menu. The page is automatically updated with the revised logo.
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**Finding Formats**
To determine which Clipboard formats a program uses, copy some information and then paste it into the Scrapbook. The formats appear in the lower-right corner of the Scrapbook window. If you cut or copy that Scrapbook page and then paste its contents into a program, the program can choose any of those formats.

---

**Updating Options**
A program's Publisher Options dialog box lets you specify when updated information should be sent to subscribers: automatically when you save the document, or only when you specify. Most programs add additional options to the Publisher Options dialog box: Microsoft Word (top) lets you specify that editions be updated as soon as you make changes (choosing this option can slow Word's performance). Adobe Illustrator (bottom) lets you specify whether the edition should contain a PICT version of the image or both PICT and encapsulated PostScript (EPS) versions.

---

**Publish and Subscribe in Business**

**In this scenario, you work in an office and your responsibilities include assembling a monthly status report for the executive staff. The report is written by several managers, and each manager's contribution undergoes several revisions before the final version is complete. (This is a common scenario not only for status reports, but for technical manuals and proposals, too.)**

By using publish and subscribe along with System 7's file-sharing features, you can streamline the process of assembling and updating each report. I've used Microsoft Word, but you can substitute any word processor that supports publish and subscribe, including WordPerfect.

**How to**
First, use System 7's Sharing Setup control panel to activate file sharing, and then use each Mac's Chooser desk accessory to connect to the shared hard drive. (For more details on System 7 file sharing, see Getting Started, Macworld, January 1993.)

The instructions in this paragraph are for each contributor to the report. Write your section, formatting it as you normally do, and then save it on your own—not the shared—hard drive. With the document still open, choose Word's Select All command and then choose Create Publisher from the Edit menu. In the Create Publisher dialog box, click on the Desktop button and then locate and double-click on the name of the shared hard drive. Type a name for the edition file and then click on Publish.

The instructions in this paragraph are for the person who assembles the report from each component. Choose New from Word's file menu. Create any special title page you might want and then choose Subscribe To from the Edit menu. Navigate your way to the shared hard drive and then locate and double-click on the name of the edition file containing the first section of the report. When you do, Word inserts its text. Insert a page break after the text if necessary, and then choose Subscribe To again and insert the next section. Repeat this process until you've inserted all sections.

From this point on, each time a contributor alters and then saves his or her section, the master version of the report changes to reflect the latest version. There's no further copying and pasting, and no fretting about whether someone's latest draft has been incorporated.

It's worth noting that each contributor might be using publish and subscribe in his or her own section. Wendy might use it to link a graph created in Lotus 1–2–3 to the original spreadsheet that generated it, while Roy might use it to incorporate inventory figures from an accounting program. As the underlying documents change, a game of digital dominos occurs—each contributor's section is updated, causing the master report to be updated, too. (You can even take the game one domino further—if you publish the final report and then subscribe to it within Aldus PageMaker, the publication updates with each revision.)

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As a subscriber, you can't perform major editing on published information. You can reformat all of the text in a publisher—change its font, size, and style as well as margins and line spacing—but you can't, say, correct a misspelled word or change the font for an individual heading. This is why each contributor performs formatting at his or her machine. (Remember that style sheets, which I covered in March's column, can help automate formatting.)

OLE: Data Exchange, Microsoft-Style

Some Microsoft programs, including Word and Excel, support an additional data-exchange system called object linking and embedding, or OLE. I don't have room here to describe all the details of OLE, but I can give you some examples of the kind of dynamic data exchange it makes possible.

In reports and manuals, it's common to refer to figures or illustrations, each of which has a numbered caption. It's also all too common to add and remove figures during revisions—a chore that forces you to renumber all the figure references and their captions. By using Word's Paste Link command, you can simplify the process so that when you update a figure reference, its caption updates, too.

How to When you need to create a figure caption, select the figure number in the figure reference and then choose Copy (see "Fixing Figures"). Next, move the insertion point to the spot where you want the caption to appear. Press and hold down the shift key and choose Paste Link from the Edit menu. Complete the caption with any additional text. From this point on, when you change the figure number in the reference, the number in the caption changes, too.

OLE is often faster and more convenient than publish and subscribe. On the downside, OLE doesn't let you link documents across a network (unlike publish and subscribe), and only a few Microsoft programs support it. For more comparisons between OLE and publish and subscribe, see page 670 in the Word 5 (or 5.1) user's guide.

Looking Ahead

Microsoft's OLE and Apple's Publish and subscribe rely on a System 7 software technology called Apple events. Apple events enable programs to talk to each other and exchange commands as well as data. Many programs support some aspects of Apple events today, but their real promise won't be realized until Apple releases its AppleScript system. AppleScript, due for release around the middle of this year, will enable you to create sequences of commands, called scripts, that control programs and shuttle data between them. Like the macro languages provided by programs such as Microsoft Excel and WordPerfect, AppleScript will let you put programs on autopilot, reducing repetitive command sequences to a single mouse-click or menu choice.

More important, AppleScript will work together with Apple events to allow programs to collaborate. For example, imagine you have a word processor that supports an AppleScript command to check spelling. Using AppleScript, you could access the spelling checker from within any other program. In short, AppleScript will enable you to combine the best features of your favorite programs. I'll have more to say about AppleScript in an upcoming column.

System 7's cutting-edge data-exchange features are impressive, but in the real world, they're often overkill. Indeed, I have encountered many Macintosh owners who haven't yet mastered the Clipboard and its cut and paste features. If you're in this group, spend some time exploring the Edit menu. Copy a chart from a spreadsheet and paste it into a word processor. Stash your name and address in the Scrapbook so you won't have to retype it.

After coming to terms with the Clipboard, you'll probably start thinking of ways to use publish and subscribe or OLE to streamline your data-exchange endeavors. You'll start combining programs to create documents you couldn't create with any single program. The way the Mac lets you sling text and graphics between programs has always been one of its unique strengths. Take advantage of it.
Ha-ha just replaced ho-hum. Introducing Now Fun!, by far the most comprehensive collection of desktop diversions available.

In this one little box you’ll get FunPictures with more than forty new patterns and images for your desktop.

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Keeping Your PowerBook and Data Secure

THE POWERBOOK, WHOSE PORTABILITY you prize, is just as appealing to a potential thief—who can take off with it as easily as you can. As with other portable, high-value items, portable computers have become choice items for criminals. The skyrocketing rise in laptop-computer theft has hit all kinds of users, from General Norman Schwartzkopf to Compaq chairman Ben Rosen.

Outright theft is just one part of the problem. Your data may well be much more valuable than your computer; plans for a new product might be leaked to or stolen by a competitor, electronic mail could conceivably lead to blackmail or legal tangles. A business colleague or a child can easily scramble your hard drive. Everybody wants to play with a A-lac.

Although many products attempt to address one security area or another, all security products are by their nature inconvenient. We accept a lot of inconvenience in our daily lives—locks on doors, inspections at airports—but most of us have had unrestricted access to our personal computers. Many people find security products so bothersome that they disable them after a time; balancing the need for security and the desire for convenience can be a challenge.

The Simplest Steps
THE FIRST THING YOU SHOULD DO IS record all serial numbers and label everything that belongs to you, including batteries and cables. This way your stuff won't get mixed up with somebody else's, and honest people will return equipment that you mislay somewhere. Use a business phone number if possible and don't include a home address, which thieves might target if you are traveling. You might consider putting a label inside a computer so that if it is ever stolen, you might be notified by a repair service. And if your equipment is stolen, notify the Stolen Computer Registry (212/777-1291) so insurance companies, service centers, and some resellers will be alerted to your serial number.

Holding On
HOW DO YOU PREVENT THEFT? A portable alarm system can help, provided you take great care to avoid false alarms—the shrill sound can be extremely annoying to innocent bystanders.

Portable motion-detector alarms sound off if moved. All work with a delay before sounding the alarm, to give you time to disarm the unit (generally done by entering a few digits on a keypad). Prices start at about $60 for a unit that can be placed inside your computer's carrying case. The $99.95 Sonicpro model 128 (408/982-2568, 800/848-0300) is programmable for motion sensitivity, alarm delay, and alarm duration. The 5-ounce Sonicpro, about the size of a pack of cards, can be glued on to a PowerBook's cover.

In addition to alarms, you can try camouflage. Carrying a PowerBook in a dirty, nondescript case may make it appear less inviting than one in a spiffy case with a logo that announces "I'm a valuable laptop computer! Steal me!"

Inevitably, you have to pull out your PowerBook to use it. Can you leave the PowerBook in place on a table? The Sonicpro alarm, if glued to the computer, provides some protection by sounding off if the PowerBook is moved, but you will certainly have many false alarms.

A cable lock offers less-intrusive protection. You can loop the flexible cable around something permanent, heavy, or bulky enough to discourage tampering. A cable won't stop a determined thief with a hacksaw or prevent someone from smashing the computer, but it will discourage casual, opportunistic theft.

You can choose from several kinds of cable locks. The PowerBooks 160, 165c, 180, and the Duo Docks (but not the Duos) have a small security slot (designed by Kensington) molded into the back edge. AST, Compaq, Toshiba, and other computer companies use the same slot in some models. Kensington (415/572-2700, 800/535-4242) also makes a $60 matching MicroSaver cable assembly that weighs 5.5 ounces (including the cable and a key). The security slot offers a neat way to attach a cable; if you attach one, make the cable as obvious as possible, so a potential thief—or prankster—sees it before starting to walk off with the computer and possibly dropping it.

The Notebook Guardian from PC Guardian (415/459-0190, 800/288-8126) attaches to the front of the PowerBook (models 140 through 180), locking through a screw hole and front-latch

MACWORLD June 1993 207
Let's face it. With a dead battery, your PowerBook is nothing but dead weight. Precisely why you need the Norton Essentials® for PowerBook. It's the only software package that lets you adjust power settings by application, so each battery charge will last up to twice as long—without compromising performance.

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opening. The 6.5-ounce, $79.95 Note­
book Guardian is more awkward to use than
the MicroSaver cable, but it's clearly
visible and can, if you wish, lock the
screen closed; it also comes with a carry­
ing pouch. For the PowerBook 100 and
the Duos, PC Guardian offers a $49.95
adhesive locking connector.

Another kind of cable lock, the 6.4­
ounce PowerLock ($49.99; CMG Com­
puter Products, 512/329-8220, 800/880­ 
9980), clamps on the side or front of a
closed PowerBook. The PowerLock
exerts no pressure; it mates with two strik­
er plates that you insert into the edge of
the keyboard or in the cover latch before
you close the PowerBook. The clamp
design works on all PowerBooks except
the Duos; a smaller model will be avail­
able for Duos. The PowerLock secures
only a closed PowerBook; so I consider it
the least convenient of the three cable­
lock designs; but it is highly visible and
will deter anyone from using the com­
puter. CMG also makes a $69.99 moni­
tor stand with a locking drawer for Pow­
nerBooks that can be secured to a desk.

If your company has many laptops and
other valuable equipment, you can
install a security tag system similar to the
antitheft systems used by retail stores.
A typical tag system uses a sensor at every
entrance (about $2300 per door, includ­
ing installation) and a $1.25 tag in each
protected item. A keypad next to the sen­
or can override the alarm system for
authorized equipment-removals.

Finally, if you see someone trying to
steal a computer, consider your own pro­
tection first. Your safety is worth more
than any computer; don't get hurt trying
to recover it. Instead, plan ahead. What
will you do if someone does steal your
PowerBook?

Information Theft

IN THE PAST YEAR, THERE HAVE BEEN
several published reports of criminal
organizations hired on contract that are
stealing laptop computers (or copying
files). And persistent reports in the press
charge that the espionage agencies of
nominally friendly countries spy on for­
gie businesses for the benefit of domes­
tic companies. In the United States,
mem bers of Congress and the intelligence
community have suggested that American
government agents ought to respond by
Spying on foreign businesses.

Beyond business information, a
PowerBook can contain many other kinds
of sensitive information. Loss of medical
records and legal notes might breach con­
identiality rules or laws. Think of what
someone with a mischievous or more sin­
ister intent might do with your passwords
for electronic mail, dial-up networks, and
online services—or your telephone cred­
it card number.

Protecting
Telecommunications

ANYONE WHO USES YOUR COMPUTER
can also connect to the telecommunica­
tions services you use, if you have auto­
mated the log-on sequence. Two simple
precautions might help. First, enter the
passwords manually—don't store them
anywhere on the computer. Second, carry
the customer-service phone numbers of
the online services so you can call and
cancel accounts if your computer is
stolen, just as you would for credit cards.
Your telephone credit card number or
corporate long-distance access code
might be in a dialing sequence for a com­
nunications program. You could enter
these numbers manually to avoid storing
them on disk. Following such precautions
is a nuisance, but then so is the process
of locking your house.

For file transfers in which you can
control the software at both ends, securi­
ty is straightforward if you encrypt the file
before sending it (see below). If your E­
mail system supports file enclosures, sim­
ply attach the encrypted file. If the mail
service supports only text files, you must
first convert the encrypted file into text­
only format with BinHex, a $10 share­
ware program available from user groups
and online services. The receiver must use
BinHex to recover the file and then de­
crypt it. If you do this, test the entire
process thoroughly before you use it for
real messages; the spurious characters
 generated by some E-mail systems can
render a message unrecoverable.

Fax images are harder to protect. A
fax modem in your PowerBook offers
some privacy compared with the typical
office fax machine, which generally sits
out in a public area where anyone passing
by can look at incoming messages (and
outgoing messages are frequently left in
the machine's tray for some time after
they've been sent). Some fax machines
offer a password feature, but no current
fax-modem software is compatible with
such features. The only practical way
To render privacy today is to ask the person
receiving the fax to stand guard at the fax
machine while it arrives. Even with a password, the fax image
travels over the phone line using standard,
easily intercepted fax protocol. At the
moment, real security for fax is possible
continues.

Compared to FileMaker® Pro, Helix Express is the
more intelligent choice. There are oceans of
differences between a flat file database (like FileMaker,
for example) and Helix Express. A flat file program
can handle basic business needs. But a relational
database program like Helix Express has more
depth, and the capability to grow as your needs grow.

Helix Express: the complete database solution for Mac users of all sizes. It's more
flexible, more expandable, more adaptable, and
more capable than other database programs. And
because it's a multi-user program, its capabilities
can keep pace with your needs, from basic to com­
plex. Helix Express can be used to design dozens of
applications needed in every business.
At first glance, most Macintosh storage solutions all seem the same. So why is it that editors and analysts so frequently select Mirror drives as best of category or Editors' Choice?

Details Make The Difference

We like to believe it has a lot to do with our attention to detail. Details that define our products' look, feel, operation, and serviceability. Since entering the Macintosh drive market in 1985, Mirror has continually refined and enhanced our products to better address real-world applications. And the editors recognize this.

Exclusive Software

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You don't have to look far to find a cheaper drive. But since your data is more valuable than any drive you might select, we choose not to compromise. Each drive is meticulously assembled, tested, and inspected, using only the fastest mechanisms, and backed by the most competent technical support in the business.

Why So Many Awards?

Mirror drives are available from 85Mb to 1.37Gb, and include a free copy of 7th Heaven utilities ($99 value).

<table>
<thead>
<tr>
<th>Drive Size</th>
<th>Direct Price</th>
<th>Ext</th>
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<tbody>
<tr>
<td>85 Mb drive</td>
<td>$279</td>
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<tr>
<td>120Mb drive</td>
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<td>540Mb drive</td>
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<td>1.37Gb drive</td>
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<td>DAT tape drive</td>
<td>$1399*</td>
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The best thing next to your Mac.
only through an expensive hardware accessory. The $1995 AT&T model 3700 fax encryptor connects between a fax machine (or modem) and the phone line and sends a secure image to another fax machine or fax modem equipped with a second encryptor. AT&T's encryptor weighs 6 pounds and runs off A/C power, so it's intended mainly for office use.

Instead of faxing an image, you could scan it and then encrypt and send the resulting graphics file to another computer that can run matching software to recover the image. This somewhat cumbersome procedure might be justified for high-security situations. A PowerBook could receive and display such messages without undue difficulty, although unless you carry a scanner with you, sending such images from a PowerBook is generally impractical.

A new generation of modems based on digital signal processing (DSP) chips should be available in 1994. DSP chips are far more versatile than current modem chips and should support much more secure fax and data communications by setting up custom modulation schemes. A secure link will require compatible DSP modems at both ends.

**Network Security**

**ANY NETWORK SET UP FOR REMOTE ACCESS via modem needs careful attention to security. If you use AppleTalk Remote Access (ARA), the first thing you should do is disable guest access (from the Setup menu, choose Users & Groups; make sure that the box under Remote Access is not checked).

The second thing to do is set ARA to callback rather than let it accept calls directly. With callback, you dial into the network and enter a password, then hang up. The network modem checks your password, retrieves your phone number from those stored in memory, and then dials your modem; only on this second call are you allowed to log on to the network.

Thus an anonymous caller can't access the network without redirecting phone lines. But if you are traveling, you may need to change the callback number frequently. And callback usually works only if the network modem can dial your modem directly without going through, say, a hotel operator.

A network manager should also carefully consider the access a user really needs; ARA can be set so callers have access to files on the answering Mac only, not to the entire network.

Passwords for network access are often a weak link, since many people choose easily remembered passwords such as their last name or some trendy word. If all users were required to use some punctuation in their passwords, the chances of someone randomly guessing a password would drop significantly. It helps to frequently change passwords. And look around the office—are passwords taped to computer displays? Do you really trust everyone with access to the office?

**Passwords and Encryption**

**YOU CAN CHOOSE FROM MANY LEVELS OF PROTECTION for your data. The simplest protection comes with screen-saver programs such as After Dark. You can set the program so that a user has to type a password to restore the screen. Screen-saver programs are also handy for wiping information off the screen in case you find a snooper lurking nearby. It's actually a fairly common problem; if you fly to or from a trade show, the person in the next seat may well work for a competitor.

Screen-saver passwords offer minimal protection; anyone can restart the computer and bypass the password. Setting file and folder password protection limits access (to those levels) to someone with a password. This provides privacy for specific portions of a drive yet still lets people use the computer normally.

At the next level is a hard drive password, which prevents anyone who doesn’t know the password from accessing the drive. A hard drive password can be set to work like a screen saver; after some inactivity, the computer automatically locks up. Optionally, the floppy disk drive can be locked as well. Disk-password programs work well for casual data-protection where a would-be snooper is unlikely to be a particularly knowledgeable computer user—but all can be easily circumvented.

Of the many disk-password programs, SafeLock Mac is the least expensive at $49 (Trend Micro Devices, 310/782-8190, 800/228-5651). Many disk-formatting programs and utility collections include password features, so you may not need to buy a new product at all.

Password systems do not change any information off the screen in case a would-be snooper is lurking nearby. It's actually a fairly common problem; if you fly to or from a trade show, the person in the next seat may well work for a competitor.

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Encryption systems go beyond password systems by encrypting the files so that no one can read the contents without a password. Every time you save, the system performs encryptions; every time you read, it does decryption. Most programs offer two or three encryption levels. The simpler levels work quickly but offer less security than the more thorough DES (Data Encryption Standard) encryption, the federal government standard.

DES encryption depends on "keys," or passwords—the weak link in many encryption products. To make the process automatic, many encryption programs store the key within the encrypted file. A sophisticated snooper simply looks for keys, a much simpler challenge than trying to break DES. Manual key-entry is more secure, and a key should use the full ASCII character set, complete with punctuation marks and uppercase and lowercase letters.

With high-level DES encryption, the keys are vital; if you lose the key, you've lost the file. You have to balance the risk of an information leak against the risk of losing the information itself by forgetting the key. Keys should not be stored anywhere on your hard drive. A snooper could easily try every name in your address book as a key, for example. A small flaw in your hard drive could potentially make an encrypted file unrecoverable, unlike a plain text file, where the flaw might garble a few words but leave everything else readable. If you use serious encryption, consider keeping a decrypted version of each file on a floppy disk or some other backup medium as well. Hide the disks or store them in a safe. Regardless of security systems, back up your files so you still have them if you lose the computer.

For an excellent survey of encryption software programs and their relative security, see Bruce Schneier's article "Data Guardians," Macworld, February 1993. For DES encryption, Schneier recommends Citadel with Shredder ($99, from DataWatch Corporation, 919/490-1277); he also recommends ultraSecure ($239, usrEZ Software, 714/756-5140), which has many options Citadel doesn't have, including simple password features and automatic encryption. As he points out, however, some of these additional features can compromise security.

The most robust security product for the Macintosh is free. PGP (Pretty Good Privacy), developed by Philip Zimmerman, includes complete support for public-key encryption, a way to send secure messages even to people you don't know. It's available on Internet at several FTP sites. Try, for example, mac.archive.umich.edu; look in the directory path/mac/util/encryption.

Moving toward Paranoia

WHEN YOU ERASE A FILE, YOU DON'T actually erase the magnetic information. Instead, the operating system sets a flag in the disk directory that marks the tracks as available for use. The file data is still on the disk until the tracks are overwritten. That's why utility programs can often recover files even after you've trashed them and emptied the Trash. Moreover, experiments show that overwriting the tracks doesn't always completely erase them; the Department of Defense requires overwriting a track three times to completely erase it; many programs, including Citadel and ultraSecure, perform such multiple-pass erasure.

A spy can eavesdrop on the incidental electromagnetic radiation generated by all computers. A PowerBook doesn't have the high-voltage CRT that radiates from desktop computers, but its plastic case does not shield as well as metal. The U. S. government security agencies set a radiation standard called Tempest that must be met by electronic equipment used for highest-security work. Tempest-qualified computers are sold only to the government and approved government contractors; they are not available for ordinary commercial purchase. No PowerBook has yet been converted to meet Tempest specifications, although Grid has a PC-compatible laptop that meets Tempest specs. Hetra (703/709-0800) and Mitek (703/318-7030) offer Tempest-qualified desktop Macs to qualified buyers.

Do business spies use incidental radiation to eavesdrop on PowerBooks? They could, but it's so much easier and cheaper to bribe a hotel employee to let them into a hotel room to copy files or comb through wastebaskets that most probably don't bother.

So you should watch what you throw away, along with everything else. Or maybe, if you are competing on a bid against another company, you should throw away or store some spoof information in your computer—an artificially high bid, for example. As long as someone is spying on you, you may as well take advantage of it.

CARY LU is a Macworld contributing editor who covers PowerBook-related issues in this monthly column.
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**Software**

**ACCOUNTING/FINANCE**

★★ Andrew Tobias' TaxCut for Macintosh, Meca Software, 203/256-5000, $79.95. The occasionally awkward interface of this personal tax-preparation software doesn't follow every Mac standard, but the help system is very good. State versions are available for California and New York. May '93

★★ Business Sense 1.6, Business Sense, 307/877-2331, $199. Competent, single-user, all-in-one bookkeeping package will adequately help you keep the books for a small company, but it's not as easy to use as its competition. Feb '93

★★★★ Components 1.0, Satori Software, 206/443-0765, $795 per module. Simple, flexible architecture sets a new design standard for Macintosh accounting software, but is not without its bugs and flaws. Sep '92

★★ Great Plains Accounting 6.0 (6.1), Great Plains Software, 701/281-0550, $795. High-end bookkeeping software offers a first-rate lineup of dedicated modules. Different individuals or groups can easily use the various accounting functions.

★★ HyperTax Tutor 1991, Sofsoft International, 508/791-4011, $99. If you're willing to put up with a design that's neither intuitive nor easy to use, this cross-referenced book contains extensive explanations, strategies, and examples of complex IRS tax laws. Apr '92

★★★★ Job Cost/Time Billing 1.05, Satori Software, 206/443-0765, $1495. Professional billing software incorporates high-end job-cost and accounts-receivable features in one module, plus an excellent report function; but confusing elements, minor bugs, and inaccuracies in the documentation are weaknesses. Aug '92

★★★★ MacinTax 1992, ChipSoft, 619/493-8722, $75.95. It's difficult to correct your errors when using this personal tax-preparation software, but it's definitely easier than doing your taxes by hand. The display is attractive, the program supports electronic filing, and there are 15 state-tax versions available. May '93

★★★★ Managing Your Money 5.0, Meca Software, 208/256-5000, $79.95. An already strong financial-management program becomes easier to use and slightly more powerful with this upgrade. Jan '93

★★★★ MYOB 3.0, Teleware, 201/586-2200, $199. A life-cabinet metaphor makes the interface of this accounting system with one user who has no need for payroll capabilities, it's the best choice.

★★ Quicken 3.0, Intuit, 452/852-9696, $699.55. Track assets, liabilities, income, and expenses with this personal-finance package. It has a good Mac Interface and is easy to learn and use.

★★★★ Timeslips III 2.1, Timeslips Corp., 508/766-6100, $299.55. Complexity is the price you pay for this time-billing utility's impressive flexibility. Fortunately, thorough documentation, excellent tech support, and default settings help any user get started. Sep '92

★★★★ WealthBuilder 2.0, Reality Technologies, 800/346-2024, $79.99. Financial-planning software forces you to think about your money and helps you develop an investment plan. It's a good program for beginning investors, but more-sophisticated investors will want more-advanced features. May '93

**BUSINESS TOOLS**

★★★★★★ 4th Dimension 3.0.1, ACI US, 408/252-4444, $895. Multitasking, which greatly improves speed in a carefully designed application, makes this upgraded relational database delightful for both developers and end users. For a relational database, it's impressively easy to use. Apr '93

★★★★ AccuZip61.5.2, Software Publishers, 714/446-1998, $899. Professional-level mail-list management tool on CD-ROM is the most comprehensive system available, but its messy documentation and inaccessible user-interface violations make our reviewers reluctant to recommend it. May '93

★★★★ Aspects 1.01 (1.03), Group Technologies, 703/526-1555, $285 to $1295. Collaborative software allows up to 16 people to edit a project. Controlled access as well as individual and linked views are good features, but the lack of outlining and spreadsheet modules limits its usefulness. Jun '92

★★★★★ Atlas Pro 1.0.6 (1.5), Strategic Mapping, 408/985-7400, $795. Although this mapping software is not a complete geographic-information system, it boasts a rich feature set and a competitive price. Nov '92

★★★★ Bar Code Pro 1.0, Symex, 718/499-6293, $450. Easy-to-use desk accessory creates bar codes in EPS or PICT for use in desktop publishing or labeling programs. It does well what it sets out to do, but lacks automatic sequential coding and fails to catch invalid characters. Sep '92

★★ Claris Resolve, Claris Corp., 408/727-8227, $249. Advanced features come with easy reach of spreadsheet pedestrians with this program. Anyone can learn how to use it in 10 minutes and how to customize it in 20.

★★★★★★ DataPoint 1.02 (1.1), Brio Technology, 415/961-1100, $239. Convenient and flexible report-generator includes fast formatting, automatic import, and just about every other item on the wish list of users who need report tables that emphasize cross-tabulation. May '92

★★★★★★ DeltaGraph Professional 2.01 (2.02), DeltaPoint, 408/648-4000, $295. A smooth interface and outstanding technical support are only two of the stellar features in this graphing and charting program. This upgrade adds 13 new chart types and a number of presentation capabilities. May '92

★★★★ Fair Witness 1.1 (1.2), Chenia Software, 215/770-1210, $295. A valuable tool for planning any project, this software coherently integrates outlining, information charts, scheduling, and time charts. Oct '92

★★★★ FileMaker Pro 2.0, Claris Corp., 408/727-8227, $399. Easier scripting, improved mailing labels and text-handling, and support for QuickTime and Apple events are the major new features of this upgraded, multiuser, flat-file database. Although it has some minor bugs, this is a strong upgrade to an excellent program. Jan '93

★★★★ FlowChart Express 1.0, Kaelon Software Corp., 713/990-3634, $149. Inexpensive, easy-to-use flowchart software readily meets the needs of most flowchart creators, although those with extensive requirements will still need a larger, more powerful feature set. Jan '93

★★★★ GeoQuery 3.02, GeoQuery Corp., 708/357-0535, $395. Gain geographic perspective with this custom-map generator and data-analysis software that uses zip codes to create "pathing" maps of files from your spreadsheet or database. Nov '92

★★★★ GraphMaster 1.31a (1.33), Visual Business Systems, 404/956-0325, $295. Excellent general-purpose charting and graphing program offers a number of unusual features, including pictographs and continues
MAC WORLD

Star Ratings

360-degree free rotation. A frequent inability to undo actions is the only serious limitation. May 93

GreatWorks 2.0, Symantec, 408/253-9600, $299. High marks to this integrated package for including an outlining module and a color paint module. While the integration may not be ideal, it's a solid program, worth a close look.

iThought 2.1.1, High Performance Systems, 603/643-9636, $599. Although it requires a real training commitment for effective use, this product is an attractive dynamic business modeling system. It's a good bet for identifying cloudy spots in the crystal ball. May 93

Lotus 1-2-3 for Macintosh 1.0.1 (1.1), Lotus Development Corp., 800/333-5414, $995. Spreadsheet program from the other side holds its own against its competitors. Its many strengths include graphing, well-implemented linking, compatibility with the DOS version, and an outstanding Help system. Apr 92

MacProject Pro, Claris Corp., 408/727-8227, $599. If you're working on a midsize project and like using PERT charts (where tasks appear in boxes and are connected by straight lines), this may be the project-management software for you. However, the multistep scheduling process and the limited integration between charts are frustrating if you prefer Gantt charts. May 93

Microsoft Excel 4.0, Microsoft Corp., 206/882-8080, $495. Create impressive spreadsheets with this upgrade that includes all the features you wished for and more. It's slower, and now needs 2MB of RAM for practical use, but almost all users will want to upgrade.

Microsoft Project 3.0, Microsoft, 206/882-8080, $695. An amazing range of functions, including new scheduling and formatting, are packed into this upgraded project-management software. The improved tool bar helps novices schedule tasks with push-button ease. Jan 93

Microsoft Works 3.0, Microsoft, 206/882-8088, $295. Capable but unspectacular upgrade delivers marginally improved functionality and a welcome face-lift to this integrated program, but there are a number of incompatibilities, odd design choices, and performance flaws. Feb 93

Muse 1.0 (1.01), Occam Research Corp., 617/923-3545, $695. Innovative data-analysis software is based on a large, ambitious vision of how to organize and use data, and it's an excellent environment for doing some data handling. "Free-form query language is powerful, but easy to missread. Jan 93

nuBase Pro 1.5 (1.54), Tactic Software Corp., 408/832-6691, $395. Although still slower than FoxBase and without the rich feature-set of 4th Dimension, this is the only relational database that allows programs to navigate data for databases with much fuss. Dec 92

OrgChart Express 1.0, Kaetron Software, 713/890-3434, $79. Organization-chart software links a database to standard box-drawing functions. Although the learning curve is steep, the effort may be worth it for people who regularly work with large or complex organization charts. Apr 93

Panorama 2.0 (2.06), ProVue Development Corp., 714/892-8199, $395. Disastrously easy-to-learn file-based file management is complete of labor-saving data-entry features, plus it boasts a remarkable macro function that lets you record and play back almost any series of database routines. May 92

PEMD Discovery 1.3.1, PEMD Education Group, 707/894-3668, $189. Unsupervised data-search and -retrieval routines, limited displays, and a weak manual restrict this graphical data-analysis software's usefulness. Apr 92

Perspective 1.5, U.S. Data on Demand, 800/352-7352, $129.95. The level of detail and comprehensive information in this collection of U.S. demographic and economic data is impressive, and the reasonable price puts it within reach of even the smallest business. Sep 92

PowerPlay 1.0 (1.1), Cognos, 617/229-6600, $695. A good program for a very limited range of business-analysis tasks. The views of data and graphs are small and manageable, and the program tabulates them in several colorful ways. Aug 92

PowerTrak 1.1 (1.2), Soft Solutions, 404/457-9400, $495. Convoluted and repetitive data-entry processes slow you down when they should speed you up in this 4D-based information-management system. Apr 92

RateFinder 1.5 (1.6), Elefunf Software, 510/843-7725, $999. Numerous interface violations don't change the fact that these all-inclusive shipping-rate tables make the old-fashioned chore of checking mail rates easier and more efficient. Jan 93

SpreadBase 1.0.1, Objective Software, 415/306-7410, $695. Powerful business-data-analysis tool is a unique combination of database and spreadsheet functions. It's worth a close look for power users, despite meager documentation and a cranky macro language. May 93

ZP 7 (10), Semaphore Corp., 408/688-9200, $125. Clean up and standardize addresses with this CD ROM, thereby reducing postage costs and avoiding undesirable mail; use a licensed version of the U.S. Postal Service's official database of every valid postal address in America. May 92

COMMUNICATIONS/NETWORKS

AUX 3.0, Apple Computer, 408/996-1010, $709. Hybrid-operating-system package implements the Stone Age, type-one-line-at-a-time interface of Unix in a way a Macintosh user might actually like. Nov 92

AccessPC 2.0, Insignia Solutions, 415/694-7600, $99.95. Slick control over formatting multiple types of DOS media is the major advantage of this file-transfer utility. Oct 92

Carbon Copy for the Mac 2.0 (2.04), Microcom, 919/490-1277, single-user $99, multi-user $299. Screen-sharing utility is convenient and economical for occasional use but because it competes for RAM on attended low-memory Macs, it isn't efficient enough to use as a global solution for remote-control support. Apr 92

CompuServe information Manager 2.0.1, CompuServe, 614/497-8600, $49.95. The goal of this product is to give friendly information-access to CompuServe for Macintosh users. An appealing color interface and increased speed are signs of success, but there's still room for improvement. Aug 92

DataClub Classic, DataClub Elite 2.0, Novell, 800/638-9273, $175, $1995. Fully distributed file servers allow users to pool the free space on their drives into one virtual server. File sharing is transparent, but when a participating Mac disconnects from the network, users lose access to files stored on its hard drive. Aug 92

DOS Mounter 3.0, Dayna Communications, 801/531-0600, $89.95. If you need to use wild cards in extension mapping, this file-transfer utility is the only option, although it's slower than other file-transfer programs. Oct 92

Macintosh PC Exchange 1.01, Apple Computer, 408/996-1010, $79. For basic file-transfer, this control panel device allowing cross-platform file sharing is fine, but it's hardly state-of-the-art. Oct 92

MicroPhone II 4.0 (4.0.2), Software Ventures Corp., 510/644-3323, $295. Refinements are evident throughout this telecommunications software's upgrade, but not everyone needs $295 worth of sophistication. The impressive scripting facility is counter by poor help features. Jul 93

MicroPhone Pro, Software Ventures Corp., 510/644-3323, $295. Truly comprehensive telecommunications package now includes send-and-receive fax software. Although the new TCP/IP tools are complicated, the documentation is clear and precise. Apr 93

NetMouter 1.0 (1.01), Dayna Communications, 801/531-0600, $999. Reasonably priced utility provides Macs access to NetWare file servers without having to install NetWare for the Macintosh on the server. It's not an ideal choice, but it is economical for small networks with only a few Macs. Sep 92

NetVirtual 2.0, Eclectics, 408/462-2040, $995, unlimited nodes $4985. One-of-a kind network-monitoring product favors flexibility at the expense of usability. Only after hours of work will your simulation report anything meaningful about your network, and even then the results are difficult to analyze. Apr 93

NetWare for the Macintosh 3.01, Novell, 800/638-3273, $495-1995. NetWare 3.1, an expensive but robust network operating system, runs on a non-Mac dedicated server and is complex to manage. This set of NetWare Loadable Modules lets you add Macs to a NetWare network.

Network SuperVisor 2.0 1 (2.1), CSG Technologies, 412/471-7170, $495. Fast and accurate data collection is the strong point of this network-management utility, but the interface isn't that intuitive. Aug 92

Network Vital Signs 1.0 (1.1), Dayna Communications, 801/531-0600, $449. Fault-monitoring application continually watches selected network devices and services, monitoring specific equipment for specific errors. Unfortunately, when monitoring more than ten devices, it noticeably degrades the performance of the monitoring Mac. Mar 93
NetWorks 1.0.1 (2.0), Caravelle Networks Corp., 613/596-2802, $1195. Become a network demigod with omnipresent capabilities over network devices using this network-management and paging utility. Aftersworld’s network manager loved it, calling it versatile, fast, and worth its weight in gold. Jun 92

Notify 1.0, Ex Machina, 718/955-0309, $149. Innovative wireless transmittor uses the Mac to send messages to pager. It’s a start on a new technology, but the quirky product has a long way to go. Jun 92

PacerForum 1.0.1, Pacer Software, 619/454-0565, $549. Any life server or underused networked Mac can host an online forum using this network bulletin board system. The well-designed graphical interface stands out, although the display looks better on color monitors. Jul 92

RouterCheck 2.0, Neon Software, 510/283-9771, $895. Keep your finger on the pulse of router configurations and internet traffic with this network-administration utility. It’s a must for midsize or larger internets, but too pricey for small networks. Oct 92

SoftPC 2.0 (2.5), Insogna Solutions, 415/694-7600, $399. A graceful implementation of the PC architecture on a Mac, this program emulates PC AT hardware through a powerful BIOS that remaps Intel 80286 addresses to a Motorola 68000-series CPU. The main drawback is slowness. Status Mac 2.0.2 (3.0), On Technology, 617/876-0900, $449. With less hassle for network managers and users, this upgrade customize in both the collecting and sharing of information about networked Macs; users can even delay time-consuming profiling. May 92

TechWorks Net Utilities 1.0, Technology Works, 512/794-6533, $129. Collection of five separate applications provides essential network-monitoring tools at a price that would please anyone. Dec 92

Timbuktu 5.0.1, Farallon Computing, 510/814-5000, single user $199, multuser $999 to $5500. By letting one computer (a Mac or a Windows-based PC) control, observe, or exchange data with another computer, this terminal- emulation product allows you to use resources almost anywhere on a network. Despite minor blemishes, such as its inability to cut and paste between Macs and Windows PCs, it’s a good product. Mar 93

Vicom Terminal Emulators (4.2), Vicom Technology, 604/684-9517, $195 to $3500. These bare bones, British-designed terminal emulators lack many common U.S. modem configurations, but do support multiple simultaneous sessions. Aug 92

WhiteKnight 11 (11.14), The FreeSoft Company, 412/846-2700, $139. In the right hands, this product is the precision tool of communications software, but it does assume familiarity with telecommunications and with programming concepts.

Aldus PageMaker 4.2, Aldus Corp., 206/628-2320, $795. Interruptible screen redraw is one of the dozens of enhancements that make this upgrade well worth its price. Even so, some of the features that users need the most—opening multiple documents, for instance—are still missing. May 92

Aldus Personal Press 2.0, Aldus Corp., 206/628-2320, $199. Basic, inexpensive page-layout program adds features and gains strength, but is still missing elements that novice users need, such as automatic kerning. Furthermore, its software-knows-best approach to copyfitting makes manual fine-tuning and is almost certain to confuse and confound beginners. Mar 93

Apple Font Pack, Apple Computer, 408/996-1010, $99. Apple’s first collection of TrueType fonts includes only 12 fonts that haven’t been available since the late eighties in the PostScript format. Still, it’s not a bad deal, considering that Apple’s PostScript fonts cost four times as much. Mar 93

Fontographer 3.5, Altsys Corp., 214/680-2060, $495. Versatile tools that enable you to edit PostScript typefaces or create your own are the highlight of this font-design software. But beware, some processes are technical and cumbersome. Nov 92

Lazy Dog Foundry Personal Font, Lazy Dog Foundry, 612/291-0306, $199.99, full 180-character set $499.99. Type 1 font made from your handwriting has clean, even lines—whether or not your writing does. Apr 93

Letraslato 2.0, Letraslat USA, 201/845-6100, $249. Precise, intuitive control over characterspacing and shapes, as well as a straightforward interface, make this program a great choice for manipulating type, but it lacks flashy effects, such as gradient fills. Oct 92

MacQull 1.0, Nest Software, 408/441-1944, $59.95. Friendly, inexpensive page-layout program is missing basic features, such as kerning and importing, and suffers from some bugs and deficiencies, but for simple word processing and cross-roots page layout it’s serviceable. Aug 92

MenuFonts 4.02 (4.04), Dubl-Click Software, 505/888-2060, $59.95. A control panel device that groups type faces in families and displays font names in their own typefaces sounds like a great idea, and it would be if there were fewer incompatibilities. May 92

Multiple Master Myriad 1.0, Adobe Systems, 415/961-4400, $370. Elegant execution and functional design combine in this two-axis Multiple Master typeface that exceeds all previous ideas of electronic font perfection. Jul 92

Personal Font, Signature Software, 408/382-0241, $179.95. Turn your handwriting into a PostScript Level 3 or a TrueType font. The results are good, although not perfect—TrueType typefaces were not connected on screen, but this should be corrected with TrueType 2.0. Dec 92

Publish It Easy 3.0, Timeworks, 708/559-1300, $199.95. Desktop-publishing program offers writing, editing, formatting, page-layout, drawing, and painting tools with well-thought-out interface innovations, plus an excellent database manager. Unfortunately, the program is unstable and crash-prone. Mar 93

QuarkXPress 3.1, Quark, 800/788-7835, $895. Dozens of updated features and frustration-relievers in this upgrade include new palettes and preferences, better zooming, and improved text-editing and -formatting. The program, while still not perfectly behaved, is stable, well designed, and full-featured. Jul 92

Renaissance 1.0, Eastman Kodak, 800/433-2839, $695. A strange mixture of power and oversight, this page-design and layout software provides several slick features, including handling multiple page sizes simultaneously, but blatantly ignores common Mac conventions, such as some keyboard shortcuts. Dec 92

Spectacular 1.2, FontHaus, 203/846-3087, $79.95. Keep track of fonts efficiently and effectively with this type-specimen generator. Printing specimen sheets is a cinch. Jan 93

SuperATM, Adobe Systems, 415/961-4400, $149. This upgrade to Adobe Type Manager lets you view Adobe-brand PostScript fonts on screen and output them at high resolutions, even when the corresponding printer fonts are unavailable. Although it has limitations, this is an outstanding advance in font technology and a tremendous value. May 93

Algebra, Broderbund Software, 415/382-4400, $89.95, school edition $99.95. Interactive, imaginative math tutorial is keyed to the standard textbook order of topics, but offers much more. It is particularly strong on word problems and graphing. May 93

American Discovery 3.0, Great Wave Software, 408/438-1950, $49.95. Without glitz graphics or sound, this educational game, intended mainly for classroom use, provides an excellent drill in geography, state capitals, and state facts. May 92

The Castle of Dr. Brain 1.0, Sierra On-Line, 209/683-4468, $49.95. After applying for a job as a lab assistant with the local mad scientist, you must use logic and raw brain-power to navigate a series of rooms, mazes, and hallways on the way to your interview. Puzzles range from simple and mundane to creatively laborious. Dec 92

Comprehensive Review in Biology, Queue, 203/335-0908, $295. There isn’t a textbook publisher in North America with the nerve to publish a black-and-white biology book with nothing more than text and basic line drawings, much less charge several hundred dollars for it, but that, in effect, is what this CD ROM is May 93

Compton’s Multimedia Encyclopedia 1.00M, Compton’s New Media, 619/929-2626, $795. The down-to-earth writing style and numerous bells and whistles of this multimedia encyclopedia on CD ROM appeal to younger readers, but the high cost and sluggish performance may be prohibitive. Apr 93

Eco-Adventures in the Ocean, Eco-Adventures in the Rainforest 1.0, Chariot Software Group, 619/298-0202, $59.95. Explore the ocean or rainforest while avoiding pitfalls and predators in imaginary landscapes that combine features found in different environments may confuse some students. Nov 92

Headline Harry and the Great Paper Race 1.0, Davidson & Associates, 310/793-0600, $59.95. Travel through time and across the country as a journalist in this history/geography game. While not an educational masterpiece, it is lots of fun. Dec 92

MacGlobe 1.3.0, Broderbund Software, 415/382-4400, $59.95. Besides maps and bits of fun, this multimedia encyclopedia on CD ROM offers a fascinating Intellectual adventure for educators and students. May 93

EDUCATION
MACWORLD Star Ratings

home and school use. Feb 93

Math Shop, Math Shop Jr., Advanced Math Shop 1.0, Scholastic, 800/541-5513, $24.95. The humdrum workbook format is converted into bits and bytes with these mathematics education games.

May 92

The New Groller Multimedia Encyclopedia, Groller Electronic Publishing, 203/797-3530, $395. The remarkably current and scholarly text of this encyclopedia on CD ROM is suitable for sophisticated readers, while its speed, ease of use, and value are impressive.

Apr 93

NihongoWare, Vol. 1, Qualitas Trading Company, 510/846-8080, $62.3. Although this Japanese-language CD ROM offers solid instruction, it's so expensive and so limited in its word selection that it's not an economical choice for individual users.

Jun 93

Number Munchers 1.1 (1.2), MECC, 612/569-1500, $29.95 to $69. Fun, educational game builds arithmetic skills through arcade action. Munchers gobble your choice of multiples, factors, primes, equalities, and inequalities, but the game can't accept custom data sets.

Jun 92

Picture It 1.0 (1.4), Penton Overseas, 619/431-0600, $69.95. If you add custom word lists, this interactive French-English picture dictionary may serve as a decent aid to a more complete curriculum, but it's buggy and of uneven quality.

Aug 92

The Secret Codes of C.Y.P.H.E.R. 1.0 (1.1), Tanager Software Productions, 510/430-0900, $59.95. Intriguing facts about mammals and a variety of quirks may confuse new users.

Sep 92

StudyWare for the SAT 3.7N (4.0), Cliffs Notes, 408/732-5900, $49.95. Four SAT sections, TSWE (Test of Standard Written English), and a series of quizzes are included with this expensive SAT-training program. It doesn't provide a lot of tutorial assistance, but may be appropriate for students who need a quick brushup.

Jun 92

Super Munchers 1.0, MECC, 612/569-1500, $49.95 to $69. From a kid's point of view, this educational arcade game offers long-lasting appeal. The player maneuvers a cartoon Muncher around a game board, gobbling up words that fit target rules, such as Romantic comedy. More strategy and capture, complete with sound effects. In this enthralling game where the goal is to replicate a pattern by moving rows and columns of tiles. The deviously simple twist is that clicking on the arrows that control movement results in reactions that are more and more complex as you progress through the 120 levels.

Apr 93

The Complete Annotated Alice 1.0, The Voyager Company, 310/451-1383, $19.95. Fans of Alice's Adventures in Wonderland will love the "lost" out-of-print chapter in this HyperCard book designed primarily for PowerBook users. As literary hyper- text and an attempt to document, it works.

Jun 92

Creepy Castle 1.0, Reactor, 312/573-0800, $49.95. Wolfman, the Bride of Frankenstein, and other ghouls from classic horror movies populate this clever arcade-style game. Still, delightful movie trivia doesn't compensate for frustrating performance delays and limited scenarios.

Jun 92

Cross Country 1.0 (2.0), T-34 Microsystems, 904/896-2785, $179.95. No unnecessary frills complicate this efficient, inexpensive instrument-flight trainer. It doesn't have a true aerodynamic feel, but that flaw's not critical. Jul 92

Cyberblast 2.01, Innerperse Software, 410/560-2434, $49.95. Aliens have overrun the 64 levels of Fastax Labs, and it's your job to get rid of them in this arcade game. While it's not the most unusual game in the universe, it's a nice, basic shoot-em-up, with clever execution and appealing graphics.

Sep 92

Go Master 5, Toyogo, 808/396-5526, $69. Go has been called the most interesting board game ever invented. This excellent software version incorporates helpful learning aids and sample games.

Dec 92

Hardball II, Accolade, 408/985-1700, $54.95. From the pitcher's windup to the batter's swing, this baseball game comes astonishingly close to natural human motion. The upgrade adds more teams, more stadiums, Instant replay, and the ability to create your own league.

May 92

Hellcats Over the Pacific 1.0.3, Graphic Simulations, 216/699-7400, $69.95. Fly a WWII-era Navy fighter, the Grumman F6F Hellcat, against enemy planes in the South Pacific with this flight simulator that offers smooth graphics, good special effects, and great documentation.

Apr 93

Insanity 1.0, UV Wave, 318/868-9944, $28.95. Shoot your Mac with this cool control panel device that offers a choice of nine weapons, ranging from an Uzi to a pigeon. It has first-rate sound effects and detailed animation, but the novelty wears off. Feb 93

Just Grandma and Me, Broderbund Software, 415/382-4400, $49.95. Merc Mayer's Little Critter comes to life in this charming, captivating, wonderfully entertaining, interactive storybook on CD ROM.

Aug 92

Kid Pix 1.0 (1.2), Broderbund Software, 415/382-4400, $59.95. An enchanting, enchanting color paint program aimed at children but delightful for grown-ups, too. Hilarious sounds, hidden surprises, spectacular...
The Orchestra: The Instruments Revealed, 415/342-4400, $5.95. A lively, classical music commentator for National Public Radio, conveys his enthusiasm for this appealing music in the lively text of this CD ROM. However, the discussion is relatively unchallenging and the musical performance, though well regarded, is not at the top of most reviewers' lists. Apr 93

The Secret of Monkey Island 1.0, LucasArts Games, 415/721-3300, $59.95. A genuinely amusing, interactive tale of swashbuckling and daring deeds using splendid 256-color graphics and an original soundtrack. Low screen resolution and irksome copy protection only slightly spoil the delight. Sep 92

Shanghai II: The Dragon's Eye, Activision, 310/207-4500, $49.95. Classic game is more addictive than ever. Edible enhancements include new tiles and layout, plus an additional, entirely new game that's a variation on the tile-removal theme. May 93

Sherlock Holmes, Consulting Detective I.0, Icon Simulations, 70B/S20-4440, $69.95. Accompany Sherlock Holmes and Watson as they investigate three CD ROM-based mysteries. Primarily made up of video scenes, this game's only slightly more interactive than TV, and the picture isn't as good. Aug 92

Sherlock Holmes, Consulting Detective, Volume II, Icon Simulations, 70B/S20-4440, $69.95. Match wits with the legendary detective by solving three difficult mysteries in this game on CD ROM. May 93

A Silly Noisy House 1.0, The Voyager Company, 310/451-1383, $59.95. A brightly colored animated world awaits exploration; this CD ROM's simple scenes and syrupy songs are perfect for preschoolers. Sep 92

SimAnt 1.0, Maxis, 510/252-9700, $59.95. Marauding red ants, ant lions, spiders, even power potters—an ant's life is likely to be short in this remarkably detailed simulation game in which the object is to have black ants amass territory in a suburban backyard. Apr 92

SimLife, Maxis, 510/254-9700, $69.95. A megalomaniac's dream come true, this amazingly intricate simulation game allows players to create and control ecosystems. It's not easy, but the reward is an increased understanding of the complex interrelationships of life. Feb 93

So I've Heard, Volume I: Bach and Before, The Voyager Company, 810/451-1383, $24.95. Engaging text by classical-music critic and lecturer Alan Rich describes nearly two millennia of western music (up to the mid-eighteenth century) in this CD ROM. It offers a unique and affordable opportunity to sample 50 or so performances, styles, and compositions. Feb 93

Space Quest 1: Roger Wilco in the Saren Encounter, Sierra Online, 209/683-8899, $29.95. As Roger Wilco, starship junior, you must defeat the evil Salians in this adventure game where your head is more important than your hands. Puzzles range from the obvious to the head-scratching, but for most players the game will be easy to complete. Apr 93

Spaceward Ho 2.0.1, Delta Tao Software, 408/730-9336, $59. A happy planet is a profitable planet in this absorbing, humorous strategy game of interstellar capitalism and imperialism. Aug 92

Spectre 1.0, Velocity Development Corp., 415/776-8000, $59.95. Fight enemy tanks in a 3-D arcade game that is at once basic and extremely addictive. When installed on a network, it's one of the great anti-productivity tools of all time. May 92

Spelunx and the Caves of Mr. Seudo, Broderbund Software, 415/382-4400, $49.95. Unanticipated giggles, rich graphics, entertaining sounds, and creative learning activities fill this interactive hyperworld. We recommend it, despite its tiny bugs. Jul 92

Super Marines 1.0, Callisto Corp., 508/655-0707, $49.95. You use logic to solve a minefield without setting off the mines in this fast-paced game that's easy to learn, but offers 84 levels for long playability. Apr 93

Super Tetris, Spectrum HoloByte, 510/322-3584, $49.95. Teeny tiles are a very minor negative in this exceptional tile game that's more varied, more challenging, and more forgiving than the original. Oct 92

Surgeon 3, The Brain 1.0 (1.1), ISM, 410/522-3584, $59.95. A medieval fantasy world is the setting for this colorful game of strategy and conquest with beautiful graphics. Unfortunately, the computer opponents are not challenging enough for an experienced war gamer, although human opponents may be. Dec 92

Who Killed Sam Rupert, Creative Multimedia Corp., 503/241-4351, $39.99. You're a police detective trying to solve the murder of a popular restaurateur in this interactive CD ROM that exploits the full range of multimedia options and provides a wealth of clues and surprises to hold your interest. May 93

Wordtrix, Spectrum HoloByte, 510/522-3584, $49.95. Tetris's falling blocks are letters in an arcade game for Scrabble lovers. Lots of variations, including modes for children, tournaments, and head-to-head play on a network, make it a super game. Jun 92

Alan Greenblat is charming but uneven. The overall look is surreal and cartoonish, but while some modules are elaborate and sophisticated, others are simple and not particularly interesting. Mar 93

Schubert: "The Trout" Quintet, The Voyager Company, 310/451-1383, $59.95. Alan Rich, classical music commentator for National Public Radio, conveys his enthusiasm for this appealing music in the lively text of this CD ROM. However, the discussion is relatively unchallenging and the musical performance, though well regarded, is not at the top of most reviewers' lists. Apr 93

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Adobe Dimensions, Adobe Systems, 415/961-4400, $199. This three-dimensional-effects utility may seem very limited, with white-only light and no surface texturing, but it's a ground-breaking product. It performs its 3-D illusions within the object-oriented, resolution-independent world of PostScript and is an excellent tool for anyone who works extensively in Adobe Illustrator or Aldus FreeHand. Apr 93

Adobe Illustrator 3.01, Adobe Systems, 415/961-4400, $695. Adept transformation and reshaping capabilities and superb text-handling stand out in this object-oriented illustration program. It also includes features found in no other Macintosh draw program, such as tools to create line and bar graphs.

Aldus FreeHand 3.1 (3.11), Aldus Corp., 206/628-3230, $595. A pressure-sensitive freehand continues
tool is the most remarkable new feature of this updated drawing program. Substitution for missing fonts is another good addition, but skimpy text-editing tools and incomplete support for EPS continue to diminish its value. Jun 92

** Aldus Gallery Effects 1.0 (1.5), Aldus Corp., 206/628-2320, $199. uninspiring collection of 16 image-editing filters has an unusually strong manual. Apr 92

** Alias Sketch 1.0.2 (1.5), Alias Research, 800/472-2542, $995. The unique collection of tools makes this the only program that allows you to sit down and play with 3-D rendering. Failings include quixotic navigation and sluggish performance. Aug 92

** ArchiCAD 4.02 (4.1), Graphisoft USA, 415/737-8655, $4450. The simple yet powerful 3-D interface in this CAD package builds on a construction metaphor. The integrated product incorporates most of the features an architect needs. Jun 92

Art Beat Professional 1.0, Pie Practical Solutions, 201/902-9500, $249. Despite a smattering of unique capabilities, this inexpensive draw and paint program lacks many of the features of equivalent programs. Apr 93

AutoCAD Release 11, Autodesk, 415/332-2344, $3500. Customizable, bare-bones drafting upgrade partially implements a graphical user interface. Few add-ons are currently available. Dec 92

** CA-CricketDraw III 1.0, Computer Associates International, 408/432-1727, $249. Although not revolutionary, this draw program boasts some original implementations, including dramatically improved graduations. May 92

** Cachet 1.0, Electronics for Imaging, 415/742-3400, $595. The tools, interface, output, and documentation of this color-image editor are all quite impressive for a first version, but serious failings include slowness and disappointing sharpening. Dec 92

Canvas 3.0 (3.0.6), Deneba Software, 305/596-5644, $399. Discovering the complex nuances of this draw program's immense feature list isn't easy, but it's well worth the effort. The precision drawing and paint components in particular should appeal to many users.

** Claris CAD, Claris Corp., 408/727-8227, $899. Serious but basic CAD package has fallen behind the competition after a long period without an upgrade. Still, it's one of the best products available for scrolling and zooming—important for work on large, complex drawings.

** Color It 2.0.1, Timeworks, 708/559-1300, $299.95. Overpriced color paint program has a full range of painting and image-editing capabilities, including 15 levels of undo and an impressive magic wand tool, but its naming conventions are bewildering. Apr 93

** CPM Graphic Tutor 1 & 2, Casey's Page Mill, 303/220-1463, $489 per volume. Although some neophytes may find these CD-ROM tutorials on Adobe Illustrator and Adobe Photoshop helpful, the programs' distracting interfaces, inconsistent execution, lack of polish, and high price weigh strongly against them. May 93

** DesignCAD 20/30 3.0.1, DesignCAD, 918/825-4884, $299.95. Despite slow rendering, this general-purpose 3-D modeler with 2-D drafting capabilities represents a price and performance breakthrough in 3-D modeling programs. Nov 92

*** ElectricImage Animation System

1.5.1, Electric Image, 818/577-1627, $7495. The most powerful animation program for the Mac improves its documentation and rendering, and adds an intuitive project window that allows you to control all aspects of animation from a single location. Unfortunately, it still retails for the price of a European vacation for two. Feb 93

**** Expert Color Paint 1.0, Expert Software, 305/567-9990, $49.95. A wonderful value for novices, this color paint program offers a tidy collection of features for an astonishingly low price. Beware of low memory settings, though, or it gets buggy. Jun 92

**** Fractal Design Painter 1.2 (2.0), Fractal Design Corp., 408/688-8800, $349. An expanded collection of paper textures and four new watercolor brushes add appeal to an already strong set of painting tools. Minor complaints include unsophisticated gradation and fill capabilities and an insensitive Undo command. Aug 92

**** Image Assistant 1.0, Corel Corp., 408/395-7000, $495. Besides unsatisfactorily addressing Adobe Photoshop's small list of liabilities, this image-editing software is barely able to keep up with less expensive bitmap editors. Problems include an unforgivable lack of anti-aliased text, no selective revert function, and an incorrectly implemented smudge tool. Apr 93

**** Infini-D 2.0 (2.5), Specular International, 413/549-7600, $995. Rich combination of 3-D modeling, rendering, and animation tools at a relatively affordable price. Visualization program works well, offers a nicely integrated approach to rendering, and is generally stable. Jan 93

**** Intellidraw 1.0, Aldus Corp., 408/628-2320, $299. Crowd-pleasing features such as physical and dynamic links make this automated draw program a great environment for planning and presenting, although it's less satisfying as a free-form drawing tool. Nov 92

**** Kai's Power Tools Volume 1 1.0, HSC Software, 310/392-8441, $149. Photoshop plug-ins include image-editing filters; texture, gradient, and fractal generators; and special-effects tools. Although at times monstrously complicated, this collection represents a virtually infinite supply of visual tools. It's an amazing tool that no regular user of Photoshop should be without. May 93

**** MacDraw Pro 1.0v1 (1.5), Claris Corp., 408/727-8227, $399. The shallow array of integrated features in this draw program is perfect for the new or moderately experienced user, but compared with other programs in the same price range, it's slow and deficient.

**** MacPaint 2.0, Claris Corp., 408/727-8227, $125. Easy-to-use black-and-white paint program takes up very little RAM, but it adds few capabilities beyond those it offered eight years ago.

**** MacRenderMan 1.0 (1.3), Pixar, 510/236-4000, $695. This dedicated renderer provides an extremely sophisticated, albeit sometimes difficult, way to generate 3-D images. Currently the most widespread rendering scheme, its algorithms to create textures, bumps, lights, fog, and practically every other element of an image. May 93

**** MiniCAD-4, Graphsoft, 410/461-9488, $795. Professionals should be delighted with this highly competent CAD package's evolution into 3-D. It has maintained its features-champion status and is easier to use. Mar 93

**** Paint It 1.0, Timeworks, 708/559-1300, $59.95. Straightforward color paint program lacks image-editing tools but has a versatile cast of selection and painting tools—and it's priced to sell. Apr 93

**** Ray Dream Designer 2.0 (2.04), Ray Dream, 415/960-0765, $895. Experienced 3-D aficionados will find this 3-D-imaging software a welcome addition to their arsenal, and beginners may find it ideal for the leap from two dimensions to three. Improved text-handling and viewing capabilities would make it even better. Sep 92

**** ScanMatch 1.01 (2.0), Savitar, 415/243-3030, $199. Basically half a color-calibration system. Software quickly and easily adjusts color scan files for screen display, with somewhat uneven results; those wishing to adjust images for print purposes need to use another application. May 92

**** Showplace 1.1 (1.1.1), Pixar, 510/236-4000, $695. Straightforward graphics application organizes shading and rendering processes into five basic components. Beginners will like the simple interface, but the feature set is small for experienced users. Jun 92

**** Sketcher, Fractal Design, 408/688-8800, $149. A variety of effects reproduce the styles and techniques of traditional drawing tools with this wonderful grayscale paint and image processing program. Feb 93

**** Smoothie 1.02, Peirce Software, 408/244-6554, $149. Create smooth screen images with this handy utility that anti-aliases the edges of on-screen artwork. Although it can't accommodate sound or accept imported QuickTime movies, it's a must for anyone who uses a Mac for presentations. Nov 92

**** StrataType 3.0 1.0, Strata, 801/628-5218, $295. The rulers, texture palette, custom bevels, and canned positioning schemes of this 3-D type-effects software are nice, but they can't compete with the animation skills, character positioning features, lighting capabilities, and superb rendering of other available programs. Mar 93

**** Swivel 3D Professional 1.0 (2.0), Macromedia, 415/252-2000, $695. Relatively unassuming cross-sectional technique makes this 3-D modeler a great tool, especially for fast prototyping. It provides a quick and easy way to create a variety of shapes.

**** Tree, Onyx Computing, 617/876-3876, $295. Single-purpose program generates lifelike color drawings of trees from a number of easily controlled parameters. Although visually appealing, it's an expensive way to draw a tree. May 93

**** Typestry 1.0 (1.1), Pixar, 510/236-4000, $299. Type enters the third dimension with this reasonably priced 3-D typographic effects and animation program. There's room for improvement, but it's an exciting tool for designers, multimedia producers, and those who enjoy working with type. Nov 92

**** TypeStyle (2.0), Broderbund Software, 415/382-4400, $219.95. The 35 shapes of this product's library let you reshape PostScript or TrueType fonts to create decorative special effects such as arches and perspective. TypeStyle turns fonts into graphics, enabling you to stretch, compress, or rotate text, as well as add colors, grays, or patterns.

**** Zeus 0.91 (0.92), Delta Tao Software, 408/730-9336, $499. Color paint program tries hard to match capabilities found in more expensive programs, continues
There are two ways to get 600 dpi on a LaserWriter

1) Buy a new one

If the recent printer introductions have made you feel like you and your old printer have been left behind, there is good news. You don't have to trash your old printer to get the latest in print technology, like 600 x 600 dpi. Xante offers upgrades that will turn your existing LaserWriter® or HP® LaserJet® into a 600 dpi, high performance, PostScript® compatible printer.

Why Upgrade?

True 600 x 600 dpi and Xante's Gray Scale Technology. Like the new LaserWriter Pro 600 and 630, the Accel-a-Writer upgrade supports 600 x 600 dpi. Unlike the new LaserWriter Pro 600 and 630, the Accel-a-Writer upgrade provides Advanced Gray Scale capability at 600 x 600 dpi. So, unlike the LaserWriter Pro 600 and 630, you will be able to combine 600 dpi text and line art with enhanced halftone images on the same page!

Permanent Font Storage

Xante's Virtual Disk Technology will give you the ability to permanently download fonts to the printer without requiring a hard disk. In addition to the standard 35 fonts that come with the Accel-a-Writer upgrade, you'll be able to make 30 of your favorite download fonts resident on the printer.

2) Upgrade

Lightning Fast Speed

Unlike the LaserWriter Pro 600 and 630, the Accel-a-Writer upgrade will provide you with the power of RISC processing. This power is coupled with Xante's advanced memory management schemes to reduce the time you'll need to print those complicated jobs.

Multi-platform Connectivity

Sharing your printer with PC users will be simple with the Accel-a-Writer upgrade. Simultaneously active AppleTalk®, Centronics® parallel, and serial interfaces are provided, as well as a SCSI disk interface.

Easy Installation

If you can work a screwdriver, you won't have any problems installing an Accel-a-Writer upgrade. Imaging Magazine states "Installation is a breeze and can be done in less than 15 minutes." Just to make sure, Xante includes an installation video.

Quality Assurance Guarantee

Xante provides peace of mind with a 1 year warranty and a 30-day money back guarantee on the Accel-a-Writer.

So, should you buy a new printer or upgrade? Weigh the differences, then call Xante.

Leasing available, starting at $55.49/mo

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<th>Feature</th>
<th>Accel-a-Writer® Upgrade</th>
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<th>LaserJet® 4M</th>
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© 1993 XANTE Corporation. XANTE Accel-a-Writer is a trademark of Xante Corporation. Other brands and product names are trademarks or registered trademarks of their respective holders. XANTE Corporation: 2560 Ponce de Leon Blvd., Mobile, AL 36602. Fax Office Box 10520, Mobile, AL 36660-0520 USA. Tel. 205-366-8888.
but not always successfully. It's intriguing with good ideas that are poorly implemented. Aug 92

M A T H / S C I E N C E

Caduceus Physics 1.0, Scientia, 617/776-3427, $159.95. Giant HyperCard stack consists of carefully indexed cards covering small conceptual bits of physics; it's the first in a series of programs designed to prepare students for the Medical College Admissions Test (MCAT). Jan 93

Data Desk 4.0, Data Description, 607/257-1000, $595. For finding patterns in data, this statistical-analysis program has no peer. Years of refinement have made it a unique, and uniquely valuable, tool for analysis, despite its lack of some tests found in larger programs. May 93

Expert Astronomer 1.0, Expert Software, 305/567-9990, $49.95. Draw maps of the sky from any location in the Solar System and learn about celestial objects with this astronomy software. Most effective in color, this is a great educational tool for beginners and a reference database for experts. Dec 92

Expertise 3.0, Pressence Corp., 415/543-2252, $119.95. If you work regularly on similar topics, you can customize this equation-writing software so that it produces equations with exactly the appearance you want, letting you work at amazing speed. Mar 93

HIQ 1.0 (2.0), Bilmillenium Corp., 408/866-2010, $695. A script language, which exhibits an enduring nonchalance about data structures and typing of variables, is only one of the impressive features of this formidable numerical mathematics software. Oct 92

Interactive Physics II 1.0 (1.01), Knowledge Revolution, 415/553-8153, $399. Motion simulation software is an improvement over traditional classroom instruction in physics. This new version greatly expands the range of problems that can be solved, and adds support for QuickTime. Dec 92

JMP 2.0 (2.05), SAS Institute, 919/677-8000, $695. You get lots of value for your money with this statistical-analysis program and its vast assortment of functions, including strong classical statistics and visualization, 3-D spin features, quality-control statistics, and a manual that is a model of conciseness. May 93

MacBreadboard 1.1, Yeriel Software, 919/644-1620, $399.50. Educational engineering software simulates with excruciating detail every aspect of a digital integrated-circuit breadboard trainer; it accurately replicates and even surpasses the behavior of a physical breadboard—without burning out IC chips. Dec 92

MacPhase 1.2, Otter Solutions, 315/768-3956, $159. Low-cost, scientific-data-visualization software with a large assortment of mathematical tools is one of the few authentically good programs in science software. One of its principal strengths is a well-planned color lookup table editor that's delightfully easy to use. May 93

Maple V, Brooks/Cole Publishing, 800/354-9706, $450. For functional scope and ease of use on a basic Mac (such as a Classic or Plus), this symbolic math software has no competitor. May 93

Mathematica 2.0 (2.1), Wolfram Research, 217/298-0700, $595. While its memory demands are high, this symbolic-math program offers a truly vast array of functions, including over 800 numerical and symbolic routines. The quality and quantity of its support literature are outstanding. Mar 93

MathType 3.0, Design Science, 310/433-0685, $159. This equation-writing software makes automatic typographical decisions, which is helpful if you produce documents on a wide range of subjects. Its smooth integration with Microsoft Word is also convenient. May 93

Minibab 8.2, Minibab, 814/238-3200, $695. These statistical-analysis tools are broad but not exhaustive. Still, they're easy to learn and easy to use, making Minibab an excellent teaching tool. The graphics and output are unfortunately typesetter-like. Jun 92

Nexu 1.1 (1.3), Charles River Analytics, 617/491-3474, $295. Lightweight introduction to artificial neural networks and knowledge-based expert systems has some merit, but cannot be considered a serious production tool. Oct 92

Sequencer 2.0, Gene Codes Corp., 313/769-7249, $2200. While not implementing everything a DNA researcher could want, this software for manipulating DNA-sequence information does provide the things a researcher really needs. The single best feature is its raw speed. Dec 92

Simulink 1.2, The MathWorks, 508/653-1415, $999.50. If you hear the word Model-predicted times a week at work, this math-simulation software is designed to make your life wonderful. Little glitches and a command-line orientation are drawbacks. Dec 92

StatView 4.0m, Abacus Concepts, 510/540-1994, $995. A nice mix of statistical prowess and operating convenience distinguishes this statistical-analysis and presentation software. The printing options are outstanding. Nov 92

TeMath 1.0, Brooks/Cole Publishing, 800/354-9706, $399.50. For roughly the price of a textbook, this mathematical-exploration software provides all the help a student needs to understand what's really happening in differential and integral calculus. Apr 92

Theorist 1.5, Pressence Corp., 415/543-2252, $449.95. Symbolic-mathematics program that you can figure out by yourself adds a useful table feature, more special functions of physics, and better graphics. Plus, it's still the only program to use real notation directly. May 93

O R G A N I Z A T I O N / P R O D U C T I V I T Y

ACT 1.0, Contact Software International, 214/919-9500, $395. While this contact manager has several useful features, such as contact contact views and an integrated word processor, learning how to use it is a frustrating experience. Feb 93

Active Memory 2.0, ASD Software, 714/624-2594, $199. Personal organizer distinguishes itself by providing strong network support, although it may be overkill for a lone user. Aug 92

Agent DA 2.0 (2.1), TeamBuilding Technologies, 514/278-3010, $129. Simple, flexible calendar/reminder program includes every obvious calendar function—easy navigation, extensive print options, adjustable displays, recurring events, and even a straightforward manual. Sep 92

Amaze Daily Planners: Cathy, The Far Side, Word-A-Day (2.0/1993), Amaze, 206/820-7007, $59.95. A cartoon (or word) a day makes scheduling more fun with these life-sized calendar/daily planners, but the graphics take up a lot of hard drive space, and the programs must be running in order for alarms to sound. Sep 92

Connections 2.1, Concentrix Technologies, 408/388-8600, $199. A wide range of scheduling features, new printing options, and improved networking capabilities don't change the fact that this HyperCard-based personal information manager is just too slow. Nov 92

DateBook 1.5.1, After Hours Software, 818/780-2320, $125. Personal time manager offers a flexible approach to event scheduling and to-do-list management. This upgrade adds new features and fixes bugs that plagued the first version. Feb 93

DayMaker 2.0, Pastel Development Corp., 212/941-7500, $129.95. If you need to organize lots of disparate information, follow up on meetings with many people, keep track of your own calendar, create an archive of completed work, and print lists of to-do items to take on the road, this free-form personal information manager is a great choice. May 93

Dynode 3.0, DataDesk Software, 408/252-0420, $89.95. The speed and printing options of this field-based address-book manager are still its strengths, but this upgrade adds welcome improvements to the interface, including automatic formatting of phone numbers. Apr 93

EasyAlarms 2.0, Essential Software, 914/889-8365, $99. Complex, flexible calendar, reminder, and to-do list program includes scripting and sound recording among many other features. Nov 92

First Things First 2.0 (2.0), Visionary Software, 503/246-6200, $69.95. The nifty on-screen clock that floats serenely above your windows is the most appealing feature of this good but basic event-reminder utility. Apr 92

Hello, Atelier Systems, 619/453-4300, $99. Unusual combination of contact management and word processing in a compact package. This first release is hampered by several notable flaws, such as text documents that must be linked to a contact name. Jan 93

In Control 1.0 (2.0), Atain Corp., 617/776-1110, $125.95. Shrinks an immense list down to a bare skeleton and expand it again using this to-do-list manager's clean interface and collapsible row-and-column format. May 92

Inspiration 4.0, Inspiration Software, 503/245-9011, $295. Watch your ideas evolve in a dynamic diagram mode and a text-based outline mode with this brainstorming tool. It works best as a vehicle for organizing and developing ideas. Feb 93

Intouch 2.0.4, Advanced Software, 408/733-0745, $99.95. Free-form database is a fast and continues
Introducing the new, improved Mirror family of color scanners. Starting with what we learned from the original Mirror 600, we designed the new 600 Plus to be the fastest, easiest-to-use 600 dpi color scanner you could buy. Then we priced it so low you might mistake it for an average scanner.

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<td>600 Plus, $999</td>
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<td>600 Pro, $1,399*</td>
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The Mirror 600 Pro and 800 Pro include Mirror’s exclusive Quick! technology for high-speed JPEG compression and decompression. Working with QuickTime, the Pro series can save high-resolution scans faster and saves disk space by compressing images up to 50 to 1. These features are fully integrated into the MirrorScan software; JPEG files can be used in most applications that support PICT. (The Mirror Pro series scanners require an available NuBus slot.)

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easy way to manage contact information. Program offers flexible data entry instead of automatic formatting. Although this version adds a handy reminder system, it falls short as a flexible data entry instead of automatic formatting. Although legal matters, financial records, insurance plans, family history, and more, but it is frustratingly inflexible. Jan 93

** Now Up-to-Date 1.0.1, Now Software, 503/274-2800, $99. The swift performance and logical structure of this network calendar program make it easy to use, but deficiencies, such as the lack of a to-do-list function, are frustrating. Oct 92

** Office Manager 2.1 (2.5), White Crow Software, 800/424-0310, $99. Simple contact- and project-management software is powerful for small database, but reliance on HyperCard limits its usefulness for low-end Macs. Dec 92

** Spiral 1.0, Technology Works, 512/794-8533, $129. Designed specifically for taking and organizing notes, this product provides an excellent feature set, including tabs, bookmarks, and an option for automatically expanding abbreviations, but it's marred by some annoying errors in the editing and import/export processes. Mar 93

** TimeVision 1.0, Powercore, 815/468-3737, $99. New scheduler with notepad and card-file functions tucked on has some worthwhile features, but in general doesn't match up to the competition. May 93

** TouchBase 2.0 (2.0.1), After Hours Software, 818/780-2220, $125. Entering data is quick and easy, and there are lots of useful printing options, but this personal information manager displays a few rough edges, such as not allowing you to copy the information in the Record Summary field. Aug 92

** Multimedia Presentation Tools

** Action 1.0, Macromedia, 415/252-2000, $495. Entry-level multimedia integration program offers, for its price, a rich selection of features, including an excellent variety of transitions as well as gradient and patterned backgrounds. It makes producing presentations with sound and motion surprisingly easy. Feb 93

** Adobe Premiere 2.0 (2.0.1), Adobe Systems, 415/961-4400, $495. A dream command post for video professionals, this QuickTime movie-editing software produces stunning special effects with little effort. Only the program's appetite for memory, disk space, and computer horsepower prevent it from being the nonprofessional's dream as well. Jan 93

** Aldus Persuasion 2.1 (2.12), Aldus Corp., 206/628-2320, $495. For slide presentations, this product provides an all-in-one studio where each element—outlines, slides, notes, handouts, and charts—is dynamically linked to the others. It offers layered builds and automated templates, and has a proven track record. Feb 93

** Animation Clips 1.0, Media in Motion, 415/621-0707, $99. Spice up a presentation with an animated staple, a jokebox that's a work of art, or any of 58 other customizable animations from these business-oriented packages. Alarmed only by some choppiness and a few lesser-quality animations. Jun 92

** CameraMan 1.0 (1.1), Vision Software International, 408/748-8411, $149. If you need to record continuous screen operations, this screen recorder is the best deal around. It handles 32-bit QuickDraw, takes advantage of QuickTime's long list of compression and playback capabilities, and even uses custom frame sizes. Sep 92

** Cinemation 1.0, Vivids Corp., 415/494-2111, $495. Easy-to-use program merges animation, interactivity, and presentation features, but the image- and text-handling capabilities are less than stellar. Jul 92

** Comet CG 1.0.3, AT&T Graphics Software, 503/274-2800, $599. Designed specifically for taking and organizing notes, this product provides an excellent feature set, including tabs, bookmarks, and an option for automatically expanding abbreviations, but it's marred by some annoying errors in the editing and import/export processes. Mar 93

** DIVA VideoShop 1.0, DIVA Corp., 617/491-4147, $599. Instantaneous playback sets this graceful QuickTime editing software apart. Its simple beauty is slightly offset by a few rough edges, a lousy manual, and an occasionally clumsy interface. Jul 92

** HyperCard 2.1, Apple Computer, 408/996-1010, $199. Ease of use has made this multimedia-authoring software a tool for the masses. Although color is awkwardly implemented, more add-on products have been developed for this than for any other multimedia program. Aug 92

** DIVA VideoShop 1.0, DIVA Corp., 617/491-4147, $599. Instantaneous playback sets this graceful QuickTime editing software apart. Its simple beauty is slightly offset by a few rough edges, a lousy manual, and an occasionally clumsy interface. Jul 92

** Magic 1.0 (1.1), Macromedia, 415/252-2000, $495. Outstanding editing features make this multimedia-presentation software easy to master. Many of the features of more-complex programs are missing, but what it does, it does well. Aug 92

** Media-Pedia Video Clips, Media-Pedia, 617/235-5671, VHS $195; S-VHS, Hi8, and 3/4SP $295; BetaCamSP $495. Fifty-seven-minute stock footage for use in QuickTime movies includes over 150 different segments, ranging from unremarkable to dramatically to genuinely funny. Apr 93

** Microsoft PowerPoint 3.0, Microsoft, 206/882-8080, $495. This remarkable upgrade puts this presentation program ahead of the pack in terms of both flexibility and efficiency. Unique to this release is the ready-made template collection is pretty paltry, the extensive system of master layers, reliable cross-platform compatibility, and strong on-screen presentation capabilities more than compensate. Feb 93

** Morph 1.0, Gryphon Software Corp., 619/454-6386, $149. With patience and practice, you can become a high-tech special-effects wizard using this image-mending movie utility that "melts" one image into another. While using it is simplicity itself, you can only make still images, and the program suffers from some first-release glitches. Nov 92

** Motion Works ProMotion 1.0 (1.02), Motion Works, 604/685-9975, $395. Inexpensive animation program consolidates a slew of tempting features, including flexible path tools and ambitious support for Apple events, but the capabilities are strong together with a weak and problem-ridden interface. Nov 92

** Passport Producer 1.0, Passport Designs, 415/726-0280, $495. Strong timing controls and good sound capabilities mix with multiling text- and image-handling and a lack of even basic animation options in this partially successful entry-level multimedia program. Mar 93

** Special Delivery 1.0, Interactive Medica, 415/948-0745, $399. While this entry-level multimedia package has all the tools you need to assemble interactive screen presentations that burst with motion and sound, it has a disorienting interface and lacks the polish and power of other similarly priced programs. Mar 93

** EdScheme 3.4, Schemers, 305/776-7376, $49.95. This clear, elegant programming language is an excellent tool for learning good programming techniques. Although it can't be used to create stand-alone applications. Nov 92

** EIS ToolKit 2.0, MicroStrategy, 302/427-8800, $1995. Reliable, field-tested developer's environment for creating executive information systems provides automatic access to information in spreadsheets and databases across a distributed system, and serves up the information on screens that provide automatic graphing, analysis, and report generation. May 93

** MetaDesign for the Macintosh 3.0, Meta Software Corp., 617/576-6920, $250. This object-oriented environment offers easy ways to group and ungroup symbols in diagrams and to show relationships between symbols. It excels at aure, classic flowcharts but could use some fleshier features, such as shaded backgrounds, for presentations. Mar 93

** Object Master 1.0.2, ACI US, 408/252-4444, $395. Successful combination of the super· rior object-management facilities typically found in Smalltalk as well as a first-rate programmer's editor. Plus it works with the most popular languages: C, C++, and Pascal. Jan 93

** Prograph 2.5, TGS Systems, 902/455-4446, $495. Designed elegantly, object-oriented development environment simplifies Macintosh programming. The graphics-based program is conceptually more advanced than traditional object-oriented programming. Jun 92

** Serious Programmer 3.0, Serious Corp., 801/261-7900, $2995. The graphical interface of this application-design environment provides nonprogrammers with tools for creating custom software, but the documentation lacks critical explanations. Jan 93

** Think C 5.0, Symantec Corp., 408/253-9600, $299. Although not a radical improvement, this is a significant upgrade to an outstanding development tool. Beginners won't find the documentation helpful. Jul 92

continues
One program makes it so easy to paint and draw—even enhance scanned photographs—that anyone can create beautiful black-and-white or full-color artwork. Award-winning Aldus SuperPaint.

Versatility is the key to SuperPaint's success with "non-artists." Start with the spontaneity of the Paint layer. It's almost impossible to resist the excitement of experimenting with the endless special effects you can create by combining two or more tools.

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**Star Ratings**

- Think Pascal 4.0, Symantec Corp., 408/252-3570, $249. A remarkable achievement—a programming language and environment full-bodied enough for professional programmers while still inviting for neophytes. No weak points or dozens of strengths. Aug 92

- UserLand Frontier 1.0 (2.0), UserLand Software, 415/369-6600, $249. A robust scripting language distinguishes this ground-breaking desktop programming tool that can automate desktop functions, repetitive data-managements tasks, and more. Scripts can only be used on computers with copies of the program. Jul 92

**Utilities**

- After Dark 2.0, Berkeley Systems, 510/940-5536, $49.95. Turn your screen into an aquarium or a view of a night skyline with this whimsical screen saver that ALSoft, 713/353-4090, $129.95. Buying this set of seven utilities is more economical than purchasing the individual utilities separately, but the other five utilities are unimpressive. Aug 92

- DiskFit Direct 1.0, Dantz Development Corp., 510/849-0293, $49.95. Basic but efficient backup system is simple and painless enough to foster better backup habits in anyone who uses it. It doesn't back up to hard drives or tape drives. May 93

- Drive 7.2.3, Casa Blanca Works, 415/461-2227, $79.95. Universal hard drive updater and formatter has an attractive, uncluttered interface that's so easy to use it makes hard drive maintenance almost relaxing. Jan 93

- EasyPrint 1.0, SF/O, 402/291-0113, $29.95. Nifty utility lets you switch printers without using the Chooser. It's a bargain for network users and those who frequently change output devices. Oct 92

- Fastback Plus 2.6 (3.0), Fifth Generation Systems, 504/721-7221, $189. Even the most hardened shirker should be inspired to back up by the marvellously simple interface of this software. One warning—memory shortages can cause it to quit unexpectedly when running in the background. Apr 92

- FolderBolt 1.02 (1.02e), Kent Marsh, 713/522-5625, $129.95. Three designated levels of folder protection, plus flexible options for password-handling, among other actions, are the assets of this utility. Fine encryption, however, is not included. Jun 92

- Gofer 2.0, Microlytics, 716/248-9150, $79.95. Polky processing time is the trade-off for flexible text-search options without indexes by this file-finding utility. Our reviewer vetoed the trade. Jun 92

- HAM 1.0, Microseeds Publishing, 203/435-4995, $79.95. Apple-menu enhancer adds submenus, allows reordering, and includes a folder of recently opened items in your Apple menu. Apr 92

- Hard Disk Toolkit Personal Edition 1.1.2, FWB Software, 415/474-8055, $79. The more arcane features of the heavy-duty Hard Disk Toolkit have been stripped out of this entry-level, non-power-user version, but everything you really need to format, update, partition, and manage your hard drive is still included. Jan 93

- INTPICKer 3.0, Inline Design, 402/345-4995, $79.95. This utility manager's ability to load aliases into a network will interest network managers. While it disables problem INTs at start-up, it doesn't help you identify the cause of INIT conflicts that don't cause the Mac to crash at start-up. Mar 93

- Inline Sync 1.0, Inline Design, 403/435-4995, $129.95. Keep the latest version of your work on both your portable machine and your desktop Mac with this file-synchronization software. It's easy to install, easy to use, easy on the wall, and does the job well. Mar 93

- Kiwi Power Menus 1.0, Kiwi Software, 805/685-4031, $39.95. Simple little utility adds flexibility to the Apple menu by adding an unlimited number of submenus and enabling you to change the font and size in the menus. Dec 92

- MacTools 2.0, Central Point Software, 503/690-8090, $149. A remarkably comprehensive interface makes it easy for the inexperienced user to navigate this utility package; the automated hard drive and floppy disk repair capabilities and antivirus capabilities make it an asset for anyone. Oct 92

- Magneto 1.0, No Hands Software, 415/321-7340, $129.95. Automates the laborious task of file management with this software. It creates "agents" or "magnets" that trigger in response to user-specified events and automatically look for files and folders to copy, move, or alias. Feb 93

- MasterFinder 1.2.1, Olduvai Corp., 305/670-1112, $149. Ingenious finder utility provides rapid access to frequently used files and folders, permits operations on several files at once, and saves catalogs of offline volumes, but the many features require some effort to learn. Nov 92

- More Disk Space 1.1 (2.0), Alysia Software Corp., 415/566-2263, $39.95. Automatically compress and expand files with this utility. Although it doesn't identify compressed files, and must run as a start-up application to work automatically, it does offer a measure of control that similar utilities lack. Sep 92

- NightWatch II 2.0.1b, Kent Marsh, 713/522-5625, $159.95. Although skillful snoops can override the screen-locker feature of this hard drive security utility, the password protection provides a flexible and safe method of restricting access to anyone turning on your hard drive. Nov 92

- Norton Essentials for PowerBook 1.0, Symantec Corp., 301/453-4600, $129. Uneven collection of a dozen PowerBook utilities ranges from the unique and useful Instant Access module, which automatically turns AppleTalk on and off, to the relatively inaccurate Battery Gauge feature, which purports to tell you the status of your battery. Apr 93
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Norton Utilities for Macintosh 2.0, Symantec Corp., 310/453-4600, $149. Everything— including the kitchen-sink utility package does an excellent job of diagnosing and repairing damaged hard drives and floppy disks, but the interfaces of the various components differ wildly. Oct 92

* Now Utilities 3.0.2 (4.0.1), Now Software, 503/274-2800, $149. Despite minor imperfections, this collection of utilities, including ten separate programs and a variety of sample and support files, provides lots of highly polished bang for your buck.

On Location 2.0.1, On Technology, 617/876-0900, $129.95. Fast file-finding utility with improved functionality shows formatted files, and updates index in background. Also, the initial indexing is time-consuming, and the search functions are incomplete. Jun 92

PicturePress 2.5, Storm Technology, 415/691-6600, $199. This image-compression software supports every useful storage mode; has new calculation features for improved image fidelity; offers utilities with practical advantages for day-to-day graphics work; and is twice as fast as version 2.0. If you work with images professionally, it’s the clear choice. Mar 93

PowerMerge 1.0.2, Leader Technologies, 714/757-1787, $129. File-synchronization utility has a potentially confusing interface, but it is a handy means of updating selected files so that different Macs end up with identical versions of the selected documents. Apr 93

RapidTrak 1.0.1, Insignia Solutions, 415/694-7600, $99.95. If you’ve got RAM to spare, this hard drive formatter offers driver-level RAM caching to shave frequency of used data and improve performance, especially on slower-speed drives. May 93

Retrieve It 1.0, MVP Software, 415/599-2704, $129. It’s great that this nonindexed file-finding utility allows you to search by file name as well as by text, but it is definitely slower than indexed searching. Nov 92

Shredder 1.0.1, DLM Software, 619/435-4984, $69. Permanently blitz your data with this quick and easy trash-management tool that writes over deleted data— in accordance with Department of Defense specifications—so that file-restoration programs can’t bring it back. Jul 92

Silverlining 5.4, La Cle, 800/999-3919, $149. Extensive and detailed testing is only one of many advanced functions offered by this hard drive-management utility. The interface is lackluster and apt to confuse beginners. Jan 93

SnapBack 1.0, Golden Triangle Computers, 619/279-2100, $129. For regular day-to-day backups, this network backup software is a great choice. Its strength lies in its simplicity and its easy-to-use, one-window interface, but it requires a dedicated hard drive. Dec 92

SpeedyCD 1.2.2 (1.2.4), ShirtPocket Software, 602/866-7767, $70. Get Info gets faster with this CD-ROM-access accelerator that creates a database of files from a CD and puts it on your hard drive. If you regularly browse through the same CD-ROM folders, this product might save you enough time for it to be worth the $70. Nov 92

Star Trek: The Screen Saver, Berkeley Systems, 510/540-5535, $59.95. Go where no Mac has gone before with this screen saver based on the original “Star Trek.” Modules vary from simple messages in “Trek”-inspired fonts to an endless parade across the ship’s main screen of aliens, spacecraft, and artifacts from different episodes. May 93

Super 7 Utilities, Atticus Software, 203/324-1142, $99.95. Collection of seven control panels/extensions adds some ease of use to System 7, although none of its functions are essential. Modules perform tricks such as turning any menu into a tear-off palette, and randomizing the sounds that play in response to errors. Apr 93

SuperDuper 1.7, NeoConcepts, 408/899-4821, $79. If you’re sick of duplicating disks with the Finder, this utility is an acceptable alternative, but there are other utilities that are better, cheaper, and do the same thing. Nov 92

Symantec Antivirus for the Mac (SAM) (3.0.9), Symantec, 408/253-9600, $99. No-holds-barred virus-fighter monitors your Mac and alerts you when it sees suspicious activity. Advanced users and network managers will appreciate its customization features and extensive scanning options.

TimeLog 1.0.1 (1.02), Coral Research, 702/831-9346, $97. Even jaded computer users will approve of the reporting options offered by this utility for recording program-usage information. No network features included. Jul 92

TimesTwo 1.0.1, Golden Triangle Computers, 619/279-2100, $149. Automatic disk-compression utility operates at the disk-driver level rather than as an operating system add-on. A number of quirks, such as its ungraceful handling of full disks, are disadvantages.

UpDiff 1.0, KyZen Corp., 609/354-3863, $169. Innovative program compares two versions of a file, extracts the differences, and creates a difference file that is typically smaller than the original and can be used to update the older file. Dec 92

Voice Navigator SW 2.3, Articulate Systems, 617/935-5656, $399. Talk back to your Mac (if it has built-in sound input) with this speech-recognition software. Defining macros that respond to voice commands is frustrating, but the product is a real boon for disabled users. Jan 93

Wallpaper 1.0.1 (1.0.2), Thought I Could, 212/673-9724, $59.95. Terrible control panel device lets you design, edit, import, and display repeating patterns on your Mac’s desktop. Comes with fun, creative predesigned patterns. May 92

WindowsWatch 1.52 (1.53), ADO Software, 714/624-2594, $149. If your main concern is to track program and file use, this utility will handle the job nicely. Using it for time billing with numerous programs, however, may be a maintenance nightmare. Jul 92

WonderPrint 1.0, Delta Tao Software, 408/730-9336, $59. StylistWriters and DeskWriters produce halftones good enough for newsletters with this printing extension that improves the output of QuickDraw printers and accelerates printing of pictures on PostScript printers. Jan 93

WorkSpace 1.0, Ark Interface, 206/654-4127, $149. Although this novel desktop replacement is an intriguing first step toward improving the Finder, not enough functionality was added to satisfy our reviewer. Jul 92

Zephyr Palettes for PageMaker, Zephyr

Palettes for FreeHand 1.0.2 (1.3), Zephyr Design

206/324-0292, $79.95. Exchange pull-down menus for palettes in PageMaker or FreeHand with these cleverly conceived, modestly priced utilities. A number of details could still be smoothed, but none are real stumbling blocks. Jul 92
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*** MacWorld — April

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Star Ratings

Correct Grammar 3.0 (3.01), Wordstar International, 415/382-8000, $99. Illogical and inappropriate recommendations are a hallmark of all grammar checkers, but this one also violates Mac conventions in imitating ways. Aug 92

Correct Letters 1.1 (1.0), Wordstar International, 415/382-8000, $49. In addition to more than 250 ready-made business letters, this HyperCard-based product boasts an excellent online Guide to Letter Writing. The disabled Find command is mystifying and inconvenient. Jul 92

Correct Writing 2.0, Wordstar International, 415/382-8000, $49. For those who are unsure of the elements of style, this online reference is convenient and comparatively inexpensive, but it is far from complete. Sep 92

DocuComp 1.0 (1.03), Advanced Software, 408/733-0745, $175.95. Document-management utility compares text in two versions of the same file and reports the differences in a comprehensive, easy-to-follow format. Nov 92

EndNote Plus 1.2 (1.2.1), Niles and Associates, 510/649-8176, $249. Reference database and tool for creating citations and bibliographies is now accessible from within Microsoft Word 5.0, representing a significant enhancement to this excellent product. Sep 92

Final Draft 2.0, MacToolkit, 310/395-4242, $349. Script-writing gets simpler with this well-conceived software that automates formatting of different elements in a script, including dialogue, action, and slug lines (scene headings). Customization is easy, and macros automate typing of common phrases such as "Fade to black." Apr 93

IdeaFisher 2.0, Fisher Idea Systems, 714/474-8111, $595. Inspiration never comes easily, but this creativity tool with a question bank of 6000 questions and an idea bank of 61,000 words and 700,000 links might help get the juices flowing. Jan 93

Just joking 1.0, WordStar International, 415/382-8000, $49. HyperCard stack of around 2800 humorous quotations offers a serviceable selection of sayings from a diverse group of humanists, comedians, philosophers, and writers, among others. Apr 93

LetterPerfect for Macintosh 2.1, WordPerfect Corp., 800/225-5000, $149. Stripped-down version of WordPerfect measures up as a serviceable low-end word processor, with clean, accurate documentation and an uncluttered interface. Jan 93

Microsoft Word 5.1, Microsoft, 206/882-8080, $495. Small, solid upgrade fine-tunes some plug-in modules and adds new modules including an icon tool bar, text annotation, and other features. The numerous minor enhancements make it worth the upgrade price, but it won't give Word 5.0 users goosebumps. Mar 93

Nisus Compact 3.3 (3.31), Nisus Software, 619/481-1477, $150. Inexpensive price and low disk-space requirements don't compensate for this word processor's many missing features, including mail merge, macros, and word count. Memory quirks are an additional problem. Aug 92

Plots Unlimited 1.04, Ashleywilde, 310/456-1277, $395. Peter loves Allison but she has a break-up when he confesses to murder. Or maybe not. This writing tool's database contains 5600 plot twists, all linked. The interface is imperfect, leaving items in bold when they should be grayed out, and it requires too much mousing. Jul 92

Pro-Cite 2.0, Personal Bibliographic Software, 313/996-1580, $395. Valuable bibliographic database program generates large, complex bibliographies. Some features aren't easy to use, but it does have 20 predefined and 6 user-defined forms, plus flexible sorting options. Jun 92

RightWriter for the Mac 5.0, Que Software, 310/573-2500, $99.95. Grammar checker looks at writing style, word usage, punctuation, and capitalization, as well as grammar. Customizable writing-style filters and multiple approaches to analysis are nice, but—as with all grammar checkers—not all of the program's advice is great. May 93

ShowCase 4.1, Lake Compumakes, 914/941-1998, $429, with WordPerfect 2.0 $579. This script-writing software formats scripts in either screenplay format or dual-column format (for audio and video) and allows you to choose the number of shots displayed per page, but it requires you to own and work in WordPerfect. Apr 93

StoryLine 1.02 (1.4), Truby's Writers Studio, 310/575-3580, $345. Frustrating and sometimes haphazard HyperCard-based program attempts to offer expert training in the craft of plot development. Aug 92

Taste 1.02 (1.02c), DeltaPoint, 408/648-4000, $149. The page-view, WYSIWYG orientation of this word processor with page-layout features makes it considerably slower than text-oriented word processors. Re-draw and translator bugs are other problems. May 92

Thunder 7 10.5 (1.5), Baseline Publishing, 301/682-9676, $99.95. The speed, customizing options, and overall feature-set of this stand-alone spelling checker and thesaurus are admirable, but before you can trust it implicitly, it needs a dictionary with greater integrity. Jul 92

TypeReader 1.0, EsperVision, 408/428-9988, $695. Speed and accuracy combine with a straightforward operating style in this high-end optical character-recognition software that doesn't do everything its competition does, but is a major contender nonetheless. Feb 93

VersionMaster 1.5, AStar Technologies, 508/486-8532, $199.95, five users $799.95, ten users $1199.95. Document-management utility helps you archive and track versions of a file by maintaining a database of altered documents. It's recommended only for workgroups that routinely follow check-out procedures and that don't need detailed reports of the changes to a file. Apr 93

WordPerfect for Macintosh 2.1 (2.1.2), WordPerfect Corp., 800/225-5000, $495. Play QuickTime movies in your text files or publish and subscribe with this upgrade. It continues to provide the best desktop publishing and graphics capabilities of any word processor, but it lacks glossary- and table-creation features. Jun 92

WordScan, WordScan Plus 1.0 (1.01), Calera Recognition Systems, 408/720-8300, $295, $595. The idiosyncratic interface of these two OCR programs is only a minor inconvenience considering their relative accuracy and speed. Jun 92

WriteNow 3.0, WordStar International, 415/382-8000, $249. The streamlined approach of this low-end word processor will appeal to many Macintosh users, especially the storage-conscious. A nice mix of features includes impressive implementation of style sheets. Sep 92

Acecat for Macintosh, AceCAD, 408/655-1900, $149. It's the hands-down winner in the digitizing-tablet price competition, but although this product works well, it lacks some of the amenities of higher-end tablets. Aug 92
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Star Ratings

TrackMan, Logitech, 510/795-8500, $149. There's a right-hand bias to this trackball with three programmable buttons and a handy click-lock feature. Jun 93

Turbo Mouse 4.0, Kensington Microwave, 415/572-2700, $169.95. The large buttons on either side of this trackball provide just the right measure of tactile feedback while the removable ball glides freely. The breakthrough feature, though, is the software that lets you customize many of the trackball's functions. Nov 92

The UnMouse, MicroTouch Systems, 508/694-9900, $199. Input device is a cursor-control device, programmable keypad, and small graphics tablet in one, and can be programmed with 60 macros (although only 16 can be selected by sight). It's ergonomically better than a mouse, but not as good as a trackball. May 93

Voice Express, MacSema, 503/757-1520, $399. Voice-recognition board lets you record words or phrases that trigger simple key sequences, but commands are limited to those with keyboard equivalents, and the system is weighed down by several quirky features. Apr 92

Voice Navigator II, Articulate Systems, 617/935-6566, $699. Stand-alone SCSI device offers an impressive, full-featured set of tools for voice control of your Mac, but mastering them takes time and effort. Apr 92

Z-Nix Cordless SuperMouse, Z-Nix, 714/629-8050, $39. Sleek and attractive cordless mouse works reliably and is attractively priced, but suffers from the same line-of-sight limitations as other infrared devices (such as TV remote controls). Dec 92

ACS300 Computer Speaker System, Altice Lansing Consumer Products, 717/296-4434, $400. Cymbal-shaped high/midrange speakers come with a freestanding subwoofer and power supply. The sound is rich and smooth, but the cabinet is nonstandard, and there is no on/off switch. Nov 92

Bose RoomMate speakers, Bose Corp., 508/879-7330, $329. Shieded stereo speakers with a rich, bassy sound can double as regular stereo speakers. Unfortunately, they're heavy, expensive, and the highs are muddy. Jun 93

MacSpeaker MS-1, Monster Cable, 415/871-6000, $229.95. Crystal-clear highs and a meaty midrange are the best features of these shielded stereo speakers. They're beautifully designed for close-up listening, but the bass sounds wimpy. Jun 93

Media Control Station, JLCooper Electronics, 310/306-4131, $269.95. This versatile tool connects to the Mac through an ADB port and offers an easy and intuitive way to cue and edit QuickTime movies, MIDI files, multimedia playlists, and other dynamic data. Feb 93

The Miracle Piano Teaching System 1.0, Software Toolworks, 415/883-3000, $499.95. Painstakingly crafted music and piano instructor comes with keyboard, software, and 120 songs, including classical, movie-theme, and rock. The program offers encouragement and advice, and ends every lesson with a synthesized orchestra accompaniment. Oct 92

The Mouse Yoke, Colorado Spectrum, 303/225-6929, $34.95. Gadget turns an ordinary mechanical mouse into an aircraft-style steering wheel, or yoke, for use with flight simulators. Simple, elegantly executed concept uses quality materials; device is not appropriate for driving simulations or shooting games. Dec 92

Organizer Link II (Model OZ-893), Sharp Corp., 800/321-8877, $129.99. If you own a 5000-, 7000-, or 8000-series Sharp Wizard, this program and cable allow you to connect it to a Mac serial port to exchange data. It's functional, but does have some minor weaknesses. Jan 93

PhonePro 1.0.3 (1.1), Cypress Research Corp., 408/752-2700, $950. Application makes it relatively easy to develop a multiple-choice voice-mail system using your Mac, especially for those with programming backgrounds. The product includes a 9600-bps modem and a handset/microphone. Feb 93

PowerKey 2.0, Sophisticated Circuits, 708/982-5001, $399.95. Send and receive faxes and data at speeds up to 14,400 bps with this attractively priced fax/data modem. The software works well; tech support is adequate. Aug 92

Ultima Home Office, Prometheus Products, 503/693-9600, $649. When it can reliably transmit data at high speeds the voice bugs are fixed, this fax modem with voice mail will be worth a second look. Oct 93

Viva 14.4/Fax, Computer Peripherals, 805/499-5751, $469. In data mode, this 14,400-bps fax/data modem performed well, but the software bundled with it is barely adequate. Jan 93

WorldPort 6400 MNPS, U.S. Robotics, 708/982-5001, $475. Only slightly larger than a deck of cards, this 9600-bps modem is geared toward PC users, with a user guide that never mentions Macs and software that is only for PC compatibles. Jan 93

C. Itch ProWriter Printer, C-Tech Electronics, 714/833-1165, $2395. Not only is this laser printer more expensive than most personal page printers, it also offers less-impressive features and so-so output. Nov 92

DECserver 1152, Digital Equipment Corp., 508/493-5111, $1299. Four-page-per-minute, 300-ppm, PostScript Level 2 printer offers simultaneous support for Macs and PCs, plus excellent image quality, for a ground-breaking price. The internal font is small, and the included 2MB of memory is not enough to print complex images. May 93

HP LaserJet 4M, Hewlett-Packard, 800/752-0900, $2999. An Intel 8960 RISC processor makes printing complex images faster than ever with this continues
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$799
$499

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$699

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1.2 GIG
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$1,499

QUANTUM INTERNAL
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525 MB
$1,337
$629

700 MB
$1,699
$1,299

1 GIG
$1,989
$1,449

1.2 GIG
$2,181
$1,699

QUANTUM EXTERNAL
Retail Price

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$1,337
$629

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$1,699
$1,299

1 GIG
$1,989
$1,449

1.2 GIG
$2,181
$1,699

OTHER DRIVES

1.44 meg Floppy Drive
$298
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4EC CD-R 74
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$679

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Single
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$69

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$129

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$109

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$79

35MB
$49

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10 Pak-ea
$60
$92

88MB
5 Pak-ea
$62
$95

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$64
$97

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Each Cartridge

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### Star Ratings

- **HP PaintJet XL300, Hewlett-Packard, 800/752-0900, $3495.** The output of this color inkjet printer won't satisfy demanding graphic arts professionals, but it's great for business users interested in punching up their presentations. Feb 93
- **IBM LaserPrinter 10A, IBM Corp., 800/358-5835, $3995.** Beautifully defined text, razor-sharp line art, clear gray tones—the output from this large, awkwardly designed, 600-dpi Postscript printer is dazzling, and all for under $4000. Aug 93
- **LZR 1560, Dataproducts Corp., 818/887-8000, $3395.** Table-sized 400-dpi laser printer blazed through our standard printer speed tests and produced output noticeably better than that of 300-dpi printers. It's a good choice for a mixed network. Sep 92
- **RasterOps CorrectPrint 300, RasterOps Corp., 408/562-4200, $899.** The cost of high-quality, photo-realistic color printing takes a nosedive with this 300-dpi, dye-sublimation printer. The relatively small (8.1 by 8.6 inches on letter-size media) print area is the only significant flaw. Oct 92
- **RealTech Laser 400, Hardware That Fits, 408/760-1400, 53195.** Exactly the same tabloid-size, 400-dpi printer as the Dataproducts LZR 1560, but for slightly less money. And it produces output that is perceptibly better than that of 300-dpi printers. Sep 92
- **StyleWriter, Apple Computer, 408/996-1010, $1079.** If money is tight, if you want nice-looking output, and if you have a little extra time to spare, this is a good personal printer with a new driver that makes it even better. Sep 92
- **Til microLaser Turbo, Texas Instruments, 800/527-3500, $3195.** An enhanced version of Til's microLaser Plus, this Postscript Level 2 printer is an admirable performer and a dependable machine, but it leaves you wondering whether the extra $500 is worth it. Jul 92
- **WideWriter, GCC Technologies, 617/890-0880, $1699.** Large-format output comes in a reasonably priced package with this ink-jet printer that can automatically feed sheets as large as 14 by 91 inches or manually feed sheets 17 inches wide with an unlimited length. Feb 93
- **WriteMove II, GCC Technologies, 617/275-5800, $599.** Portable printer for the PowerBook measures 111/2 by 2 by 31/2 inches and weighs 21/2 pounds. Although it's no speed demon, it's fine for short jobs. May 93
- **HP ScanJet IIP, Hewlett-Packard, 800/752-0900, $1095.** An elegant piece of technology, this desktop gray-scale scanner produces excellent results for a street price of around $750. Muddled online help and a flimsy hinge are minor problems. Aug 92

### Scanners

- **LightningScan Pro 256, Thunderware, 510/254-6881, $499.** A well-executed hand-held gray-scale scanner worth the cost. It creates 8-bit scans at up to 400-dpi; images scanned in two passes can be joined flawlessly. The only drawback is slow scrolling in software. Jun 92
- **Mirror 600 Color Scanner, Mirror Technologies, 612/634-4450, $1199.** Three-pass scanner with 600-dpi vertical and 300-dpi horizontal resolution is fast, precise, and an excellent value. The only liability is its somewhat quirky software. Apr 92
- **Nikon LS-3510AF Film Scanner, Nikon, 516/547-4355, 8-bit $9535, 24-bit $11,316.** The bread-box-style design of this 35mm film scanner may be reminiscent of past models, but many changes make it faster and more convenient. Still, advanced users won't be satisfied with the tools for overriding automatic exposure and tone adjustments. Sep 92
- **PageBrush Professional, Mitsubishi International, 415/544-2781, $795.** A brilliant idea with unfortunate rough spots. Gray-scale, hand-held scanner/ mouse scans full-page or larger images and produces 300-dpi gray-scale files, but the process and software are agonizingly slow; the buttons are hypersensitive; and the product is expensive. Jun 92
- **RasterOps Expresso Personal Slide Scanner, RasterOps Corp., 408/562-4200, $849.** Essentially a video camera mounted above an illuminated stage, this slide scanner outputs NTSC video. It's fast, convenient, and economical, but falls short for digital images; its best file looks worse than output from a 24-bit flatbed or slide scanner. Apr 92

### Systems/Storage

- **Duo Dock, Apple Computer, 408/996-1010, $1079.** Immensely clever desktop-Mac-size housing for the Duo laptops provides back-panel connectors, a SuperDrive, electrical and physical support for external monitors, and two expansion slots. Although the Duo Dock is easy to like, some details, such as the difficulty of installing NuBus boards, belle Apple's usual attention to detail. Mar 93
- **FastCache Guadara, Daystar Digital, 404/967-2077, Quadra 950/900/700 version $449, Quadra 900/700 version $299.** PDS board provides 128K of secondary cache for a Quadra with 15m static RAM (25ms on the 900/700 version). The average real-world speed improvement is 15 percent, although some operations benefit more from the cache card than others. May 93
- **Floptika 20/M, Procom Technology, 714/852-1000, $585.** It is easy to recommend this floppy drive due to its speed, relatively low cost, bundled software, and lack of problems. Although it allows invalid SCSI ID addresses, it's a fine product. Sep 92
- **Freedom 120, Maxem, 619/944-0818, $699.** Battery-powered hard drive provides three to four hours of hard drive storage without a power cable; it performs at a respectable speed, but lacks a battery-power gauge and automatic sleep mode. The skimpy manual is the most serious problem. Sep 92
- **Infinity Floptical 21MB, Peripheral Land, 510/657-2311, $599.** The good points of this floppy drive include extensive documentation, switchable
Video/Display

- BookView Imperial, Computer Care, 612/371-0661, $1399 (includes 6MB of RAM). This notebook-display adapter supports all common sizes of monitors, including 16-inch and 19-inch, plus both Mac and VGA. It is expensive, however, and uses 2MB of system memory for video processing. Feb 93
- Canon ESP, Canon USA, 516/328-5970, $4500. Nononsense package enables you to shoot still-video pictures, digitize the video into a Mac for touch-up, and record the modified shots back to the camera for playback through any television set. It's good for presenters who need to incorporate photographs, but it is quite expensive. Apr 93
- Canon RC250, Canon USA, 714/753-4320, $799. An adequate choice for users looking for an inexpensive still-video system. Camera captures up to 50 color images per video floppy disk and hooks up to any television June 93
- Dycam Model 1, Dycom, 818/988-8008, $895. Compact, point-and-shoot, still-video camera records and downloads images in 8-Bit gray-scale—as long as the battery doesn't die first. Jun 92
- LTV, Lapis Technologies, 510/740-1600, $349. Interface board allows a Mac LC, LC II, or Performa to use a standard television monitor as a display device. Unfortunately, a standard television is a poor substitute for a color monitor, but while the LTV does its job adequately, the setup is unsuitable for many applications. May 93
- Lightning Effects II, Spectral Innovations, 408/955-0366, $1295. Digital-signal-processor chips dramatically speed up some Photoshop operations with this expensive Photoshop-acceleration board. It had problems acquiring some IPEG files. May 93
- Macintosh 16" Color Display, Apple Computer, 408/996-1010, $1599. The display quality of Apple's 16-inch monitor is tough to beat. It has realistic color, minimal curvature, and a uniform display. Jun 92
- Power Portrait, Sigma Designs, 510/770-0100, $599 or $949. Hook your Classic or PowerBook to this 15-inch portrait-style monochrome display. Built-in QuickDraw acceleration speeds up the slow SCSI connection on the one hand and results in a few software incompatibilities on the other. Feb 93
- PowerVision, Mirror Technologies, 612/633-4450, with no RAM $499, with 2MB of RAM $699, with 4MB of RAM $999. Separate VRAM means you don't lose system memory with this nicely priced notebook display adapter. It only supports 12-inch and 14-inch monitors, and 15-inch portrait gray-scale and black-and-white monitors. Feb 93
- ThunderStorm, SuperMac Technology, 408/245-2202, $999. Photoshop-acceleration board uses digital-signal-processor chips to speed up some Photoshop operations. It's fast, with good JPEG compatibility and a great manual. May 93
- VideoSpin, SuperMac Technology, 408/245-3202, $499 to $1599. Crab video from a camcorder, video deck, TV, or monitor with this easy-to-install board and save it as a 24-bit QuickTime movie. Comes with ScreenPlay, an application that lets you choose from among several compression options, frame rates, and window sizes. May 92

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SQ510 88MB | 469 | 489
SQ510C 44/88MB | 569 | 599

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**MacWorld Best Buys**

**PowerBook Modem** $69
 APSModem, 2000 baud data, 9600 baud fax, next: 9600 baud data, 14400 baud fax, installation instructions—compatible with PowerBook 100 through 90

**Quantum 85MB** $199/269
 120MB formatted capacity, IBM/sec, transfer rate two-year warranty, $2.69 per MB

**Maxtor 120MB** $229/309
 130MB formatted capacity, IBM/sec, transfer rate two-year warranty, $2.89 per MB

**Maxtor 230MB** $349/409
 220MB formatted capacity, IBM/sec, transfer rate two-year warranty, $2.72 per MB

**Maxtor 340MB** $599/669
 340MB formatted capacity, 137MB/sec, transfer rate two-year warranty, $3.64 per MB

**SyQuest 88MB** $469/499
 85MB formatted capacity, 65MB/sec, transfer rate five-year mechanism warranty, one-year cart warranty

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For more information about APS Technologies, please visit their website at [APSWORLD.com](http://www.APSWORLD.com).
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**Includes Micropolis’ 5-year warranty**

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**Includes Fujitsu’s 5-year warranty**

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**Includes Quantum’s 5-year warranty**

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**Includes Toshiba’s portable case for PowerBooks**

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**Includes Quantum’s portable case for PowerBooks**

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**NEC MultiSync 5FG Monitor**

- [PostScript Level 2](#)
- [Envelope feeder and cassette included](#)
- [3-year on-site warranty (limited time)](#)

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**NEW! Syquest 10mb drives now in stock!**

**SyQuest**

<table>
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**Circle 245 on reader service card**
Bernoulli Mac Transportable MultiDisk 150
Enjoy all the benefits of a Bernoulli with the flexibility to read and write to disks of many capacities - 35MB, 65MB, 105MB, and 150MB. And the MultiDisk 150 is downward compatible so it reads and writes to 90MB disks and reads 44MB disks. You get unlimited storage expandability, lock-away security, and transportability. The patented Bernoulli design resists head crash and the sturdy disks can survive a drop of eight feet. This Bernoulli is internally terminated with a single external SCSI connector, so it must be installed as the last device on your SCSI chain. It comes with the Iomega Driver and Workshop utility and free shareware. (5069, IOMEGA)
Minimum requirements: Mac Plus, System 6.0.4
$468, Mac Transportable 90 PRO (#5812)

$799.

In Control 2.0
This is the new version of the 1992 Eddy Award winner. It's the only To-Do list manager that lets you organize all your activities in an outline, a prioritized list, and on your calendar. So you choose what works best for you. Includes FREE Day One Lite which prints pages for Day-Timers, Day Planners, and other organizers. (5060, Attain)
Minimum requirements: Mac Plus, 600K RAM, System 6.0.5
$84.

Times Two
Expand your disk capacity as much as 100 percent in minutes. Times Two transparently compresses disk blocks, not files. So when you move a file from your Times Two hard disk to another device, it arrives in its original form. It's compatible with all Mac software and works with all SCSI disks. (5233, Golden Triangle)
Minimum requirements: SE/30, 2MB RAM, System 6.0.4. Get a SyQuest Cartridge for only $80 with the purchase of Times Two. (5289, limit 5)
$99.

Microsoft Office CD-ROM
Get the full versions of the latest Microsoft Word, Excel, PowerPoint, and Mail for over $1000 less than if you purchased them separately. All are full of great features like drag-and-drop editing, customizable Toolbars, keyboard shortcuts, spell-checking, and much more. And PowerPoint presentations cross platforms without translation. (5288, Microsoft)
$1898.

Apple Font Pack
This is a carefully chosen selection of 43 TrueType fonts. They're expertly crafted to provide excellent results - maximum legibility on screen and crisp output on paper. The Apple Font Pack includes new display, text, and symbol faces to give you a wide range of type choices. Ask about the $15 rebate when you buy this and System 7. (5284, Apple)
Minimum requirements: Mac Plus, System 7.0, a hard disk.
$68.

Aldus IntelliDraw Competitive Upgrade
More to IntelliDraw from no other drawing software. Aldus IntelliDraw defines a new category of drawing program with intelligent features that give you an easy way to visually experiment, refine, and draw your ideas. Innovative smart tools link line, graphics in your drawing so they respond to changes automatically. Create visual "what if" scenarios with features like intelligent clip art and dimension lines. Autoalignment, shape blending, arcs and dashes, powerful text handling capabilities, unlimited layers, color gradations, easy object animation, slide show mode, and standard draw tools are a few of the features. It also shares files seamlessly between Mac and Windows versions. (6041, Aldus)
$98.

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**WordPerfect for Macintosh Competitive Trade-Up**
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Minimum requirements: Mac Plus, 1MB RAM, System 6.0.3.

**$108.**

**Vintage Photo CDs**
Vintage Quality Photographic images on CD-ROM are albums of 300 images, each color corrected and ready for separation. When you buy an album, the images are yours to use completely royalty free. You can change the size, flip, rotate, add or delete, and save an album as a single file or as multiple files. Four albums are available: Medley, Mosaic, Art & Society, and Melanges. (Seattle Support Group)
Minimum requirements: Mac Plus, 2MB RAM, System 6.0.3.

**$88. each**

**Cricket Graph III**
Convert text or data into a complete, professional-looking graph in seconds. Editing graphs is easy too — just double-click a graph component or other object, make your changes in the dialog box that appears, and view the results immediately. Import and graph data from word processors, databases, spreadsheets, or any program that produces files in TEXT, SYLK, JWS, or WKS formats. Choose from scatter, line, stacked bar, pie, column, text, area, stacked column, double Y axes, bar, polar, quality control and overlay combinations. Customize graphs with 16 bar patterns, 40 plot symbols, six line styles, and five line widths. (#5001, Computer Associates)
Minimum requirements: Mac Plus, 2MB RAM, System 6.0.7, hard drive or second floppy drive, 2.5MB RAM under System 7.

**$118.**

**DeBabelizer**
This graphics processing toolbox will save you lots of time, effort, and money. It translates from and to over 40 standard graphic file and animation formats for Mac, DOS, Windows, Silicon Graphics, Sun Microsystems, Amiga, and others. You can even edit images without the creating software. Batch processing and internal scripting functions save time by automating repetitive manipulation and editing tasks. Create QuickTime blue-screen effects with background removed features. A catalog feature lets you automatically place a series of images onto a single page. DeBabelizer will also report and display differences between original and revised images. (#6193, Equilibrium)
Minimum requirements: Mac Plus, 2MB RAM, System 6.0.5.

**$224.**

**Kal's Power Tools**
Get 33 powerful generators and filter plug-ins for Adobe Photoshop, Fractal Design Painter, and others. Includes the Gradient Designer, Texture Explorer, Gradients on a Path, and four Fractal Generators. "A fantastic plug-in for Adobe Photoshop...together a creative explosion," says Jeff Parker, Adobe Photoshop Product Manager. (#5854, HSC Software)
Minimum requirements: SE, 4MB RAM, System 6.0.3, 4MB free hard disk space, 32-bit QuickDraw.

**$79.**

**Sketcher/ArtZ Bundle**
Create realistic natural-media effects with Sketcher. Use brushes, pens, chalks, paper textures, and image processing tools to create or retouch gray scale images. The ArtZ 6x8 ADB lab is a graphical input device on which you use the stylus as if it were a pen or brush. The stylus is cordless, batteryless, and detects 120 levels of pressure. (#6070/5355, Fractal Design Corp./Wacom Technology)

**$398.**

**Accura 144+ Fax 144**
Everything you need to send and receive data and Group 3 faxes is here. It's a V.32bis, 14.400 bps fax/data modem which supports 9600, 2400, 1200, and 300 bps data, plus V.42, V.42bis, and MNP 5 error-control and data compression. Get up to 57,000bps throughput with V.42bis. Includes cables and fax software. (#6068, Hayes)
Minimum requirements: Mac Plus, 1MB RAM.

**$358.**

**Environmental Clip Art**
These 200 EPS images depict environmental issues such as recycling and pollution. They range from simple to complex illustrations which can be separated into more than 400 self-standing images. Add color, resize, or reshape them using any of the major applications that support the EPS format like PageMaker, Permacom, Word, and more. (#6189, ASRO International)
Minimum requirements: A hard disk.

**$149.**

**Adobe SuperATM**
Eliminate lagged type on screen and on paper. SuperATM also simulates different type styles on Mac running the same applications. This new "font substitution" feature lets you share, view, edit, or print files, and retain the typographic character and texture of the original, even if your Mac doesn't have the actual fonts. Includes five typefaces. (#6044, Adobe)
Minimum requirements: Mac Plus, 2MB RAM, System 6.0.2, 4MB RAM under System 7, a hard disk and one floppy drive, a printer.

**$98.**

**Environmental Graph III**
Convert text or data into a complete, professional-looking graph in seconds. Editing graphs is easy too — just double-click a graph component or other object, make your changes in the dialog box that appears, and view the results immediately. Import and graph data from word processors, databases, spreadsheets, or any program that produces files in TEXT, SYLK, JWS, or WKS formats. Choose from scatter, line, stacked bar, pie, column, text, area, stacked column, double Y axes, bar, polar, quality control and overlay combinations. Customize graphs with 16 bar patterns, 40 plot symbols, six line styles, and five line widths. (#5001, Computer Associates)
Minimum requirements: Mac Plus, 2MB RAM, System 6.0.7, hard drive or second floppy drive, 2.5MB RAM under System 7.

**$118.**

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Minimum requirements: A hard disk.

**$149.**

**DE BABELIZER**
THE GRAPHICS PROCESSING TOOLBOX
This graphics processing toolbox will save you lots of time, effort, and money. It translates from and to over 40 standard graphic file and animation formats for Mac, DOS, Windows, Silicon Graphics, Sun Microsystems, Amiga, and others. You can even edit images without the creating software. Batch processing and internal scripting functions save time by automating repetitive manipulation and editing tasks. Create QuickTime blue-screen effects with background removed features. A catalog feature lets you automatically place a series of images onto a single page. DeBabelizer will also report and display differences between original and revised images. (#6193, Equilibrium)
Minimum requirements: Mac Plus, 2MB RAM, System 6.0.5.

**$224.**

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Minimum requirements: MB 100, System 7.0.

DynoDex 3.0/
PowerBook T-shirt Bundle
This award-winning address book manager is perfect for your PowerBook. Enter information quickly. Print labels, envelopes, rotary cards, and address books for most popular personal organizers. DynoDex 3.0 synchronizes files and can dial phone numbers automatically. And get our great PowerBook T-shirt FREE while supplies last. ($447.00, Portfolio Software/Mac's Place)
Minimum requirements: Mac Plus, 2MB RAM, System 6.0.4.

PowerBook 165c 6MB RAM
Users who want to take full advantage of the 165c's color capabilities need extra memory. These new memory modules use the Apple-specified pseudo-static RAM chips to maintain the speed and warranty of your PowerBook. Extra memory will allow you to simultaneously run multiple applications such as QuickTime editing software as well as photo retouching software. Newer Technology specializes in low power consumption PowerBook memory with a card for every PowerBook, old or new. They are easy to install and were designed with all-important battery life in mind. (Module may not look exactly as shown. ($6205, Newer Technology)
Minimum requirements: SE, 4MB RAM, System 6.0.7.

PB Tools/InLine Sync/
Tesserae Bundle
PBTools gives you more power, without the fluff. Know exactly how much battery life remains, and sleep your system to conserve it. Password protection secures your PowerBook, and HotKey functions stretch keyboard power. InLine Sync updates files on your PowerBook and desktop Mac to the latest versions. Sync via file sharing, network, or SCSI connection. Tesserae has a simple but challenging premise: clear the board of colored tiles by jumping one over another in as few moves as possible. When only one tile remains on the board, a different, more difficult arrangement appears. Animated on-line help illustrates possible moves. ($693.01, Inline Design)
Minimum requirements: Mac Plus, 2MB RAM, System 2.0.

Clinton: Portrait of Victory
Audio speeches, music, narration, and QuickTime video complement nearly 300 photographs by award-winning TIME photjournalist P.F. Bentley. This multimedia CD-ROm is an intimate look at the Clinton campaign from the primaries, through the scandals, to the victory. Includes an epilogue by TIME chief political correspondent Michael Krammer. ($6201, Warner New Media)
Minimum requirements: Any Mac with a 13" color monitor, 4MB RAM, System 6.0.7, CD-ROM drive.

Battle Chess Enhanced
CD-ROM
"Every chess player will want a copy of this program. Highly recommended." - Computer Gaming World
This CD-ROM brings the game to life with a magnificent chess logic system dramatic three-dimensional animations, a musical score, superb sound effects, and a complete talking tutorial. Includes modern capability for long-distance games and ten levels of play. ($6202, Enterplay)
Minimum requirements: CD-ROM drive.

CD-ROM Toolkit
This utility replaces your CD-ROM drive's original software, transparently speeding up CD-ROM operations up to 1000 percent, improving compatibility, and allowing you to play audio CDs. There are no boards, cards, or tools to install. The CD-ROM Toolkit transparently caches CD-ROM information to your hard disk so mounting, folder opening, seeking, and searches happen instantly. ($5731, FWB)
Minimum requirements: Mac Plus, 1MB RAM, System 6.0.4, CD-ROM drive.

TransTalk
Buy two and get a $100 rebate from Transware. TransTalk connects local networks anywhere in the world to create wide area networks (WANs). It enables full network-to-network connections, so all users can easily share all network service. TransTalk cuts the time and cost of network connections in half with built-in DMA, and real-time compression and decompression of AppleTalk communications. Get multiple levels of network protection: passwords, zone and laser printing hiding, and dial-back security — all features exclusive to TransTalk. TransTalk offers full support of both synchronous and asynchronous communications, so it can be used with modems as well as high-speed digital connections. ($6932, Transware)
Minimum requirements: Two TransTalk.
QuicKeys
QuicKeys is the ultimate desktop automation tool, designed to improve your desktop environment. It's easy to create and use hundreds of time-saving shortcuts. Any repetitive task you perform on your Mac can be done more easily and consistently with QuicKeys. Supplies are limited at this price. (#3388, CE Software)

Smart Label Printer Pro
Produce fast, high-resolution, laser-quality output on multiple label sizes. Using Seiko Instruments' latest and most advanced thermal print engine, the Pro can print text, POSTNET, barcodes, even photo-like graphics from digital images. Print labels for envelopes, file folders, badges, diskettes, binders, and more. (116 154, Seiko Instruments)

Bose RoomMate Speaker
The Bose RoomMate Computer Monitor provides room-filling sound for your computer system. Bose, the world leader in innovative audio products, offers advanced audio performance for presentations and desktop use. Distortion-limiting circuitry ensures lifetime sound at virtually any listening level. Active equalization delivers full rich bass, balanced midrange, and crisp clear highs. And magnetic shielding prevents interference with your video monitor and storage media. The RoomMate connects directly to your CD-ROM audio output or computer earphone jack, and includes connectors for both stereo and mono systems. While it requires minimal desk space, optional mounting accessories can position it up off your desk. (li6 J97, Bose Corporation)

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• Bose is open from 8 a.m. to 4 p.m. EDT, Mon.-Fri.
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• No sales tax except WA residents and NYS.
• Orders include full 180-day money-back guarantee.

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• When a partial order is shipped, we pay freight on additional shipments.
• All products carry a 180-day limited warranty. Bose software is replaced immediately with like items. Defective hardware item replaced or repaired at our discretion.

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Square One
Store all of your favorite files in an easy-to-use icon palette. To access a file, just double click on its icon. To switch between running applications, just click the Active Applications palette once. No more time wasted rummaging through your hard drive, and no goofy hierarchical menus. Just point and click with Square One. (#5180, Binary)

Bose RoomMate Speaker
The Bose RoomMate Computer Monitor provides room-filling sound for your computer system. Bose, the world leader in innovative audio products, offers advanced audio performance for presentations and desktop use. Distortion-limiting circuitry ensures lifetime sound at virtually any listening level. Active equalization delivers full rich bass, balanced midrange, and crisp clear highs. And magnetic shielding prevents interference with your video monitor and storage media. The RoomMate connects directly to your CD-ROM audio output or computer earphone jack, and includes connectors for both stereo and mono systems. While it requires minimal desk space, optional mounting accessories can position it up off your desk. (li6 J97, Bose Corporation)

$69.

$298.

$228.

$54.

In Touch
Try this easy-to-use contact and time organizer. Easily group, sort, and list your contacts, phone, and fax numbers. Keep track of your appointments and meetings. In Touch is a must-have for your Mac. (#5968, wait)

Minimum requirements: Mac Plus, 2MB RAM, System 7.

$38.

Safe & Sound
Keep your Mac up and running. This utility automatically diagnoses and repairs the 100 most common disk problems—like when your system is having trouble starting, recognizing or reading disks; opening, closing, or trashi ng folders; or launching applications. Safe & Sound checks for disk problems, scans for the most common viruses, and offers an instant fix. Safe & Sound is based on Central Point MacTools—the highest-rated complete disk repair and data recovery product available for the Mac. This is the technology the pros turn to first. Best of all it's quick and easy. No technical experience is required. (#6199, Central Point Software)

Minimum requirements: Mac Plus, 2MB RAM, System 6.0.5.
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<thead>
<tr>
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Yes, I’d like more information about the 7th annual CD-ROM Expo, October 27 - 29, 1993.

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### Printers

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<td>NEC SilentWriter Model 95F</td>
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<td>Panasonic Postscript KX-P4455</td>
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### Scanners

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### UMAX

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### Cypress

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### Video Products

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<td>Video Spigot LC</td>
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<td>Supercam Spectrum 24 Series IV</td>
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<td>Thunderstorm PRO</td>
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### COSTAR Corp.

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- 16MB-70ns $569

#### Quadra 800 - 60ns

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- 8MB-60ns $269
- 16MB-60ns $669
- 32MB-60ns $2219

#### Mac Portable S3M

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#### Mac Portable 4MB

- $449

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- External Battery Charges (PB100) $145
- Battery Charged/Battery (except 100) $69
- Bundle $145
- CPU Connectix Powerbook Utilities $45
- Bookview/SMB Bundle Imperial $79
- PowerBook Install Kit $79

---

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---

### 1-800-848-8967

7:00 A.M. to 6:00 P.M. M-F • 9:00 A.M. to 4:00 P.M. Sat • Pacific Standard Time
## Networking

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>Maccon + iLink/Thin (64)</td>
<td>$169</td>
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<tr>
<td>Maccon + Thick/10Base T (64k)</td>
<td>$189</td>
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<tr>
<td>Maccon + Thick/Thin/10Base T (64k)</td>
<td>$239</td>
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<td>Maccon + 30k/Thin (64k)</td>
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<td>Maccon + Thick/Thin/10Base T (64k)</td>
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<td>Maccon + iLink/Thin/10Base T (64k)</td>
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<td>Maccon + LC or 10Base T (16k)</td>
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<tr>
<td>Maccon + iLink/Thin w/FPU</td>
<td>$269</td>
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<tr>
<td>Maccon + LC/10Base T w/FPU</td>
<td>$169</td>
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<td>Maccon SE Thin/10Base T (16k)</td>
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<td>iLink/SE30/iLink/10Base T (16k)</td>
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<tr>
<td>10Base T Hub w/12 10T/Thin/10T (16k)</td>
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<tr>
<td>Hub 10/2 Vien/Mac 2.0</td>
<td>$149</td>
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<td>10Base T Hub w/Thin Port</td>
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<td>SCSI Ethernet Thick/Thin/10Base T (24k)</td>
<td>$309</td>
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<tr>
<td>SCSI Ethernet for PC, 10Base T</td>
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<td>SCSI Ethernet 10T (w/SCSI Cable)</td>
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<td>MAU 10Base T Media Attachment</td>
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<td>Friendly Net Adaptor - 10Base T</td>
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<td>Asante Print</td>
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<td>Asante Print/Thin</td>
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## PLI Drives

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<th>Product Description</th>
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<td>PLI Infinity 88 Turbo</td>
<td>$619</td>
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<tr>
<td>PLI Super Floppy</td>
<td>$319</td>
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<tr>
<td>Infinity Flexible 2 MB</td>
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<td>Infinity 40 Turbo</td>
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<td>Infinity 88R4W4</td>
<td>$669</td>
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<td>PLI Multi-Session CD-ROM</td>
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<td>PLI Multi-Session CD-ROM</td>
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<td>PLI 35/128 Optical (Sony)</td>
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<td>PLI 600 MB Optical</td>
<td>$2,419</td>
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<td>PLI Max Optical 16X</td>
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<td>PLI 65 MB Turbo External Hard Drive</td>
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<td>170 MB Turbo External</td>
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<td>212 MB Turbo External</td>
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<td>424 MB Turbo External</td>
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<td>520 MB Turbo External</td>
<td>$1,409</td>
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<td>1 GB Turbo External</td>
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<tr>
<td>QuickSCSI Nadus Card</td>
<td>$359</td>
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</tbody>
</table>

## Pinnacle Micro

- 650MB Optical Drive | $2,875 |
- PMD 130 | $1,500 |
- Recordable CD-ROM Drive | $3,835 |
- Optical CD-ROM Gold Disc | $36 |

## Verbatim Media

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**The LLB Company**

300-120TH Ave. NE • Bldg 1, Suite 128 • Bellevue, WA 98005 (206) 454-7258
<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity</th>
<th>Model Name</th>
<th>Form Factor</th>
<th>(ms)</th>
<th>Int.</th>
<th>Ext.</th>
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</tr>
</tbody>
</table>

- **Unformatted Capacity**
- **Model**
- **Form Factor**
- **(ms)**
- **Int.**
- **Ext.**

**EXTENSION DRIVE HOUSINGS**

- **SIGNAL PROPORTIONS**
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    - **$799**
  - **12" x 18" Electromatic**
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**TWINCOM**

- **Modems**
  - **24/96 Power Twin 4800/9600**
    - **$129**
  - **144 Power Twin**
    - **$199**
  - **144/33 Power Twin**
    - **$299**
  - **Transf. Warp 2300 40MHz**
    - **$189**
  - **Transf. Warp 2300 40MHz w/FPU**
    - **$409**

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- **MO Cartridge**
  - **60MB**
    - **5.25"**
      - **$99**
  - **MO Cartridge**
    - **128MB**
      - **5.25"**
        - **$40**

**POWERBOOK ACCESSORIES**

- **PowerBook Cable**
  - **HDI 150-3 Centronics**
    - **$39**
  - **Power Pad (keyboard)**
    - **$89**
  - **PowerBook Memory**
    - **(Call)**
  - **PowerBook Battery**
    - **for 140/140/140/170/180**
      - **$65**
  - **Battery Charger**
    - **$90**

**TOYOSHA**

- **MK224BF-S**
  - **2.5" HARD DRIVE**
    - **$599**

**ALIMEDICAL**

- **ST1120N**
  - **5.25 FH 12.9**
    - **$1689**
  - **5.25 FH 14**
    - **$1945**
  - **5.25 FH 15**
    - **$2499**

- **ST42100N**
  - **5.25 FH 11.5**
    - **$1799**
  - **5.25 FH 13**
    - **$2399**

- **ST43100N**
  - **5.25 FH 14**
    - **$2999**

**MAGNETO OPTICAL MEDIA**

- **MO Cartridge**
  - **60MB**
    - **5.25"**
      - **$99**
  - **MO Cartridge**
    - **128MB**
      - **5.25"**
        - **$40**

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- **Immagene Hard Drive**
  - **500MB**
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HARDWARE THAT FITS

Monitors: all sizes, brands & prices

Need help choosing a monitor? Not sure if you need one that auto-syncs? Call our friendly sales team. They're happy to answer your questions.

<table>
<thead>
<tr>
<th>Monitor Type</th>
<th>Price</th>
<th>Size</th>
<th>Resolution</th>
<th>Sync</th>
</tr>
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<tbody>
<tr>
<td>A. Radius 21&quot; Color</td>
<td>$3,069</td>
<td>Hitachi</td>
<td>1188 x 1152</td>
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<tr>
<td>B. NEC 21&quot; 6/6/3 G</td>
<td>2,429</td>
<td>NEC</td>
<td>1188 x 1152</td>
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<td>SuperMac 21&quot; Mon3Grays</td>
<td>989</td>
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<tr>
<td>C. SuperMac 20&quot; (Supermatch)</td>
<td>1,499</td>
<td>Hitachi</td>
<td>1188 x 1152</td>
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<td>D. RasterOps 20&quot; Trinitron Multi-Mode</td>
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<td>E. NEC 20&quot; Trinitron Multi-Mode</td>
<td>1,895</td>
<td>Trinitron</td>
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<td>F. Radius Precision Color 20&quot;</td>
<td>2,389</td>
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<td>G. RasterOps 20&quot; Hitachi Color</td>
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<td>I. E-Machines 19&quot; Color (17 II)</td>
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<td>Trinitron</td>
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<td>J. Mitsubishi 17&quot; Diamond Pro</td>
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<td>L. G. Sony 17&quot;</td>
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<td>O. J. RasterOps 16&quot; (RasterOps Sweet 16)</td>
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<td>Q. K. NEC 15&quot; 4/6/3 G Color</td>
<td>789</td>
<td>NEC</td>
<td>1188 x 1152</td>
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<tr>
<td>R. L. RealTech 15&quot; Multi-Mode</td>
<td>599</td>
<td>Hitachi</td>
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<tr>
<td>S. Sigma 15&quot; Grayscale (PageView CS)</td>
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<td>Philips</td>
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<td>T. Sigma 15&quot; Grayscale (Power Portrait)</td>
<td>659</td>
<td>Philips</td>
<td>1188 x 1152</td>
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<td>W. E. Sony 13&quot; Color</td>
<td>689</td>
<td>Trinitron</td>
<td>1188 x 1152</td>
<td></td>
</tr>
</tbody>
</table>

* shown above

Your Hardware That Fits partner will tell you which monitors are on-board compatible, and which ones require a card or cable.
### Laser printers:
The right printer can do wonders for your productivity. Do you need speed? Adobe PostScript Level 2! Do you need to print a lot of pages each month?

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Price</th>
<th>Lease Cost/month</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEC Silentwriter</td>
<td>$1,399</td>
<td>$38/month</td>
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<tr>
<td>RealTech Laser Plus</td>
<td>$1,449</td>
<td>$140/month</td>
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<tr>
<td>Texas Instruments</td>
<td>$2,795</td>
<td>$77/month</td>
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<tr>
<td>Texas Instruments Plus</td>
<td>$1,099</td>
<td>$30/month</td>
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<tr>
<td>QMS 860 Hammerhead</td>
<td>$4,279</td>
<td>$177/month</td>
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</table>

#### Specifications:
- **NEC Silentwriter Model 95**
  - **Resolution:** 300 dpi
  - **Pages/min:** 6
  - **RAM:** 2 MB (expandable to 5 MB)
  - **Processor:** Motorola 68000
  - **Pages/mo:** 6,000
  - **Trays:** Built-in envelope feeder & 250-sheet tray

- **RealTech Laser Plus**
  - **Resolution:** 300 dpi
  - **Pages/min:** 9
  - **RAM:** 3 MB (expandable to 10.5 MB)
  - **Processor:** Weitek RISC
  - **Pages/mo:** 5,000
  - **Trays:** Optional 2nd paper tray & envelope feeder

- **Texas Instruments MicroLaser XL Turbo**
  - **Resolution:** 300 dpi
  - **Pages/min:** 15
  - **RAM:** 2.5 MB (expandable to 10.5 MB)
  - **Processor:** Weitek RISC
  - **Pages/mo:** 25,000

- **Texas Instruments MicroLaser Plus**
  - **Resolution:** 300 dpi
  - **Pages/min:** 10
  - **RAM:** 3 MB (expandable to 4.5 MB)
  - **Processor:** Weitek 8220 RISC
  - **Pages/mo:** 10,000

- **QMS 860 Hammerhead**
  - **Resolution:** 600 dpi
  - **Pages/min:** 8
  - **RAM:** 4 MB (expandable to 16 MB)
  - **Processor:** Intel 80870CA RISC
  - **Pages/mo:** 10,000

#### Additional Features:
- **NEC Silentwriter**
  - Micro-fine toner and NEC's patented "Sharp Edge" technology creates sharp black print quality.

- **RealTech Laser Plus**
  - "Genius level" memory is dynamically allocated and automatically reallocated.

- **Texas Instruments**
  - Available with 35 resident fonts ($1349)

- **QMS 860 Hammerhead**
  - Includes Ethernet

---

**License Agreement:**
- For more details, visit the [MacWorld Magazine website](https://www.macworld.com) or contact the listed numbers for availability and pricing.

---

**Contact Information:**
- **INTERNATIONAL:** 1-409-760-2400
- **IN CANADA:** 1-800-972-3018
- **FAX 24 HRS/DAY:** 1-409-539-4141
**ACCELERATORS**

**DO YOU FEEL THE NEED FOR SPEED?**

**DAYSTAR DIGITAL**

**NEW! Turbo 040 Accelerators**

Get the maximum in 68040 acceleration and 100% compatibility. For Mac IIci and IIi; includes math chip. 25 MHz Turbo 040...

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Price</th>
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<tbody>
<tr>
<td>Turbo 040</td>
<td>$1099</td>
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<td>Turbo 040</td>
<td>$1349</td>
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<tr>
<td>FastCache</td>
<td>$259</td>
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<tr>
<td>FastCache</td>
<td>$339</td>
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</tbody>
</table>

**Math chip available. Supports QuickDraw and display-list acceleration software.**

**Universal PowerCache Accelerator**

Math chip available. Supports 16 platforms.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>33 MHz Accelerator</td>
<td>$379</td>
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<tr>
<td>40 MHz Accelerator</td>
<td>$549</td>
</tr>
<tr>
<td>50 MHz Accelerator</td>
<td>$719</td>
</tr>
</tbody>
</table>

**PowerCache Adapter**

Charger (Photoshop Accelerator)

Includes PicturePress 2.5, Charger Plug-ins, and Kodak Photo CD access with clip art images.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charger</td>
<td>$799</td>
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</tbody>
</table>

**RADIUS**

**radius Rocket™**

For the Mac II family. Includes QuickDraw and display-list acceleration software.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Price</th>
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<tbody>
<tr>
<td>Radius Rocket 25i</td>
<td>$999</td>
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<td>Radius Rocket 33</td>
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<td>SCSI II Booster</td>
<td>$249</td>
</tr>
<tr>
<td>Rocket Share</td>
<td>$419</td>
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**FUSION DATA SYSTEMS**

**AE Applied Engineering**

**NEW!**

<table>
<thead>
<tr>
<th>Model Number</th>
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<tbody>
<tr>
<td>Infinity 44 Mb Drive</td>
<td>$499</td>
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<td>Infinity 88 Mb Drive</td>
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<tr>
<td>128 Mb 3.5&quot; Magneto-Optical Drive</td>
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<td>88 Mb Read/Write 44</td>
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<td>CD ROM Multi-Session-Int.</td>
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<td>CD ROM Multi-Session-Ext.</td>
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<td>1 Gb MaxOptical 3.25&quot; Erasable Drive</td>
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<td>1 Gb MiniArray Drive-Ext.</td>
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<td>2 Gb MiniArray Drive-Ext.</td>
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<td>Quick SCSI Accelerator</td>
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**PLI**

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<td>PLI 45 Mb DataPak Removable Cartridge Drive</td>
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<td>PLI 120 Mb DiamondDrive</td>
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<td>PLI 210 Mb DiamondDrive</td>
<td>$549</td>
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**STORAGE OPTIONS**

**MASS MICROSYSTEMS**

**TOLL-FREE TECH SUPPORT**

Have your customer number ready. Call 1-800-364-MACS.
### PowerBook Systems

<table>
<thead>
<tr>
<th>Model</th>
<th>RAM</th>
<th>Hard Drive</th>
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<td>PowerBook Duo 230 8/80</td>
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<tr>
<td>PowerBook 160 4/80</td>
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<td>PowerBook 165c 4/80</td>
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<td>PowerBook 180 8/80</td>
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### PowerBook Portable Docks

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<tr>
<td>PowerLink Presenter (8-bit)</td>
<td>$469</td>
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<tr>
<td>PowerLink DeskNet (8-bit)</td>
<td>$659</td>
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### PowerBook Duo 230 8/80
- 8 Mb of RAM, 80 Mb hard drive, 33 MHz 68030 microprocessor, FPU.
- **Price:** $2,859
- **Lease:** $78/month

### PowerBook Duo 230 8/80
- 8 Mb of RAM, 80 Mb hard drive, RealTech 20" Trinitron monitor, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $2,859
- **Lease:** $127/month

### Macintosh Ilvx Business Solution
- 5 Mb of RAM, 230 Mb hard drive, SuperMac 21" Platinum monitor w/video card, cache card, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $4,639
- **Lease:** $127/month

### Powerbook 160 8/80
- 8 Mb of RAM, 80 Mb hard drive, RealTech 20" Trinitron monitor, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $2,679
- **Lease:** $241/month

### Powerbook 165c 4/80
- 4 Mb of RAM, 80 Mb hard drive, RealTech 20" Trinitron monitor, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $3,399
- **Lease:** $241/month

### Powerbook 180 8/80
- 8 Mb of RAM, 80 Mb hard drive, RealTech 20" Trinitron monitor, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $4,359
- **Lease:** $241/month

### Powerbook 180 8/80
- 8 Mb of RAM, 80 Mb hard drive, RealTech 20" Trinitron monitor, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $4,359
- **Lease:** $241/month

### Quadra 800/Trinitron Intermediate Graphics Solution
- Quadra 800 of RAM, 230 Mb hard drive, RealTech 20" Trinitron monitor w/PainterBoard Li and Key Tronic MacPro Plus extended keyboard.
- **Price:** $6,979
- **Lease:** $191/month

### Quadra 950/Trinitron High-end Graphics Solution
- Quadra 950 of RAM, 520 Mb hard drive, RealTech 20" Trinitron monitor w/PainterBoard Li and Key Tronic MacPro Plus extended keyboard.
- **Price:** $8,819
- **Lease:** $241/month

### LCII System
- LCII, 4 Mb of RAM, 80 Mb hard drive, RealTech 15" full page display, and standard Apple keyboard.
- **Price:** $1,799

### Centris 610 Systems
- Centris 610, 4 Mb of RAM, 80 Mb hard drive, Seiko Instruments 14" Color CM1445 monitor, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $2,415
- **Lease:** $241/month

### Centris 650 Systems
- Centris 650, 8 Mb of RAM, 230 Mb hard drive, Sony 17" Color monitor, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $4,075
- **Lease:** $241/month

### Centris 650 Systems
- Centris 650, 8 Mb of RAM, 170 Mb hard drive, 20" Real Tech Trinitron monitor, RasterOps Paintboard Li, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $6,695
- **Lease:** $241/month

### E-Machines
- Macintosh Ilv, 5 Mb of RAM, 230 Mb hard drive, SuperMac 21" Platinum monitor w/video card, cache card, and Key Tronic MacPro Plus extended keyboard.
- **Price:** $4,639
- **Lease:** $127/month

### Our Great Values
- 100% Satisfaction
- Our Great Service

**Talk to one of our friendly systems consultants. They'll help you figure out the right solution for your business. We can configure any combination of CPU and hard drive with the monitor and peripherals of your choice (even if you don't see it in this ad). That's why we've come to be known as your ONE-STOP SOURCE FOR CUSTOM SOLUTIONS.**

To a lot of you, we’ve become a trusted business partner. So when you told us we needed to offer you more storage options, we listened. Our systems engineers have worked tirelessly to design the best possible enclosure for name-brand mechanisms. The result? These drives are the value you’ve been looking for—priced right, and built with the quality your irreplaceable data demands.

During the past eight years, we’ve become America’s one-stop source for Macintosh solutions. Now we can be your one-stop source for storage solutions, too. Because we’re the company you can trust to give you the very best...

- QUALITY
- SERVICE
- VALUE

Stack up our drives against the "best of the best" and they’ll come out on top. You can trust us to always bring you the highest-quality Mac hardware!

Need a really big drive, with a LOT of storage capacity? These drives offer big performance.

<table>
<thead>
<tr>
<th>Model number</th>
<th>Price (Internal)</th>
<th>Price (External)</th>
<th>Expanded Mac capacity</th>
<th>Avg access time (msec)</th>
<th>Transfer rate (MBps)</th>
<th>MTBF (hours)</th>
<th>Form factor</th>
<th>Warranty (Years)</th>
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<td>5.25 FH</td>
</tr>
</tbody>
</table>

* Transfer rate throughput depends on your Mac CPU and system configuration. For more information, ask your Hardware That Fits sales partner. **MTBF=Mean Time Between Failure

SCSI-2 Fast These drives are most efficient when used with a Macintosh Quadra 800, 950 or a RealTech SCSI-2 card.

Limited time offer!

Included FREE with your drive...award-winning Now Utilities (Version 4.0.1).

Includes 7 powerful utilities:
- Startup Manager, Super Boomerang, WYSIWYG Menus, Now Profile, and much more.
- Use Now Utilities to maximize System 7's capabilities, and to simplify using your Mac.

SCSI-2 CARD

Allows all Macs to communicate with newer, higher-performance hard drives at substantially faster transfer rates. Sustained transfer rate of up to 4.4 MB per second, plus a burst transfer rate of 6 MB per second (6/10 on a Quadra). Mirroring capabilities.

RealTech SCSI-2 Card: $299
## DRIVE SOFTWARE

RealTech drive utilities are included with your drive. Disk partitioning; password protection; diagnostic testing; multiple SCSI-Bus support; extensive on-line help; and more. Also included: System 7.01.

### Do you need a fixed hard drive, or the flexibility of a floppy? Call us; we can explain your options.

<table>
<thead>
<tr>
<th>Model number</th>
<th>Price (Internal)</th>
<th>Capacity</th>
<th>Price (External)</th>
<th>Type</th>
<th>Access time</th>
<th>Transfer Rate</th>
<th>MBF</th>
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### REMOVABLES

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<th>Price (External)</th>
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<td>21 Mb Floptical Diskette</td>
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<td>5-pack of Floptical Diskettes</td>
<td>$105</td>
<td>128 Mb Optical Diskette</td>
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<td>624 Mb M-O Cartridge</td>
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*T Transfer rate (or throughput) depends on your Mac CPU and system configuration. For more information, ask your Hardware That Fits sales partner. *MTBF=Mean Time Between Failure. LP=Low Profile; HH=Half Height; FH=Full Height

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30 ms Average Seek Time
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34 ms Average Seek Time
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128REM Sony
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< 1 ms Short Seek Time

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1.2 ms Short Seek Time

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### Magic Hard Drives

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<thead>
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<th>Model</th>
<th>Capacity</th>
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<td>85MB</td>
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<td>QuantumELS**</td>
<td>127/170MB</td>
<td>$259/$319</td>
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<td>QuantumPro**</td>
<td>240MB</td>
<td>$369</td>
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<td>QuantumPro**</td>
<td>525MB</td>
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<td>QuantumPro**</td>
<td>1.2GB</td>
<td>$1399</td>
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<td>QuantumPBGo*</td>
<td>80/120MB</td>
<td>$299/359</td>
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<td>MagicAMXModem</td>
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<td>MagicVXV.32Modem</td>
<td>9600/38400bps, Hayes compatible</td>
<td>$199</td>
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<tr>
<td>MagicVXV.32bisModem</td>
<td>14400bps, compression to 57600bps</td>
<td>$239</td>
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### Magic FaxModems

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<td>MagicFXFaxModem</td>
<td>2400bps modem, send &amp; receive class 2</td>
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<td>MagicVFXFaxModem</td>
<td>2400bps modem, class 2, Group 3 fax</td>
<td>$139</td>
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<td>MagicVFXV.32bisFaxModem</td>
<td>14400bps modem, 14400bps, class 2, Group 3 fax</td>
<td>$249</td>
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### Magic CD-Rom Drive

"The highest scoring CD-ROM Drive overall was the Magic CD-ROM." - MacUser Magazine, March'93

### Magic 45R SyQuest Removable

"The Magic 45R is one of best SyQuest Drives available, offering high speed and high quality." - MacUser Magazine, July '90

### Magic 128REM 3.5" Optical


### Magic FaxModems

<table>
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<th>Model</th>
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<td>MagicAFX &amp; PKTTFax Modem</td>
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<td>2400bps modem, class 2, Group 3 fax</td>
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<td>14400bps modem, 14400bps, class 2, Group 3 fax</td>
<td>$249</td>
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NEC Silentwriter 2 M90 2MB .................. $299
NEC Silentwriter M9597 2MB ............... $129
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<th>Category</th>
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<tr>
<td>Computer Systems</td>
<td>LA Computer</td>
<td>818.719.0007</td>
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<td>Monitors</td>
<td>Panelight</td>
<td>800.726.3599</td>
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<td>Peripherals</td>
<td>Aura Systems</td>
<td>800.241.2872</td>
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### Software

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<td>PowerBooks</td>
<td>Adambyte</td>
<td>415.988.1418</td>
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<td>Scanners</td>
<td>Spark Int'l, Inc.</td>
<td>708.998.6640</td>
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<td>MicroMac</td>
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<td>Accelerators</td>
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<td>MIFP</td>
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<td>Casa Blanca Works</td>
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<thead>
<tr>
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<th>Title</th>
<th>Phone</th>
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<tbody>
<tr>
<td>Carol Johnstone</td>
<td>Account Manager, MW Shopper</td>
<td>415.978.3152</td>
</tr>
<tr>
<td>Shannon Smith</td>
<td>Account Manager, MW Shopper</td>
<td>415.974.7414</td>
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<tr>
<td>Niki Stranz</td>
<td>Account Manager, MW Shopper</td>
<td>415.978.3105</td>
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<th>Speed</th>
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<th>External</th>
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<tr>
<td>40mb</td>
<td>80mb</td>
<td>120mb</td>
<td>240mb</td>
<td>450mb</td>
<td>3.5&quot;</td>
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### 72-PIN SIMMS

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>4MB (70 NS)</td>
<td>126</td>
</tr>
<tr>
<td>8MB (70 NS)</td>
<td>259</td>
</tr>
<tr>
<td>16MB (70 NS)</td>
<td>559</td>
</tr>
</tbody>
</table>

### QUADRA 800

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>4MB (60 NS)</td>
<td>145</td>
</tr>
<tr>
<td>8MB (60 NS)</td>
<td>282</td>
</tr>
<tr>
<td>16MB (60 NS)</td>
<td>679</td>
</tr>
<tr>
<td>32MB (60 NS)</td>
<td>2210</td>
</tr>
</tbody>
</table>

### POWERBOOK MEMORY

<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB100/140/170-2MB</td>
<td>4MB (70 NS)</td>
<td>80</td>
</tr>
<tr>
<td>PB100/4MB</td>
<td>4MB (70 NS)</td>
<td>189</td>
</tr>
<tr>
<td>PB100-6MB</td>
<td>4MB (70 NS)</td>
<td>241</td>
</tr>
<tr>
<td>PB140/170-4MB</td>
<td>4MB (70 NS)</td>
<td>169</td>
</tr>
<tr>
<td>PB140-6MB</td>
<td>4MB (70 NS)</td>
<td>210</td>
</tr>
<tr>
<td>PB160/180-4MB</td>
<td>4MB (70 NS)</td>
<td>204</td>
</tr>
<tr>
<td>PB160-6MB</td>
<td>4MB (70 NS)</td>
<td>290</td>
</tr>
<tr>
<td>PB160-8MB</td>
<td>4MB (70 NS)</td>
<td>369</td>
</tr>
<tr>
<td>PB160-10MB</td>
<td>4MB (70 NS)</td>
<td>439</td>
</tr>
<tr>
<td>PB165C/4MB</td>
<td>4MB (70 NS)</td>
<td>202</td>
</tr>
<tr>
<td>PB165C/6MB</td>
<td>4MB (70 NS)</td>
<td>294</td>
</tr>
<tr>
<td>PB165C/8MB</td>
<td>4MB (70 NS)</td>
<td>388</td>
</tr>
<tr>
<td>PB165C/10MB</td>
<td>4MB (70 NS)</td>
<td>504</td>
</tr>
<tr>
<td>PBDUO 210/230-4MB</td>
<td>4MB (60 NS)</td>
<td>215</td>
</tr>
<tr>
<td>PBDUO210/230-6MB</td>
<td>4MB (60 NS)</td>
<td>289</td>
</tr>
<tr>
<td>PBDUO210/230-8MB</td>
<td>4MB (60 NS)</td>
<td>399</td>
</tr>
<tr>
<td>PBDUO210/230-10MB</td>
<td>4MB (60 NS)</td>
<td>475</td>
</tr>
</tbody>
</table>

### SYQUEST CARTRIDES

<table>
<thead>
<tr>
<th>Model</th>
<th>Cartridge Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SyQuest</td>
<td>44MB Cartridge</td>
<td>63</td>
</tr>
<tr>
<td>SyQuest</td>
<td>44/Preformatted</td>
<td>68</td>
</tr>
<tr>
<td>SyQuest</td>
<td>44/w/Diva</td>
<td>68</td>
</tr>
<tr>
<td>SyQuest</td>
<td>88MB Cartridge</td>
<td>99</td>
</tr>
<tr>
<td>SyQuest</td>
<td>88/Preformatted</td>
<td>105</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Hard Disk Drives</th>
<th>Microtek/Epson/Nec</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/16 MB Quantum..</td>
<td>8/16 MB Corner...</td>
</tr>
<tr>
<td>10/16 MB Zero...</td>
<td>10/16 MB Con.</td>
</tr>
<tr>
<td>12/16 MB Con...</td>
<td>12/16 MB Con.</td>
</tr>
<tr>
<td>24/32 MB Classic..</td>
<td>24/32 MB Classic.</td>
</tr>
<tr>
<td>24/32 MB Classic..</td>
<td>24/32 MB Classic.</td>
</tr>
<tr>
<td>50/80 MB Quality..</td>
<td>50/80 MB Quality.</td>
</tr>
<tr>
<td>120 MB Fuji...</td>
<td>TOSHIBA Fuji...</td>
</tr>
<tr>
<td>120 MB Fuji...</td>
<td>120 MB Fuji...</td>
</tr>
</tbody>
</table>

**Memory Upgrades**

<table>
<thead>
<tr>
<th>RAM Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>2MB 75 ns</td>
<td>$32.00</td>
</tr>
<tr>
<td>2MB 72 ns</td>
<td>$22.00</td>
</tr>
<tr>
<td>4MB 70 ns</td>
<td>$69.00</td>
</tr>
</tbody>
</table>

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Qualified Macheads are on hand to show users the tricks of the trade, and there are plenty of Macs provided on-site for impromptu practice sessions. Users try out new software for home and office, separating the quick from the dead, and getting expert critiques on a wide range of applications. In fact, there are so many experts at MACWORLD Expo, it's like you're hearing the word of God... (well, uh, you know what we mean).

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The Akihabara Syndrome

BY GUY KAWASAKI

There is a district in Tokyo called Akihabara. By railroad, it's two stops from the Tokyo station on the Yamanote line. Akihabara contains seven-story stores as well as five-by-five-foot stalls. In these stores and stalls you can buy every imaginable (and unimaginable) television, VCR, video camera, tape recorder, computer, CD player, household appliance, and electronic component.

It's hip for the executives of American computer firms like Apple to talk about visiting Akihabara. They came back to America and exclaim, "I was just in Tokyo to see the selection of stuff they have there." But they go to Akihabara and their round eyes glazed over and their Protestant brains went to sleep. Executive Syndrome. Then these executives come back to Cupertino and design too many kinds of Walkmans than Apple has reorgs.

Here's the problem: Apple executives go to Akihabara and their round eyes glaze over and their Protestant brains short out. This is called The Akihabara Syndrome. Then these executives come back to Cupertino and design too many kinds of Macintoshes. As a result, the hardest thing about buying a Macintosh is figuring out which one to choose (or more accurately, which one to wait for).

Which PowerBook?

SIX MONTHS AGO, I WAS A VICTIM OF The Akihabara Syndrome. I was interviewing someone for my next book, and she told me she was about to buy a laptop for her daughter. She had gone to a computer store, and the store gave her a quote of $2200 for a generic clone laptop running the Gates User Interface (GUI).

You can take the evangelist out of Apple, but you can't take Apple out of the evangelist, so I quickly told her she was making a mistake. I asked her if she loved her daughter. I told her it would hurt me to see her waste $2200. Naturally, she came back with the dreaded question, "Well, which laptop should I buy?"

"Why, a Macintosh PowerBook," I responded confidently, and then I thought, "Oh no, she's going back to the store and she'll talk this to a guy who doesn't know a spreadsheet from Shinola, and he's going to tell her a clone running the Gates User Interface 'is just like a Macintosh, only cheaper.'" I had to tell her which PowerBook to buy, so she wouldn't have to ask any questions at all.

Which Macintosh should she buy? I had to get back to her. The 180 costs twice what she was quoted. The 140 was just discontinued. The 145 wasn't shipping. The docks and external drives for the Duo 210 and 230 weren't available yet. The 160 was the right price, but I hated the screen.

I had to call two people to ask their advice. Imagine that: Guy Kawasaki, four-year Apple employee, former director of software product management, the person who's forever taking credit for the plethora of Macintosh software, a legend in his own mind, had to ask two people for advice on which Macintosh to buy. We came to the conclusion that she should buy a 160 and hope she never looks at the screen of a 170 or 180.

Then Which Macintosh?

AS OF MARCH 1993, THERE ARE SIX MODELS of PowerBooks and nine models of desktop Macintoshes—not even counting the Performas. This is crazy—why doesn't Apple ship 3 models instead of promising 15? Exercise: send an E-mail to John Sculley and ask him which Macintosh he recommends to his in-laws.

Here's the Kawasaki Solution to The Akihabara Syndrome: Bless three models so their sales go through the ceiling, and Apple will discontinue the rest.

Blessed Macintosh #1: Color Classic 4/80. Market: side: if all those Apple execs were still at Apple, this is the berries (admittedly, the rest of the Macintosh Way: compact design, plug-and-play, and puppylike in charm. People will disagree with the Color Classic as the ideal first Macintosh because it isn't as expandable as the LC II or LC III. Tough. Macintoshes are like cars: either you're happy with the one you have or you buy a new one; you don't upgrade them. Second, Apple executives are going to whine: "You tell us you want us to innovate, so we innovate. We're introducing more models this year than in the entire history of Apple." Nice try. Wake up and smell the wasabi: we want paradigm-shifting, leapfrogging innovation, not a change in clock speed.


Let's face it. You buy a PowerBook to use when you travel. A traveling computer has two minor requirements: it has to work with a modem (and there have to be modems available that you can actually buy), and it has to run on batteries for at least an hour. The screen on the 160 will drive you crazy, but if enough people buy it, Apple will have to lower the price of the 160. Then we'll bless the 180.

Blessed Macintosh #3: Centris 650 8/80. Market: businesspeople who don't travel. Suggested retail price: $3189. This is the desktop model for most of us: it is powerful enough for most applications in the real world, and you can add a full-page or two-page display. Sure, we'd all like a Quadra, but how fast do you really need to scroll that five-page memo?

Be prepared to take some flak. First, people will disagree with the Color Classic as the ideal first Macintosh because it isn't as expandable as the LC II or LC III. Tough. Macintoshes are like cars: either you're happy with the one you have or you buy a new one; you don't upgrade them. Second, Apple executives are going to whine: "You tell us you want us to innovate, so we innovate. We're introducing more models this year than in the entire history of Apple." Nice try. Wake up and smell the wasabi: we want paradigm-shifting, leapfrogging innovation, not a change in clock speed.

The Ginza Syndrome

CAN WE STOP THE AKIHABARA SYNDROME? It may be too late. But look at the bright side: if all those Apple execs caught the Marunouchi line and got off at the Ginza stop, they'd see two dozen strawberries (admittedly, perfect strawberries) selling for $50 in a Japanese department store.

God help us if they catch The Ginza Syndrome.

Guy Kawasaki's views are his own and only sporadically represent those of Macworld. His latest book is The Computer Curmudgeon (Hayden Books, 1992). He has investments in After Hours Software, Objective Software, Global Village Communications, Bookmaker Corporation, and others.

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