16 PostScript Printers
Speed • Precision • Clones • Fonts • Memory • RISC

Mac Font Guide
• Bit-Map vs. PostScript
• 10,000 New Styles
• Apple's Outline Fonts

Boardroom Boredom?
Animate Your Presentations

Our New NetWorkShop
Connectivity Lab Rates
Novell's NetWare

New Power Tools
How-to Section!
• Finder Alternatives
• Keyboard Repairs
• Customized Systems

PLUS
HOT NEW MAC REVIEWS
Nexpert, Business Sense,
Voyager, TableTools,
SmartForm . . . and more!

SEPTEMBER 1989
### Monthly Profit By Product Line

**April Promotion**

### SELECTED FIVE-YEAR FINANCIAL DATA

**Revenue and Costs**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$432,806</td>
<td>$358,663</td>
<td>$309,266</td>
<td>$239,656</td>
<td>$207,907</td>
</tr>
<tr>
<td>Cost</td>
<td>79,809</td>
<td>65,570</td>
<td>58,344</td>
<td>40,710</td>
<td>40,215</td>
</tr>
<tr>
<td>R and D</td>
<td>79,809</td>
<td>52,361</td>
<td>33,081</td>
<td>21,420</td>
<td>20,676</td>
</tr>
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<td>62,490</td>
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<td>26,409</td>
</tr>
<tr>
<td>Gen Admin</td>
<td>27,653</td>
<td>18,537</td>
<td>12,594</td>
<td>7,306</td>
<td>4,520</td>
</tr>
</tbody>
</table>

**INCOME FROM OPERATIONS**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>$157,855</td>
<td>$134,087</td>
<td>$142,756</td>
<td>$121,221</td>
<td>$116,088</td>
</tr>
<tr>
<td>Non-op Income</td>
<td>7,804</td>
<td>6,639</td>
<td>3,715</td>
<td>2,008</td>
<td>1,387</td>
</tr>
<tr>
<td>Income Before Taxes</td>
<td>165,659</td>
<td>140,726</td>
<td>146,471</td>
<td>123,229</td>
<td>117,475</td>
</tr>
<tr>
<td>Provision for Taxes</td>
<td>67,092</td>
<td>56,290</td>
<td>59,321</td>
<td>49,908</td>
<td>47,577</td>
</tr>
</tbody>
</table>

**NET INCOME**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>$98,567</td>
<td>$84,436</td>
<td>$87,150</td>
<td>$73,321</td>
<td>$69,898</td>
</tr>
</tbody>
</table>

### Assets and Liabilities

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Current Assets</td>
<td>223,579</td>
<td>112,622</td>
<td>79,282</td>
<td>44,256</td>
<td>44,055</td>
</tr>
<tr>
<td>Net Property</td>
<td>75,468</td>
<td>73,937</td>
<td>41,209</td>
<td>24,957</td>
<td>19,374</td>
</tr>
<tr>
<td>Other Assets</td>
<td>5,643</td>
<td>3,764</td>
<td>3,673</td>
<td>2,402</td>
<td>1,899</td>
</tr>
</tbody>
</table>

**TOTAL ASSETS**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Current Liabilities</td>
<td>34,423</td>
<td>18,319</td>
<td>11,599</td>
<td>5,077</td>
<td>9,940</td>
</tr>
<tr>
<td>Long-term Liabilities</td>
<td>4,578</td>
<td>4,114</td>
<td>3,602</td>
<td>3,293</td>
<td>3,146</td>
</tr>
<tr>
<td>Stockholder’s Equity</td>
<td>265,689</td>
<td>167,890</td>
<td>108,964</td>
<td>63,245</td>
<td>52,242</td>
</tr>
</tbody>
</table>

**TOTAL LIABILITIES & EQUITY**

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Capital</td>
<td>189,642</td>
<td>173,468</td>
<td>127,766</td>
<td>119,489</td>
<td>77,041</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>3,456</td>
<td>2,727</td>
<td>1,681</td>
<td>1,390</td>
<td>1,086</td>
</tr>
</tbody>
</table>

### Common Stock Data

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Net Income per Share</td>
<td>$1.13</td>
<td>$1.64</td>
<td>$1.94</td>
<td>$1.90</td>
<td>$2.59</td>
</tr>
<tr>
<td>Book Value per Share</td>
<td>$4.56</td>
<td>$3.56</td>
<td>$2.29</td>
<td>$1.46</td>
<td>$0.78</td>
</tr>
<tr>
<td>Cash and Investments</td>
<td>$2.65</td>
<td>$1.60</td>
<td>$0.83</td>
<td>$0.64</td>
<td>$0.48</td>
</tr>
<tr>
<td>Average Shares Out</td>
<td>87,535</td>
<td>83,258</td>
<td>44,956</td>
<td>38,634</td>
<td>26,984</td>
</tr>
<tr>
<td>Shares Out/Year-end</td>
<td>86,790</td>
<td>51,305</td>
<td>26,589</td>
<td>15,905</td>
<td>9,082</td>
</tr>
</tbody>
</table>

### Key Ratios

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Return on Net Revenues</td>
<td>23%</td>
<td>23%</td>
<td>28%</td>
<td>31%</td>
<td>34%</td>
</tr>
<tr>
<td>Return on Total Assets</td>
<td>32%</td>
<td>44%</td>
<td>70%</td>
<td>102%</td>
<td>107%</td>
</tr>
<tr>
<td>Return on Stock Equity</td>
<td>37%</td>
<td>50%</td>
<td>80%</td>
<td>116%</td>
<td>134%</td>
</tr>
</tbody>
</table>

As you can see, there's more than one way to highlight. Now pick from 256 fonts. Change row height. Shade. And get used to the sound of applause.
Back in 1985, not long after the Macintosh was unveiled, Microsoft Excel became the most compelling reason to buy one. Within minutes, it was the spreadsheet standard on the Macintosh. And before we knew it, a full 9 out of 10 Macintosh spreadsheet users were swearing by it. They still are.

But while many consider Microsoft Excel to be one incredible spreadsheet, we’ve been working on a way to change all that. The result: Microsoft Excel version 2.2 has just come to the small screen.

In simple mathematical terms, let’s just say that 2.2 is greater than 1.5. In more technical terms, let’s just say that now your spreadsheets aren’t limited to 1MB of memory — version 2.2 taps every ounce of power from even the 8meg machines, which means very soon you’ll be creating spreadsheets of outrageous proportions.

Equally outrageous is how much faster you’ll be able to perform your calculations: Try up to 40% faster, thanks to our advanced intelligent recalc.

As for presentation? Version 2.2 lets you highlight data in ways you never could before: You can pick from 256 different fonts per sheet, including up to six styles and eight colors. You can change row height. You can shade. And basically pack your documents with more visual punch than ever before.

You can also add notes to any cell on a worksheet, or macro-sheet, so key assumptions are documented — and printable. Plus, thanks to our new built-in tools, you can even audit things like cell precedents and dependents.

Microsoft Excel version 2.2. Another improvement designed to make Mac enthusiasts even more enthusiastic. Something 90% of you are already used to.

And you other 10% easily can be.

Microsoft
Making it all make sense:

Used to be, 1MB was enough. Now with Microsoft Excel 2.2 you can take full advantage of the 8megs in today's most powerful Macintoshes.
90% of Macintosh spreadsheet users have been working on this program.
### Selected Five-Year Financial Data

**Revenue and Costs**

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Revenues</td>
<td>$432,806</td>
<td>$318,663</td>
<td>$309,266</td>
<td>$239,656</td>
<td>$207,907</td>
</tr>
<tr>
<td>Cost of Revenues</td>
<td>79,309</td>
<td>165,570</td>
<td>58,344</td>
<td>40,710</td>
<td>40,215</td>
</tr>
<tr>
<td>R and D</td>
<td>79,309</td>
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<td>21,420</td>
<td>20,676</td>
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<td>48,999</td>
<td>26,409</td>
</tr>
<tr>
<td>Gen Admin</td>
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<td>18,537</td>
<td>12,594</td>
<td>7,206</td>
<td>4,520</td>
</tr>
</tbody>
</table>

**Income from Operations**

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-op Income</td>
<td>7,304</td>
<td>6,639</td>
<td>3,715</td>
<td>2,008</td>
<td>1,387</td>
</tr>
<tr>
<td>Income Before Taxes</td>
<td>165,659</td>
<td>62,190</td>
<td>146,471</td>
<td>123,229</td>
<td>117,475</td>
</tr>
<tr>
<td>Provision for Taxes</td>
<td>67,092</td>
<td>294</td>
<td>50,321</td>
<td>43,908</td>
<td>47,577</td>
</tr>
</tbody>
</table>

**Net Income**

|-------------|----------------|-------------|----------------|----------------|----------------|

### Assets and Liabilities

**Current Assets**

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<tr>
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<td>19,374</td>
</tr>
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<td>3,764</td>
<td>3,673</td>
<td>2,402</td>
<td>1,899</td>
</tr>
</tbody>
</table>

**Total Assets**

<table>
<thead>
<tr>
<th></th>
<th>1988 ($304,690)</th>
<th>1987 ($190,323)</th>
<th>1986 ($124,164)</th>
<th>1985 ($71,615)</th>
<th>1984 ($65,327)</th>
</tr>
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<tr>
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<td>167,390</td>
<td>108,964</td>
<td>63,245</td>
<td>52,242</td>
</tr>
</tbody>
</table>

**Total Liabilities and Equity**

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<th>1987 ($190,323)</th>
<th>1986 ($124,164)</th>
<th>1985 ($71,615)</th>
<th>1984 ($65,327)</th>
</tr>
</thead>
</table>
Presentations with Punch
BY SALVATORE PARASCANDOLO AND KRISTI COALE
Dreary slide shows can be the death of a sales pitch, but animated presentations will have the audience glued to their seats. We examine two powerful new tools for making a moving presentation -- MacroMind Director and Studio/I — that will transform your boardroom from dullsville to Disneyland.

Fonts from A to Z
BY STEVE MCKINSTRY
Everybody loves them, but nobody understands them. Here's the whole font story: how type works, where to get the right face, and the fundamentals of good type design. Also, simple (but lifesaving) utilities for font management and manipulation and how to avoid hidden hazards.

StartUp
News edited by RUSSELL ITO
What do you do when you need to check a PostScript file while you're knee-deep in a text-only word processor? Where can you find an application that writes its own documentation? When hypermedia went off to the Ivy League, what new tricks did it learn? Answers to all these questions — plus news, rumors, the hottest new products, upgrades of old favorites, and more — in this brand-new StartUp section.

Reviews
Microsoft Excel 2.2 lets you teach an old workhorse new tricks. ....... 60
Omnis 5 is a new database that's at home on the Mac or the PC. ...... 61
TableTools simplifies complex tables in DTP'd documents. ................. 62
Business Sense may be all the accounting software you need. ... 67
SmartForm Designer is Claris' entry in the electronic-forms arena. ....... 68
Xtree Mac challenges the Finder for the job of hard-disk manager. .... 78
MultClip lets you have as many Clipboards as you want. .......... 82
Voyager defines a new genre: desktop astronomy. .......... 89

Departments
Mail Merge FROM THE MAC COMMUNITY
Readers identify Canvas 2.0's real competition, seek overseas Wingz, and address our dear Mr. Sculley. 8

DTP EDITED BY AILEEN ABERNATHY AND SALVATORE PARASCANDOLO
Fine Print
BY SALVATORE PARASCANDOLO
Can Apple's new outline-font technology or Adobe's ATM solve your screen-font woes? How long will you have to wait? We outline some current and future solutions. 239

Desktop Tip: Illustrator
BY TOM WERNSMAN AND SALVATORE PARASCANDOLO
Lost an Illustrator 88 file? If you've already placed it in a PageMaker document, you can get it back and make your picture perfect once again. 243

Desktop Tutorial: Word 4.0 and PostScript
BY GREGORY WASSON
Word 4.0's powerful new PostScript variables, group commands, and glossary make it easy to write your own programs for fancy DTP effects. 245

The Expert Is In
BY DANIEL RASMUS
Put an expert to work. Expert systems can turn the Mac into a reasoning machine that will do whatever you want it to — from diagnosing diseases to routing the mail. We look at the leading packages, including Neuron Data's $5,000 brain buster, Nexpert Object.

Tying the Net
BY BRENDA MCLAUGHLIN AND STEPHAN SOMOGYI
A PC standard for corporate connectivity has finally added the Mac to its network. Our new NetWorkShop tested NetWare for Macintosh to see how this newcomer stacks up against AppleShare. Switching over can save you lots of money — or give you lots of headaches.

Bridges EDITED BY HENRY HORTMAN
Currents
BY HENRY BORTMAN
Overhead LANs, desktop DOS, and more. 251

A Guide to LocalTalk Routers
BY KEE NETHERY
The key to choosing a LocalTalk-to-LocalTalk router is reliability. Our NetWorkShop tested the five LocalTalk routers on the market. 257

Trouble Shots
BY KURT VANDERSLUIS
Moving to an active-star network can solve "guerrilla" wiring problems. Keeping an active star running, though, takes special skills.

Bobker's Dozen
BY STEVEN BOBKER
Quick looks at 13 no-nonsense products. Some of this month's stars: PictureBook, Pyro!, and ExpressWrite.

About MacUser

Coming Soon

Advertiser Index

Marketplace
Every Mac comes with the Finder, but that doesn’t mean you’re stuck with it. We take a tour of different ways to run your desktop: PowerStation, On Cue, DiskTools Plus, and DiskTop offer powerful features that enhance the Mac’s fast, intuitive interface.

Getting Involved with Your System
BY MICHAEL SWAINE
Here’s a new column that shows you how to master your Mac with System techniques and sneaks that only the experts knew—until now. And if you think you’re one of those experts, take the Swaine challenge: Can you solve his monthly puzzle?

A keyboard takes a lot of abuse, and it can pay you back by breaking just when you need it most. But that doesn’t mean you have to spend a lot of money to replace it or get it fixed. We show you how to find the problem and fix it yourself, step by step.

Can any PostScript printer beat Apple’s NTX? MacUser Labs tested them all—16 models, from LaCie’s $3,499 PostScript clone to Varityper’s $17,000 high-resolution alternative—to find the fastest machine, cleanest output, and best overall bargain. Plus: How to save thousands of dollars by using your printer smarter.

Meet the new MacUser, all DTP’d up and everywhere to go.

The latest spreadsheets raise the ante—and the consumer wins.

As Guy Kawasaki’s new tell-all book proves, he’s a real wise Guy.

A history of the computer industry, told with 20/20 hindsight.
Key Features:
- All the standard drawing tools
- Unlimited layers
- Ultra-fine hairlines
- Editable arrowheads
- Smooth polygons
- Object libraries
- ± 32x magnification/reduction
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- High precision
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- Auto-dimensioning of lines

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1-800-6CANVAS In Florida: (305) 594-6955
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HIGH PERFORMANCE MS-DOS® for MACINTOSH™
with Mac286/86 2.0

PERFORMANCE THROUGH HARDWARE
The Orange Micro® Mac286 "brings the power of an IBM® AT™ to your
Macintosh II™." Multiprocessing of MS-DOS and Macintosh applications at the
same time is now possible. Got the true speed of an IBM AT with the
Mac286, the highest performance MS-DOS compatibility solution available for
your Mac II. Containing its own memory and powerful 80286 processor, the
Mac286 benchmarks at 8.2 on the Norton Computing Index. That's six times
faster than any software based solution.

If you own a Mac SE, the Mac86™ is your most powerful MS-DOS solution.
Upgrade your SE with the Mac286 to get the optimum performance of an IBM
XT™ and Macintosh in one system.

PERFORMANCE THROUGH APPLICATION COMPATIBILITY
The Mac286 and Mac86 open up new windows of opportunity by insuring
compatibility with all major MS-DOS application packages. In fact, you can
use MS-Windows®, AutoCad®, Lotus 1-2-3®, Lotus Symphony®, or Flight
Simulator® while simultaneously executing your favorite Mac programs.

Fortran, Pascal, and C language compilers can be run in the Mac286 or
Mac86 windows. You can now run your Macintosh II into a full development
system.

PERFORMANCE THROUGH FILE SHARING
Transport files from your Mac286 or Mac86 window through the TOPS
network to another Macintosh. Copy and Paste graphics from an MS-DOS
charting program directly into Microsoft Word®, PageMaker®, or MacWrite®
on your Macintosh. Transport files easily back and forth between Macintosh
and MS-DOS formats by using the Mac286 file utilities. With two quick steps,
files as complex as AutoCad designs or as simple as text files can be
transferred back and forth between the Mac286/86 and the Macintosh.

MacUser's Art Department designed and implemented
our new DTP look: (clockwise from upper left) Peter
Gould, Dan Clark, Diane
Dempsey, Jeff Felmus, Lisa
Orsini, Michael Yapp, and
Mark Sweeney.

Performance: The Inside Story

As regular MacUser readers know, we've been steadily incor-
porating desktop-publishing technology into our produc-
tion process. Over the past few months, we've been applying
the lessons presented in our DTP section. This issue is a
milestone, however, because we produced it entirely with DTP
tools. No wires, no mirrors, no artificial ingredients.

How is it done? In a nutshell, after editors turn in their stories,
the articles are placed on PageMaker pages. Using Adobe Illustrator
88, designers next add all the graphic elements — such as logos,
icons, spot color, and informational graphics — to the
pages and then print them directly to film as four-color separations, us-
ing a Linotronic 300 imagesetter.

The process demands painstaking coordination among the copy-edit-
ning, design, and production departments, as well as with the many
writers and editors. The payoffs are substantial: reduced cost and greater
control over both the art and editorial content. And the more control we have over the production
process, the easier it is for us to bring you the latest and most
accurate information.

MacUser's evolution toward DTP started last December
with our first desktop-published Lab Report, "The Data Chase.
Since then, we've extended the charter for that first report to include the rest of MacUser: Deliver extremely useful informa-
tion in an extremely readable and attractive format.

To meet that goal, Art Director Lisa Orsini and Technical Art
Director Michael Yapp created new design elements for our
DTP transition that would be simple and bold but still reflect the
technical orientation of our readers. They call it a neoclassical
Bauhaus design (in which form follows function), reflected in
bold type, sans serif headlines, a little more white space, and a
primary color palette. We call it easier to read — and far more
effective in delivering the key information you need.

Our inspiration continues to be the intuitive and easy-to-
access architecture of the Mac itself. But the Mac has come a
long way since we started writing about it, and we're deter-
mmed to keep pace. Don't be shy about sharing your opinion of
the new MacUser look and feel with us.
It takes quite a booklet to show you all the terrific ways Apple Desktop Media™ can help you express your ideas.

If you've ever worked with an Apple® Macintosh® computer, or watched someone working on a Macintosh, you know that it had to happen.

The ability to command a whole world of communicating without leaving your chair.

To create what you need to get your ideas across with maximum impact. Not just in one medium, but in all media.

That's Apple Desktop Media™

And to show you what it's all about, we'd like to place something else on your desk.

An especially beautiful and informative booklet.

You can get a copy just by mailing in the coupon on the right.

But here's a little sampling of what it's about.

For the printed page, you probably already know how a Macintosh can help you produce better-looking memos and reports. And do them faster than ever before.

Now imagine incorporating the visual impact of high-quality graphics. Even photographs. And retouching or modifying them right on screen. Even adding special effects. And still printing right from your desktop. In color or black-and-white.

Now imagine doing all of that for 35mm slides or overheads. With the final product just the way you want it.

Now imagine doing all of that in live media. Creating your own interactive demonstrations with HyperCard® Where individuals can choose just what they want to know more about.

Or having your message seen and heard with real animation. With characters that can walk or talk. Along with a full soundtrack.

But why go on?

Our fascinating booklet awaits you.

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And see just how much impact you can generate without even leaving your chair.

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In Search of Smart Software

What do Mac users want? I'm glad Paul Somerson asked (July '89).

I want a word processor that, when I open it, asks me what I want. For example: a book divided into chapters, text that I can lay out according to given specs, universal find/replace/index searches that run through the whole book (whether the files are open or closed), a style sheet that learns as the book develops and that ensures that groundwater doesn't appear as ground water—in short, I want an interactive program that will help me customize the functionality for this particular job.

We're still in the Dark Ages as far as the interaction of software and user goes. There's a fortune waiting for the programmers who understand the problems and can solve them.

Karen Arms
Savannah, GA


I've Got a Little List

You did a great job of reviewing Canvas 2.0 (April '89), and the comparison with MacDraw II was insightful—but I don't think you compared Canvas to its real competition. The head-to-head comparison was partly motivated by the fact that the list prices for the two programs are in the same ballpark ($299 for Canvas, $395 for MacDraw II). But consumers are more interested in actual street prices, not manufacturers' suggested list prices. One typical discount prices Canvas at $159 and MacDraw at $309. Better comparisons could have been made with Drawing Table (with a street price of $76), Cricket Draw ($168), and SuperPaint ($129). On this basis, MacDraw competes with the likes of FreeHand 2.0 ($349) and Illustrator 88 ($299). And against that competition, MacDraw II strikes out.

Michael G. Rudel
Houston

The Overseas Connection

There has been much debate in Australia about the high price of software. There are substantial savings in buying from U.S. mail-order houses, even with the steep shipping charges. However, after placing an order with MacConnection, I was shocked to find—three weeks later—that my order had been canceled because it totaled less than $250. (In addition, a 2-percent surcharge would have been incurred.) What sort of service is this? Sure, MacConnection is within its rights to implement such policies, but it won't endear itself to potential overseas clients.

Phillip R. Thompson
Canberra, Australia

I planned to buy a new Apple computer, and I asked the mail-order company MacConnection for a price quotation for Wingz. To my surprise, it replied that it was not allowed to ship the program overseas. I do not understand this. To my knowledge Belgium is not a communist country that would be subject to COCOM restrictions.

This is a strange kind of protectionism, refusing to sell goods abroad. Now I can understand the reason behind the big American trade imbalance.

Louis Engelen
Embassy of Belgium
Tokyo

First the good news: MacConnection will sell Wingz to citizens of Belgium (or any other regular U.S. trading partner). The bad news is that many mail-order firms don't really want foreign business, since it's next to impossible to get local support for these products. Another option is to buy the International-English version of Wingz through Informix's Japanese distributor, Ascii, which is working on the upcoming Kanji Wingz. It will cost ¥28,000 (about $880—or the price of a good dinner in Tokyo). —JB

ResEdit Revisited

A few concerns about the ResEdit article by Darryl Lewis (June '89): The statement that "the data fork is the programmer's code that makes an application do what it is supposed to do" is wrong. The data that does this is in the CODE resource. The data fork is simply data that the application can use any way it sees fit. The statement that "the resource fork controls what you actually
We found a measure they could both agree on.

Up on the hill it looked like another split along party lines. Both Macintosh and PC users fought for access to the same information. Until a TOPS network brought them together in bipartisan agreement, that is.

Maybe that's why TOPS has been voted the de facto standard for easy Mac-to-PC connectivity by some 600,000 users. All you have to do is install TOPS software in each Macintosh and PC on the network, add a network card to each PC, and you've got a quorum.

A polished diplomat in any arena, TOPS easily trades data from Lotus 1-2-3 to Excel, Microsoft Word PC to Word Mac and most other Mac and PC applications.

And if you're looking to discuss the issues with other networks and systems, such as Novell, AppleShare, and Sun NFS, TOPS provides the perfect forum.

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3437 NetBridge
4942 TeleBridge
3443 NetModem V2400
* Software Ventures ... 30 day MBG
3454 MicroPhone 1.5
3455 MicroPhone II 3.0
* Solutions Int‘l ... 60 day MBG
4308 BackFAX (reqs Apple FAX modem)
* Synergy ... 30 day MBG
3130 VersaTerm 4.0
3131 VersaTerm Pro 3.0
* TOPS ... 30 day MBG
4188 TOPS Teleconnector (DIN-8)
4189 TOPS Teleconnector (DB-9)
3726 TOPS for DOS 2.1

Digikat ... 60 day MBG
SmallTalk/V Mac 1.0-The original object-oriented development environment. Extensive manual and tutorial. Easy integration with other languages. Complete toolbox access. MultiFinder friendly

$129.
Dear MacConnection,

When I tried to boot my new Thunder-Scan program from MacConnection, all I got was a fearsome bomb. I'd heard horror stories about mail order, and thought, great, it's my very own double feature: "Night of the Undead Hardware" and "The Warranty From Hell."

But, I called your toll-free Technical Support Line. I explained the problem to Paul, who suggested there was a ROM incompatibility problem. He confirmed this diagnosis with Thunderware. The solution was shipped to me. No "Warranty from Hell." Just a pleased customer who will definitely use you again.

Stephen Leigh
Cincinnati, OH

"The Warranty From Hell."

MacConnection 1-800/622-5472

MacConnection, 14 Mill Street, Marlow, NH 03456 1-800/622-5472 603/446-7711 FAX 603/446-7791

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Just for the record, all the ads in this series feature photographs of real live MacConnection customers and the real live letters they wrote us. Really!
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- 3239 Sony 3.5" HD Disks (1.44 Meg) ... $32.00
- 2793 MAXELL 3.5" HD Disks (1.44 Meg) ... $32.00

**ACCESSORIES**

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>4864</td>
<td>Disk Labels 3.5&quot; (Qty. 250)</td>
<td>$13.00</td>
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<tr>
<td>5392</td>
<td>Disk Labels — Laser 3.5&quot; (Qty. 630)</td>
<td>$29.00</td>
</tr>
<tr>
<td>5403</td>
<td>Address Labels 17/8&quot; x 4&quot; (Qty. 1000)</td>
<td>$9.00</td>
</tr>
<tr>
<td>4865</td>
<td>Address Labels 3.5&quot; x 5/8&quot; (Qty. 375)</td>
<td>$15.00</td>
</tr>
<tr>
<td>4811</td>
<td>Transparency 8 1/2&quot; x 11&quot; (Qty. 50)</td>
<td>$22.00</td>
</tr>
<tr>
<td>4813</td>
<td>Round Labels 3/4&quot; (Qty. 150)</td>
<td>$7.00</td>
</tr>
<tr>
<td>4812</td>
<td>Laser Labels 1/2&quot; x 1/4&quot; (Qty. 2000)</td>
<td>$7.00</td>
</tr>
<tr>
<td>4807</td>
<td>Laser Labels 1/2&quot; x 2/3&quot; (Qty. 3000)</td>
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<td>4808</td>
<td>Laser Labels 1 1/2&quot; x 3/4&quot; (Qty. 1400)</td>
<td>$7.00</td>
</tr>
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<td>4809</td>
<td>Laser Labels 2 1/2&quot; x 4&quot; (Qty. 1000)</td>
<td>$24.00</td>
</tr>
<tr>
<td>4810</td>
<td>Laser Labels 8 1/2&quot; x 11&quot; (Qty. 100)</td>
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## Computer Coverup ... 60 day MBG

1722 ImageWriter III Cover ... $8.00
1723 ImageWriter III Cover ... $10.00
1720 Mac Plus Cover ... $10.00
1724 Mac SE Cover ... $10.00
1725 Mac SE Ext. Keyboard Cover Set ... $10.00
4657 LaserWriter II Cover ... $10.00

## Golden & Blair ... 30 day MBG

2307 The Macintosh Bible (2nd Edition) ... $20.00

## I/O Design ... 30 day MBG

2379 MacLuggage ImageWaire II ... $49.00
2376 MacLuggage Macinware Plus ... $64.00
2381 MacLuggage Macinware SE ... $75.00

## Kalmar Designs

2531 Teakwood RollTop Case (holds 45 disks) ... $14.00
2532 Teakwood RollTop Case (holds 90 disks) ... $21.00
2533 Teakwood RollTop Case (holds 135 disks) ... $31.00

## Kensington ... 30 day MBG

MacConnection carries the entire line of Kensington's accessories. Partial listing below.

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2569 Mac SE Ext. Keyboard Cover Set ... $9.00

## Logitech ... 30 day MBG

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## MacConnection ... 60 day MBG

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- 3270 ImageWriter II Rainbow Six Pack ... $20.00
- 3260 ImageWriter II Black Ribbon ... $17.00
- 4011 ImageWriter II 4-Color Ribbon ... $20.00

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- 4019 Mac SE & Ext. Keyboard Cover (navy) ... $15.00
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- To order: call us anytime Monday through Friday 9:00 to 9:00 EST or Saturday 9:00 to 5:30 EST. You can call our business offices at 603/446-7711 Monday through Friday 9:00 to 5:30 EST.

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Continental U.S.: Barring major computer failures and other natural or unnatural catastrophes, all credit card orders shipped into MacConnection weekdays by 6 PM EST will ship Airborne the same night for delivery the next business day (i.e., not Saturday or Sunday), except for those within UPS Ground Zone 1 (which is also an overnight service). The local freight charge on any order placed with MacConnection is now $3. Backorders will also ship Airborne overnight at no additional charge. Some areas require an additional day delivery.

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with our 30-60 day...

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**3729** LAP-LINK Mac 2.0 . . .... 83.

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**3725** TOPS Repeater . .... 129.
**3723** TOPS Mac 2.1 . .... 145.
**3720** TOPS Flashcard . .. 159.
**3724** NetPrint 2.0 . .... 119.
**4714** InBox Starter Kit 2.2 . . 149.
**4715** InBox Connection Mac 2.2 . . 49.

### Treasure Software

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**5388** FastNet LAN 4 . (1 Meg/chip) . . . 1724.
**5387** FastNet LAN 5 . (4 Meg) . . . . . 2175.
**5396** FastNet LAN 6 . (4 Meg/chip) . . . . . 2293.

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**1795** Marathone 020 MEE3 (math chip) . . 599.
**1796** Marathone 020 MEE4 (1 Meg/chip) . . 899.
**1797** Marathone 020 MEE5 (4 Meg) . . . . . 1269.
**1798** Marathone 020 MEE6 (4 Meg/chip) . . . . . 1449.
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**5396** FastNet LAN 6 . (4 Meg/chip) . . . . . 2293.

### Epson

**5132** 10 Meg Raw Drive . . . . . 1724.
**5131** 10 Meg Raw Drive . . . . . 2175.
**5130** 10 Meg Raw Drive . . . . . 2293.

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**3189** MacBottom HD 32. SCSI . . . . . . call
**3190** MacBottom HD 64 SCSI . . . . . . call

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**5462** Dataframe 20 . . . . . . 599.
**5447** Dataframe XP 50 . . . . . . 749.
**5448** Dataframe XP 60 . . . . . . 1059.
**5449** Dataframe XP 100 . . . . . . 1419.
**5450** Dataframe XP 150 . . . . . . 1949.
**5451** Dataframe XP 330 . . . . . . 2849.

### Targus

**1607** MacSnap S24E . . . . . . 189.
**1609** MacSnap S24E . . . . . . 239.

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**1794** Marathone 020 MEE2 (1 Meg) . . . . 719.
**1795** Marathone 020 MEE3 (math chip) . . 599.
**1796** Marathone 020 MEE4 (1 Meg/chip) . . 899.
**1797** Marathone 020 MEE5 (4 Meg) . . . . . 1269.
**1798** Marathone 020 MEE6 (4 Meg/chip) . . . . . 1449.

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**5390** FastNet LAN 2 . (1 Meg) . . . 1499.
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**5449** Dataframe XP 100 . . . . . . 1419.
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**5451** Dataframe XP 330 . . . . . . 2849.

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### Olduvai Software

**3729** LAP-LINK Mac 2.0 . . .... 83.
Please circle 135 on reader service card.

I see on the screen" is also misleading. The CODE resource contains the machine-language instructions that are executed, and these control the appearance of an application's screen.

Evan Olcott
Cincinnati

Dance 10, History 3

It sounds as if Mark Coniglio has done a masterful job of capturing dance movements as electronic signals that can be translated into music ("Audible Motion," March '89). Coniglio is not the first to do so; John Cage and the Merce Cunningham Dance Company's pioneering work in this area dates back to at least 1952.

Herbert M. Rosenthal
Albuquerque, NM

Bands Across the Water

In her May '89 column, Louise Kohl asked: "Why stop at companywide networks when we can be shooting formationwide or worldwide networks?" We read that statement with great interest, since we are distributing a product that may help realize this dream. The product, the Samba Bridge X25, permits the liaison of two AppleTalk networks over an X.25 network (such as Telnet). X.25 networks are used worldwide; we're using one of these bridges in our Montreal offices to...
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Dan Shafer, Author of HyperTalk Programming

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Guy Kawasaki, President of ACIUS, developers of 4th DIMENSION

* Stand-alone version licensed for developers only. Requires Macintosh SE or II with 7MB of RAM, 5MB hard disk space, floppy disk drive, and HyperCard 1.2. Includes 30-day technical support, ORACLE database, Hyper-SQL (HyperCard Interface), SD–Plus, SCS and Pre-C (Macintosh Programmer's Workshop) required for programming language, System Stacks and Example Stacks. ** Full networking version is $399 and includes SQL-Net (for database communications), API to ODBC, DECnet, TCP/IP support, Axon Systems, Stor/Net (permit transfer and drivers), and Winter's TCP/IP protocol and driver. Accessing database software on other machines requires a separate license for each machine. For detailed information, call for additional information. Copyright © 1989 by Oracle Corporation. ORACLE is a registered trademark of Oracle Corporation. The other companies mentioned above are trademarks, IBM.
You need a gray scale scanner for your Mac. So you go to your ImageWriter. Pop out the ribbon cartridge. Snap in ThunderScan. Insert your artwork. And quicker than you can say Van Gogh, you’re already going.

ThunderScan lets you import quality images into all painting, drawing and desktop publishing programs. Contrast and brightness are fully adjustable. And now ThunderScan 5.0 loads TIFF files and lets you display and edit grays on your Mac II.

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It is the second largest river in the world. It carries nearly twenty percent of the world's fresh water to the ocean. It is high up in the Peruvian Andes. It is the only means of transportation through the largest rain forest. It is the Amazon River. It was discovered by Hernando de Orellana in 1541.
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“Improving on a classic like MacWrite was no small task,” says Steve Singh, Engineering Manager for Claris’ Text Products. “It took a lot of gifted developers, all working together. At breakneck speed. That’s why we chose THINK C to develop the all-new MacWrite II. Its instant linking and source level debugging gave us lightning-quick turn around time. And its simplicity of design allowed everyone to use all of THINK C’s power the first day.”

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The Professional’s Choice.
Over the past few years, *MacUser* has established a clear reputation as the industry’s leading magazine. By a significant margin. And we’re not just blowing our own horn — in independent studies, readers who subscribed to several Mac publications were asked which they would read if they could have only one. *MacUser* trounced the nearest competition by more than 3 to 1 (72 percent versus 19 percent).

That’s just one of the many measurable differences that set us apart. We’ve succeeded by following a simple formula: We publish the most reliable, comprehensive, lab-based reviews of every important Macintosh product on the market to help you select the ones that best suit your needs.

Which is why we have more honest circulation than anyone else in the business. More than 300,000 readers pay to get each new issue. We don’t mail copies to people who didn’t request them. We don’t scavenge subscriptions from publications that are no longer around. Grateful Mac users tell us they’re happy to pay for the critically useful information we publish.

We’re going to pay these readers back handsomely, in a different currency. Starting with this issue, we’re taking major steps to make *MacUser* even more useful and informative.

Normally, change can be a bit daunting. But in this case we’re not straying one iota from our charter; we’re hewing closer to it. One of the first things you’ll notice is that we’re publishing many more reviews of the hottest, newest products. To handle this increase, we’ll be significantly expanding the size of our editing and testing staffs. And we’re distilling our test results into lean, crisp prose. We don’t think readers should have to wade through long-winded fluff to find the critical buying information they need.

In any monthly publication, product “news” is always several months old. If you want rewritten press releases masquerading as news, there are plenty of other places out there to get it. We think you deserve better. We’d rather rush the actual product into our lab and give you the fastest, most-accurate hands-on reviews anywhere.

While we’ll be keeping individual reviews concise and to the point (and giving you lots more of them in each issue), we’ll still provide our trademark in-depth *MacUser* Lab Reports. Nobody does it better. And, in addition to our acclaimed Lab Reports, we’ll be publishing a brand-new series of mini Lab Reports on products that represent emerging technologies. These will be based on the same rigorous testing procedures and will provide the same unassailable results that have made *MacUser* Lab Reports an industry institution.

*MacUser* Labs will be involved throughout the entire magazine. To handle this, we’re doubling the size of our product-testing lab. We don’t believe in the “pizza delivery” lab approach, where magazines send out for results. To provide you with recommendations you can really trust, we need to control every aspect of the evaluation process, spot trends, and continually monitor the testing procedures. This just isn’t possible when the testing is done by someone else outside the office.

We’re also proud to introduce a brand-new connectivity lab, the *MacUser* NetWorkShop. This separate new testing facility houses nearly two dozen Macs, as well as PS/2s, Compaq DOS clones, Sun workstations, and systems from DEC and NeXT. Proper testing of network hardware and software demands a lab of this scale. Tests done in someone’s basement on a handful of Macs don’t really tell you anything about actual performance, yet that’s often how others are forced to do it.

The NetWorkShop will evaluate connectivity products for our increasingly popular Bridges section, as well as for our ongoing series of network features. We’re also making this showplace lab and our staff of technicians available to manufacturers of connectivity products for their own testing.

You’ll see other important enhancements in *MacUser* as well, including a new section called Power Tools, which shows you how to work more efficiently and use your entire system far more productively than you ever thought possible. We’ll publish the very best techniques for squeezing every last bit of horsepower out of your hardware and software. We’ll provide clinics on handling problems adroitly. And we’ll show you tricks to make even complex tasks seem effortless.

We’re also starting a new department that focuses on unheralded gems of hardware and software from smaller companies. It’s important to review products from companies of all sizes. A lot of other magazines pretty much ignore products from small vendors. We don’t. We understand that it’s often the smaller ones that are friendly.

The changes we’ve implemented are simply to make the information more useful and accessible than ever.
HOW TO ELIMINATE HOLES IN YOUR HARD DISK

Each time you use your Mac, fragmentation pushes parts of files here, there and all over your hard disk. Like holes in Swiss cheese. Soon, there are more holes than cheese, your hard disk gets slower, and so does your Mac.

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doing the most innovative things; how else can they compete against the big guns? We also feel that such coverage will help the industry grow — every big company was once small.

Other publications cater to beginners and provide sections on starting out. All of our research has shown that MacUser readers are well beyond this stage; they're anything but beginners. What serious business users need most is the kind of no-nonsense technically and technologically astute recommendations that only a lab-based publication can provide.

To help you get the key information that you require, we'll soon be offering much of it electronically. MacUser will be providing on-line systems that will do everything from making sure that you buy the right products for your particular needs to dispensing around-the-clock technical help with hardware and software problems. And we'll be creating useful new custom software each month for you to download.

As the Mac market matures, choices proliferate. Buying decisions become far harder. Users find themselves confronted with whole new categories of products and lots of new products in each category. Mistakes can be very expensive. Now, more than ever, you need a source of information that's current, comprehensive, and reliable. One that's based on the most trusted product-testing lab in the industry.

While we've added some sections and fine-tuned others, our fundamental mission hasn't changed a bit — to help you buy products smarter and use them smarter. This is why we're continually investing so many resources in our product-testing lab and why we're starting an entire new lab to deal solely with networks. The changes we've implemented are simply to make the information more useful and accessible than ever.

We're not a coffee-table book designed to look pretty in a waiting room. We're meant to be read from cover to cover, acted upon, and filed away for future reference. Most magazines follow the industry. We want to lead it.
If you design on a Mac II, a screen that's too small will cramp your style. That's why you should be looking into a SilverView from Sigma Designs.

At 21", this landscape monitor offers the biggest viewing area anywhere. A full 16" x 12" 2-page spread including rulers and margins.

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In the beginning, there was Multiplan. And it was good. In retrospect, it was not great, but it was the first spreadsheet with a graphical interface, and it was absolutely lyrical when compared with the command-line interface of Lotus 1-2-3 on the IBM PC. You did need a separate application, Chart, to draw graphs, and there were many things 1-2-3 did that Multiplan couldn’t quite match, but there was a lot of magic in that first point-and-click spreadsheet. In its defense, Multiplan ran on a Mac 128K, so there really wasn’t room for a fistful of features. But Multiplan was only a prelude.

It was in 1985 that the real action began. Lotus, publisher of the MS-DOS spreadsheet standard, 1-2-3, finally released Jazz amid much hoopla. Jazz wasn’t just a spreadsheet; it was a word processor, a telecommunications program, and a database. Jazz had one of the best features in a Macintosh program so far: “hot views” that allowed instantaneous updates across different Jazz modules.

Jazz was also a flop. It might have been a success but for two things: Lotus didn’t understand that the consistent Mac interface obviated much of the need for integrated programs, and Microsoft cut it off at the knees.

Back in January 1984 at the Macintosh introduction, Mitch Kapor of Lotus, Bill Gates of Microsoft, and Fred Gibbons of Software Publishing stood alongside Steve Jobs to show the world that “the big boys” of software development were supporting the Macintosh. Microsoft had one product, Multiplan, ready to go, with another, Word, to follow shortly. Lotus had only promises. Just over a year later, right before the release of Jazz, Microsoft pulled off the surprise of the decade by releasing Excel, a stunning spreadsheet program with integrated charting and database functions and, most important, a macro facility. No one had expected Microsoft to release another spreadsheet product when Multiplan and Chart were hardly a year old. And as reviewers and users started looking at Excel, they discovered that it didn’t just beat Jazz and Multiplan, it also walloped Lotus 1-2-3 in features, ease of learning, and ease of use. Microsoft had seriously raised the ante in the spreadsheet game. Lotus was left with a poor cousin to its PC product, Symphony, while Microsoft had a serious competitor to 1-2-3. Excel was so good that it achieved the ultimate accolade: People bought Macintoshes just to be able to use it.

It didn’t take long for Excel to establish itself as the standard for Macintosh spreadsheets. And in 1986, Microsoft debuted its integrated product, Works, which sold well and dealt the final blow to Jazz. Microsoft even released a PC version of Excel to take on 1-2-3.

Things remained pretty much the same into 1987, when stories began circulating about Galaxy, the code name for Lotus’ follow-up to the ill-fated Jazz. Galaxy was an improvement on Jazz in every way and even offered macros — and not just in the spreadsheet module. Meanwhile, Excel was more than two years old and getting long in the tooth, without even a substantial upgrade to invigorate it. Lotus was on the comeback trail. There were some stumbles, such as when Lotus, feeling defensive about Excel for the PC, struck back by announcing its “intention to announce” 1-2-3 for the Macintosh. All in all, as development on Galaxy progressed, Lotus was looking serious about the Macintosh market again. In January 1988, Lotus unveiled Modern Jazz, the near-final form of Galaxy, and it was still an impressive product. Several months later, when Modern Jazz was nearly ready for release, Lotus mysteriously killed the project, ostensibly to focus its efforts on 1-2-3 for the Macintosh (which, as of this writing, still has not been announced).

Lotus’ sudden withdrawal from the field did not leave Microsoft free and clear. There were two more giants who wanted to play. The biggest (and first) splash was made by Informix, an IBM PC developer whose Wingz spreadsheet was announced with much fanfare at the beginning of 1988. Leonard Nimoy was the host of a special film shown in the Wingz “time shuttle” booth at the San Francisco Macworld Expo. The time shuttle was set to look ahead a few months but ended up looking forward more than a year, as Wingz suffered repeated delays. In the meantime, Ashton-Tate much more quietly debuted and shipped Full Impact, an excellent spreadsheet program from Randy Wigginton and Encore Systems.
Write from the Start!

WORKING WITH WORD, 2nd ed.
Chris Kinata and Gordon McComb
Updated for version 4, this information-packed resource is filled with inside advice, information, and tutorials on Microsoft Word. Included are tips -- many not in the documentation -- that show you how to: desktop publish • integrate graphics • customize menus • work with lists, tables, and columns • retrieve lost files • optimize memory management • and much more. Plus blueprints for newsletters, multicolumn brochures, correspondence, and reports. $21.95

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"Fifteen months ago, we started working on a new underwater adventure movie called The Abyss. We needed a hard drive that could stand up to the worst possible circumstances. So we got two Jasmine DirectDrives." And immediately, we put them in the worst possible circumstances.

"We took them down to a hot, dusty place called Gaffney, South Carolina, where the majority of the film was shot. We put them in dirty rooms. We ran them almost 24 hours a day for over a year. They were dropped, they were covered with dust, they were bounced from location to location, they were used and abused — and they still worked great. We put them through as much hell as we went through. If anybody could break a drive, we could, and we didn't. They really performed for us.

"Often, we wouldn't have time to back everything up, so we just had to rely on the Jasmine drives to run properly all the time. And, even when they were really put through the ringer and we thought we were going to lose everything, the Symantec™ Utilities for Macintosh that come with the drives really saved us.

"We basically had the entire movie on those Jasmine drives. They were used to store storyboard scans, script changes, animation tests, and various files covering every aspect of the film. This took up hundreds of megabytes of disk space, because the storyboards that we scanned into our Macintoshes® were constantly being revised and updated, and we couldn't afford to throw anything away during filming.

"The drives are still working great. We figure they'll probably have a long career in this business! And because they held up so well under pressure, so did we."

"We put the Jasmine DirectDrive through hell, but it got us through 'The Abyss.'"
WriteNow 2.0’s speed is particularly impressive. On any given system — and I’ve used it on a Mac 512KE, a Mac Plus, a Mac II, and (briefly) a Mac IIcx — it’s the fastest Macintosh word processor I’ve ever seen. For writers, especially — people who prize word processors that get out of the way when you’re trying to think and want to dump the results of that thinking onto paper as fast as possible — WriteNow 2.0 is the Mac word-processing product of choice.

In fact, it may prove to be the word-processing product of choice for the majority of Mac users. It’s not a do-everything program, but it’s a do-everything-you-need-100-percent-of-the-time program for maybe 90 percent of us. (Note how that differs from the usual situation: programs that can do 90 percent of what you need 90 percent of the time. What are you supposed to do for that other 10 percent you need, often so badly, 10 percent of the time?)

What don’t I like about WriteNow 2.0? Setting margins is infuriating, especially top and bottom margins. It’ll drive you crazy until you figure it out — and then irritate the hell out of you every time you change margins. And the spelling checker is counter-intuitive: The way you invoke and use it is goofy.

Still, I thought WriteNow came closer than any program I’d used before to achieving that title of TBPIEU. I abandoned Word 3.02 for WriteNow 2.0. My work went faster. I was a happy man.

Then came Word 4.0. I have a long-standing love/hate affair with Word. First, because as an early user of Word on the PC, I was disappointed that Microsoft’s first release of Word for the Mac was so feeble. Second, because of the endless wait for the major upgrade that was finally called, oddly, 3.0. (Where 2.0 went remains one of the mysteries of the ages.) Third, because of all the bugs in the release version of 3.0, which were well documented in these pages. And fourth, because Word has always been so full of potential — but largely unfulfilled potential. (As Charlie Brown once observed to Linus, “There is no heavier burden than a great potential.”) But Word 4.0 — friends, Microsoft has finally gotten its act together.

I admire the

lean grace and

intuitiveness of

WriteNow, but I

sometimes need

the muscle of Word.

By Jim Seymour
I first saw Word 4.0 about a year ago, in a hush-hush, work-in-progress demo. I was skeptical of the value of some of the big changes.

One change I profoundly misunderstood at first was Word 4.0’s new Table feature for multicolumn text. I saw it as an OK but unimportant way of handling spreadsheet-like data in a text document. Oh, was I wrong.

By setting up a table and formatting the cells properly, you gain from Word the most marvelous way I’ve ever seen on a computer of jumping back and forth between text entries in multiple columns. Text wraps within each “cell” of each line of the table. How many times have you tried to do that manually — using carriage returns — and screwing?

As with every other high-end word processor, Word 4.0 has pushed into turf traditionally held by desktop-publishing programs. But Word’s Table feature goes way beyond what you can do in any existing DTP package; it’s a completely new kind of text-handling feature — and it’s a doozy.

But Word’s Achilles’ heel remains speed: It’s much slower than WriteNow 2.0, and in Page View mode it’s slower than any other major word-processing program I’ve used on the Mac. But the overall richness of the program leads me to overlook that failing.

These two programs have pushed into a tie for that elusive TBPIEU title. Not just among all Mac programs or all text processors, but among all computer programs, period. While I admire the lean grace and intuitiveness of WriteNow, I sometimes need the muscle and genius of Word. I know no better example than this duo of the emerging split in the software market between fast, easy, do-almost-everything programs for the majority of users and monster-feature programs for power users.

I suspect I’m not going to be alone in keeping both of these programs on my hard disk. [For two more views on these programs, see “War of the Words,” July ’89, and “Word Wrestlers,” August ’89. —Ed.]
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PixelPaint 2.0 lets you work easily with tools you use every day—like pens, brushes, lines and shapes. And gives you versatile tools for precision work—like masks and a PANTONE Color selector. You can even make your own color separations.

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Today, SuperMac gives you even more ways to improve your work. With a new generation Spectrum/8. And a complete family of color, grayscale, and monochrome subsystems. So you can choose the right graphics card and monitor for your work—and your budget.

And take full advantage of desktop publishing and presentation programs. Databases and spreadsheets. On any Macintosh II or SE system.

The Spectrum/8 (Series II) card for the Macintosh II. Get 256 colors or shades of gray on the most popular monitors. Including ours.

The Spectrum/8 supports all of Apple's standard graphics modes—1, 2, 4, and 8 bit. With up to 256 colors or shades of gray on a 1024 x 768 pixel display, the full area of SuperMac’s 19" monitor. For sharp, brilliant images that look just the way they'll print.

And its unique Virtual Desktop™ gives you the same area on smaller monitors, like Apple's 13" color or 12" monochrome displays. Just move your mouse, and hardware pan allows you to instantly view any part of an image that can't be displayed on screen at once. And hardware zoom gives you 2x magnification with a single keystroke.

And when 256 colors aren't essential, the Virtual Desktop lets you work in 2-, 4-, and 16-color modes. So you can reduce the number of colors on screen to enlarge your display up to 4096 x 1536 pixels.

The Spectrum/8 works with SuperMac's 16" and...
19" high-performance color monitors, based on Trinitron® technology. With our standard 19" color and grayscale displays. Plus Apple's 13" color and 12" monochrome monitors.

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Now there's a Spectrum/8 (Series II) designed just for the Mac SE/30.

We're first again. Supporting Apple's first compact color machine, with the Spectrum/8 for the Macintosh SE/30. Delivering the same high-performance capabilities we pioneered for the Macintosh II. Including the ability to support multifrequency monitors, and industry-standard NTSC monitors and projection equipment.

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Please circle 100 on reader service card.
When we decided to interview Guy Kawasaki about his new book, The Macintosh Way (Scott, Foresman and Co., $19.95), I volunteered for the assignment immediately — in my usual low-key, gentle way. (Picture a grown woman jumping up and down with her hand in the air, chanting “I’ll do it! I’ll do it!”) As it turned out, I was a show-in — and I didn’t even have to hold my breath. I know Guy well, so I had a chance of getting away with sneaky questions; I’d read prepublication drafts of the book; and we both live in roughly the same neighborhood in Palo Alto (although not exactly on the same side of the tracks, metaphorically speaking). This made it convenient to meet at one of Guy’s favorite restaurants, and now from the horse’s mouth: I understand that MacUser in some way inspired you to write a book. How did we do that?

I really enjoyed writing a guest column for MacUser (“How to Succeed in Mac Software,” September ’88), so I contacted MacUser to be a regular columnist. My next goal in life is to be the Fran Lebowitz of high technology. You guys blew me off, so I decided to write a book instead.

[Actually, that’s not exactly how we would describe it, but it is, after all, Guy’s interview.]

Why did you write this particular book?

I didn’t like how history was being recorded — particularly the interpretation of Steve Jobs’ role. Most of the current books about Apple and the Macintosh completely miss the point of what Steve and the Macintosh Division were trying to do.

Nice Guys Finish Books

Joanie’s (across the street from the legendary all-Mac ComputerWare store) for a Saturday breakfast-cum-chat for publication. (If you are unfamiliar with the ComputerWare legend — or Joanie’s — I can only refer you to Mr. Kawasaki’s book.)

EXERCISE #1:

Ask anyone from the Macintosh Division if they would do it all over again.

The Macintosh Way combines an insider’s account of the development of the Mac with a humorous and full discussion of a way of doing business that should probably be adopted across the board by the American business community. Don’t skip the footnotes or the exercises, either. The footnotes alone are worth the price of the book. Among my favorites are the ones for Compuserve,1 Cray,2 bug,3 and dating.4

Also, the revisionist historians were getting quite a few things wrong. For example, most of Apple fought against the LaserWriter. Apple Marketing just wanted a letter-quality printer driver, not a laser printer. Most of Apple fought against what saved it.

So what were Steve and the Macintosh Division actually trying to do?

We were trying to bring computers to more people to increase their creativity and productivity. It was a divine and grand mission. Seriously. There were a few screwups and tragedies along the way, but it was worth it nonetheless.

What would Apple be like today if it had continued to espouse the Macintosh Way?

Apple bashing, like oat bran, is “in” these days. One could say that Apple’s marketing consists of using “desktop” as an adjective, its product development of cutting out slots, and its support of selling people to go back to the dealer.

I believe Apple has continued to espouse the Macintosh Way — it’s just a lot more difficult when you’re a $5 billion company with 10,000 employees. Apple can do the difficult quickly. The impossible takes a little longer. This answer has some oat bran in it, doesn’t it?

How would you characterize Apple’s present corporate style in a few well-chosen, witty words?

As Jean-Louis Gassée would say, “It could be even more stable at this time.”

Without the radical changes that took place in Apple’s corporate structure in 1985, what — if anything — would be different about the Macintosh itself?

It would probably be a black cube and not shipping. But as some

By Louise Kohl
yuppie once said, “Individuals dwelling in glass domiciles should refrain from activating geological objects.”

What would have happened if you had been given John Sculley’s job?

Apple would have published 4th Dimension and Jean-Louis would be wearing a hoop earring rather than a stud. I don’t want John’s job. I want to be the Fran Lebowitz of high technology. However, if I were president of Apple for one day, I would extend the warranty period to one year and ban the printing of T-shirts, and put that money into telephone end-user support. As I say in the book, “I can’t explain why a company that spends $2 million on a Christmas party and $2½ million on T-shirts doesn’t provide direct customer telephone support. Or hires only one summer student to fix ImageWriter drivers. Some things you simply accept, I guess.”

In the book, you characterize Macintosh Way companies as wanting to change the world and selling a dream. How do you want to change the world?

I want to change the world just a little by helping people celebrate absurdities.

EXERCISE #2:

Call Apple at (408) 996-1010 and ask for technical support.

The dream I’m selling with 4th Dimension is the ability to control one’s data and computer. If enough people buy that dream, I’ll be able to buy my dream.

Speaking of dreams, when is the next version of 4D going to ship?

Oh, about the same time that your editors and columnists start returning my phone calls.

What companies are furthest down the Macintosh Way?

There’s about a 2,000-way tie for last place in the software business. In business as a whole, Honda is the furthest along. They make their cars so good they don’t require support — that’s the best support of all. If I weren’t so insecure, I would drive one. [Guy drives a Porsche with the license plate “MERC4D.” Ah, well. . . if wishes were Porsches . . .]

Is NeXT a Macintosh Way company? Will the NeXT machine change the world? Is it a dream for sale (or at least lease)?

NeXT is the computer company that Steve started after he was purged from Apple. Almost everyone (some secretly) hopes he succeeds. A few Apple employees have gone to NeXT to relive their youth. Some have returned to Apple because youth is overrated.

A NeXT computer is the most indulgent computer you can buy today, especially if you have a burning desire to model bouncing balls.
Why waste time doing your finances? Quicken slashes time and effort every month...perfectly organizes your finances...and provides instant insight into your money matters.

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Quicken takes the drudgery out of routine finances. It automates everything from bill paying to bookkeeping...reconciliation to reporting. Quicken does it in minutes what used to take hours. Quicken actually learns your regular bills. Just confirm payment amounts, and in seconds, Quicken performs 14 bookkeeping steps, categorizes expenses, and hands you printed checks addressed for mailing. And, Quicken keeps perfect records of all your handwritten checks.

A Bigger Picture with Smaller Effort
Quicken automatically organizes your finances. Imagine always knowing how much money you have...and exactly where it's going. At the click of a button, Quicken generates insightful reports such as Income and Expense, Cash Flow, Budget vs. Actual, Job Costing, and more.

Relax at Tax Time
Stop dreading tax time. Quicken keeps important tax data at your fingertips automatically. In seconds, you can print an itemized list supporting your deductions. Plus, Quicken links directly to top selling tax software like MacInTax.

NEW VERSION 1.5
FAR MORE THAN A CHECKWRITER
- Far more flexible reports:
  - Multi-column reports show spending and profit trends over time
  - A/R aging and customer history reports
  - A/P reports by supplier
  - "Modeless" reports recalculate automatically on screen
  - Improved payroll handling
  - More ways to split transactions
  - New wallet-size and laser voucher checks
  - New Canadian dates and tax categories

The World's #1 Best Seller
Quicken is the best selling business and personal finance software in the world. Ken Landis of MacUser gives Quicken the highest rating of five mice and says, "Quicken is a great program...the industry standard." Broadway playwright ("Mame") Robert E. Lee remarks, "This astonishingly simple program...is truly true to its name. Indeed, it does quicken the time required for routine bookkeeping"

No Computerese or Accounting Mumbo Jumbo
Quicken is so easy, you're up and running in minutes. That's because the whole program looks and works just like the paper checkbook and register you've always used. Quicken doesn't change how you do your finances, only how fast you finish them.

Powerful Business Features
Over half of Quicken's customers use it for small business bookkeeping. Quicken produces financial statements such as P&L, Tax Summary, and other useful management reports. It forecasts your cash flow, and tracks A/R, A/P, payroll, jobs, clients, properties, and more.

SPECIFICATIONS
Software Compatibility: Exports to SYLK, Text, Excel* HyperCard and MacInTax
Hardware Compatibility: All Macintoshes with at least 512K RAM. Works with your printer and monitor; we guarantee it.
Capacity: Unlimited number of basic accounts and transactions. Subject to available disk space. Maximum amounts to $9,999,999.99.
Other: Unlimited FREE technical support. Not copyrighted. Checks are preapproved by all financial institutions in the U.S. and Canada. Sample checks and order forms are enclosed in Quicken package. Also available for IBM and compatibles and Apple II (faster version available).

Quicken is available at most computer and software stores.

Say Goodbye to Financial Hassle!

So Long, Tedium
Why waste time doing your finances? Quicken slashes time and effort every month...perfectly organizes your finances...and provides instant insight into your money matters.

Breeze Through Financial Chores
Quicken takes the drudgery out of routine finances. It automates everything from bill paying to bookkeeping...reconciliation to reporting. Quicken does it in minutes what used to take hours. Quicken actually learns your regular bills. Just confirm payment amounts, and in seconds, Quicken performs 14 bookkeeping steps, categorizes expenses, and hands you printed checks addressed for mailing. And, Quicken keeps perfect records of all your handwritten checks.

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Quicken is available at most computer and software stores.

Try Quicken FREE for 30 Days
Order from the coupon below, and if you're not completely satisfied for any reason, simply return it for a full, no-questions-asked refund.

Send in the coupon, or call 1-800-624-8742 U.S. and Canada.

$59.95

Yes, I want to say goodbye to financial hassle and try Quicken. If I'm not completely satisfied, I may return it within 30 days for a full refund. Quicken Version 1.5 for Macintosh, U.S. $59.95, includes free shipping by air. California residents, please add sales tax. For coupon orders, allow 10 days for delivery (longer to Canada).

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540 University Ave.
Palo Alto, CA 94301
Or, call: 1-800-624-8742 in U.S. and Canada for charge card orders.
Current Quicken users: To upgrade, call the 800 number above.

G-MU09
I don’t think Steve wants NeXT to be a Macintosh Way company. He wants to create the NeXT way — he’s not into merely re-creating or repeating history. I have a rough idea of what the NeXT Way will be: Design a machine to kill Apple, position it for universities, give Businessland a one-year exclusive since you can’t build enough anyway, then tell the world that “business [buyers] demanded that they buy our machine.” There’s a lot of oat bran in this one, too.

You slam Apple yourself in the book. Is this by any chance sour grapes?

Sour grapes for what? Apple was very, very good to me. I love Apple — that’s why I slam it. A lot of Apple employees wish they could say what I said in the book. It’s a testimony to Apple’s humility and Jean-Louis’ level of testosterone that he wrote the foreword.

One of the things you hit hardest is Apple’s early association with Microsoft and Ashton-Tate. How would you have handled that situation?

Microsoft, or more accurately, Bill Gates, respects only power. When Gates builds a missile, you build a missile. Ashton-Tate, meanwhile, is investigating cold fusion. The only way to deal with both of them is to say, “Lead, follow, or get out of the way.”

I take it that Jean-Louis Gassée read the chapter about himself, “BFD: Big French Deal.” What was his reaction?

He edited the chapter to make it even better. It’s his way of saying, “Here’s the recipe. Here are the ingredients. Now, bozo, try to be a master chef.” It’s my favorite chapter.

Did you consider any other titles for the book?

The Reward is the Reward. Guyanet­tics. In Search of Mediocrity. Up the Status Quo. There were some pretty cerebral choices.

Did you learn anything by writing the book?

Yes, I had this concept that authors had all this wisdom stored in their brains, and all they had to do was vomit it onto the pages. It’s not true. Writing forces you to think, rethink, and question all the things that you thought you knew.

I also learned a lot about product development. I thought I could finish the book in two to three months in 100 pages. It took me roughly twice as long and twice as many pages. I thought I was feature-frozen many times, but I couldn’t resist adding more things. I can relate a lot better to programmers now.

Why do you have a chapter about dating and marriage?

Why not? It’s my book. It’s a wink between myself and readers. I think that more people care about dating and marriage than about “SQL interoperability platform independence” if you know what I mean.

[You may take it that I know what he means. I also recommend this particular chapter to every man in Silicon Valley who hasn’t yet answered the question, “What do women want, anyway?”]

EXERCISE #3: Send me [Guy] an EasyPlex on CompuServe. Ask me if Beth wants me off the computer.

Where did you learn to write so well and so family?

First, I had a weak English teacher in high school. He made us correct every error in our papers by citing the rule we violated, writing the sentence the wrong way, and then writing it the right way. Second, I am a voracious reader, so I get a lot of inspiration. Third, I had a good editor — Steve Roth. Fourth, I read your column. The oat bran is getting overwhelming now.

So why isn’t my name in the book anywhere?

Neither is Jerry Borrell’s. I kept both of you out so you could both write about the book in your columns. It seems to have worked well.

[Interview concludes as we negotiate for the second edition.]
Now you can treat any Group III fax machine in the world as a remote printer for your Mac. With the Abaton InterFax, you can print letters, reports, and memos in Los Angeles, New York, London, and Tokyo, even if your office is in Peoria.

And all your documents will look as good off the fax as they would off an ImageWriter. No blotchy letters, streaky lines, or dirty smudges like normal faxes. With the Abaton InterFax, even your fine print is perfectly legible.

And the InterFax gets your fax out fast. MacWEEK rated it the fastest fax for the Mac. That’s because the friendly InterFax software compresses your file first, then sends it out. So it takes less time to transmit.

You can also use the InterFax as a Hayes-compatible data modem to communicate with other asynchronous devices. Which makes it a great deal as well as a great tool. But that’s not the only way it saves you money. With the InterFax, you can schedule when faxes are sent—like right before a telephone conference, or after hours when the rates are lower. And because the InterFax receives as well as it sends, you can screen faxes before you commit them to paper.

Since the InterFax works in background—with or without Multifinder—you can continue working in PageMaker, Excel, Word, or most other Macintosh applications while you’re sending or receiving faxes. Which makes you even more productive.

If you want to know why The Macintosh Buyer’s Guide rated the InterFax 9.3 (out of a possible 10), call Abaton at 1-800-444-5321. We’ll fax or mail you more facts about the InterFax. Then you can start faxing (and printing) all over the world.
Welcome to StartUp, our first words on the latest news and products. We'll also be keeping our eyes on trends, what's happening in the world of graphical user interfaces, what's in beta, and a lot more.

In our premier edition, you'll find reviews of Omnis 5, Excel 2.2, Business Sense, SmartForm, and more. Plus, we'll take a first peek at PixelPaint Professional, TurboStar, and CanOpener.

Contents

Microsoft Excel 2.2 ................. 60
Omnis 5 ......................... 61
Table Tools ..................... 62
Business Sense ................. 67
SmartForm Designer .......... 68
XTreeMac ...................... 78
MultiClip ..................... 82
Voyager ....................... 89
Edited by Russell Ito

PixelPaint Turns Pro

SuperMac has pumped up PixelPaint into PixelPaint Professional. Its 32-bit color choices are essentially limitless, and effects that would be impossible with 8-bit color are simply a stroke or two away. The familiar PixelPaint interface remains uncluttered.

With the subtleties of 32-bit color, PixelPaint Pro offers natural blending effects, anti-aliased (jaggy-free) lines and text, a realistic airbrush, transparency, and tools that blend and smear. One powerful touch is the ability to have the blend tool follow the path of a line, curve, or polygon automatically. PixelPaint Pro can mask (protect from change) selected areas, newly typed text, or a range of colors. It can merge another document into an open paint file as ordinary drop-in art or as a variable transparency.

PixelPaint Pro works in 8-, 16-, 24-, and 32-bit color modes and runs on all Mac IIs and SE 30s. In 16-, 24-, and 32-bit modes, PixelPaint Pro requires 4 megabytes of RAM. MacPaint, PICT, PICT2, EPSF, and TIFF formats are supported. PixelPaint Pro outputs to QuickDraw and PostScript printers, and it offers built-in color separation and halftone controls.

If you can't afford — or don't need — 32-bit color, the 8-bit version of PixelPaint will still be available. — Salvatore Parascandolo

SuperMac Technology, 485 Potrero Ave. Sunnyvale, CA 94086; (415) 349-8400

Database Cause and Effect

As more PCs and Macs begin living together, database-management applications that work on both platforms are becoming more desirable. The duo of Cause and Effect, from Maxem, uses a simple graphical interface on both machines, and it may be a solution for users who need custom databases but don't want to hire professional programmers.

Cause and Effect are a little like HyperCard: Small windows with a little house icon that brings you back to the first card pop up on the screen. Unlike HyperCard, Cause produces relational database systems. Another difference is that two programs are required: Cause generates, compiles, and modifies applications, and Effect runs the applications. A feature that promises to be popular with developers is that Cause automatically generates user documentation for applications.

Cause doesn't use a traditional programming language; a series of decisions is made with menu choices and fill-in windows. Maxem has promised a subroutine language and commands to call other languages, similar to HyperCard's XCMDs, by the end of 1989.

When an application is created, two files are generated, the source and the run-time. Double-clicking on the run-time file brings up the application (using Effect), and clicking on the source file brings up the modifying environment (using Cause), which is required to modify anything. To move applications between DOS and Mac environments, move the source file from one machine to the other and recompile it, using the native version of Cause. You may have to adjust some screens. — John Rizzo

Maxem Corp., ASU Research Park, 7866 S. River Parkway, Suite 217, Tempe, AZ 85284
(602) 481-2486. Professional version with unlimited run-time license rights, $995; personal version, $485
An All-Purpose CanOpener

The only problem with the ever-growing number of Mac applications is that there's also an ever-growing number of proprietary formats. Invariably, you never have the application you need to open the document you want to view right now. That's where CanOpener comes in. This handy utility, which comes as both a DA and an application, lets you open and view almost any file.

CanOpener can open any type of text, EPSF, PICT, or paint file — even if it's contained within another file type — without requiring prior conversion. Other utilities have similar abilities, but they require the document to be saved in their own format first.

CanOpener performs free-text searches as well. While other utilities can also do this, CanOpener goes one step further. Since it can open practically any file type, it can find text strings even if they're in a graphic (provided they were created with a text tool). Unlike its competition, CanOpener lets you open and view entire documents without switching applications.

Currently, CanOpener's only limitation is that it can't properly display files created by programs that use floating-point calculations, such as spreadsheets. However, the publisher promises this feature will appear in the next version.

If you've been looking for the software equivalent of a skeleton key, CanOpener may be it. — Russell Ito

* Abbott Systems, 62 Mountain Road
  Pleasantville, NY 10570; (800) 352-9157. $125

CanOpener, available as both a DA and an application, can open almost any file format without conversion, and it also conducts free-text searches. It was able to find this occurrence of the word canopener even though it was part of a graphic.

NewsLine

A MOLE IN THE APPLE?

CUPERTINO, CA — Apple's Macintosh source code has been one of the industry's most closely guarded secrets, but now someone is giving away pirated copies. A group calling itself nuPrometheus League has distributed disks containing 1.4 megabytes of source code. This source code includes (in the group's words) "the complete assembly language source to both Color QuickDraw and all the hardware.

The group says its goal is "to distribute everything that prevents other manufacturer's from creating legal copies of the Macintosh. As an organization, the nuPrometheus League has no ambition beyond seeing the genius of a few Apple employees benefit the entire world, not just dissipated by Apple Corporate through litigation and ill will."

Apple has mounted an internal investigation and has assumed that the pirated code is genuine. Apple says that it considers the code to be stolen property and that it will prosecute anyone caught using or receiving the pirated material.

WHOSE NEXT?

FREMONT, CA — Steve Jobs has signed a $100-million investment deal between his company, NeXT, and Canon. Canon now owns 16.67 percent of NeXT, as well as the exclusive Asian distribution rights to the NeXT machine. Canon's future holdings cannot exceed 20 percent of NeXT for at least ten years, and no technology-licensing or manufacturing rights were granted.

Canon thus becomes the third-largest NeXT shareholder, after Jobs (50 percent) and NeXT employees (20 percent), and ahead of H. Ross Perot (12.5 percent) and Stanford and Carnegie-Mellon universities (83 percent).

MICROSOFT OFFICE COMPACT DISC

REDMOND, WA — Microsoft, the first major software publisher to commit to using CD-ROM as a software-delivery medium, announced that its Microsoft Office bundle (which includes Word 4.0, Excel 2.2, PowerPoint 2.01, and Mail 1.37, see the review of Excel 2.2 in this issue for more detail) will be available on CD-ROM. The CD-ROM version will list for $899 — only $50 more than the disk-based version — and will include all the documentation in HyperCard format on the disc. The multimedia documentation will include sequences created with Farallon Computing's ScreenRecorder and MacRecorder.
Brown University's Institute for Research in Information and Scholarship (IRIS), in conjunction with the Apple Programmer's and Developer's Association (APDA), has taken hypermedia out of the academic hot-house and dropped it into developers' laps with the release of IRIS Intermedia, a multiuser development system. Using applications developed with IRIS Hypermedia, a network of Mac users can explore a shared database, creating and tracing individual paths and links.

Designed for network use under A/UX, IRIS Intermedia consists of two parts: the IRIS Intermedia Server, which contains the file system, database, and document links; and the Intermedia Client, which runs on the local stations. Intermedia Client comprises four applications: InterWord, a word processor; InterDraw, a graphics editor; InterPix, a scanned-image viewer; and InterVal, a time-line editor.

Designed for nonprogrammers, IRIS Intermedia uses the four applications plus menu commands to build webss of information. Each user creates webs by using the menu commands to link anything from single characters to entire documents. Multiple links between documents are supported, and all links are bidirectional. — Russell Ito

With IRIS Intermedia, a network of users can create webs of information by linking anything from single characters to entire documents.

A Network Star

For the first time in the AppleTalk world, network administrators will be able to access a star controller from any Mac on the network, even across bridges. Nuvotech's TurboStar is an intelligent star-controller and network-management package that gives network administrators more control over their problems.

TurboStar acts as the hub of the network, boosting incoming signals from up to 16 lines of networked Macs that form the star's "arms." Star configurations are popular with networks that use existing telephone wire, because no additional wiring is needed, and the controllers can be kept in telephone-wiring closets next to the patch panels. They also let you have longer networks than are possible with simple daisy chains.

An important feature of TurboStar is the ability to run live, on-line diagnostics for each arm of the star separately. For each port of the TurboStar, the software gives you a live graph of traffic in packets per second, error rates, and a list of nodes and node types. This data has been available before, but only for the network as a whole. — John Rizzo

TurboStar, Nuvotech, 2015 Bridgeway, Suite 204, Sausalito, CA 94965; (415) 331-7815. $1,795

Nano, Nano?

The two most-common time values associated with computers are nanoseconds (ns) and milliseconds (ms), but many users may not know the difference. A nanosecond is a billionth of a second. A beam of light travels one foot in a nanosecond. A millisecond is a thousandth of a second, or one million nanoseconds. A beam of light travels 19 miles — or the length of Manhattan plus 6 miles — in one millisecond, but it can't even get down the block in one nanosecond.

MUG Shots

MUG OF THE MONTH: The NASA Headquarters MUG has produced an 18-minute VHS-video tutorial on how to detect and get rid of Macintosh viruses. The video is available for $15 (or for $20 as a set of eight disks) — if you have a Mac II with 4 megabytes and VideoWorks Interactive.

SPEAKING OF VIRUSES, be sure to obtain a free copy of Virus Encyclopedia, a stack by Henry C. Schmitt. This stack, combined with the NASA tutorial, thoroughly covers the virus issue. The Virus Encyclopedia is available on most BBSs.

Henry C. Schmitt, 6613 Scott Lane, #17, Hanover Park, IL 60133.

Don Ritter is editor of the MUG News Service. Send him MUG news at GEnie: D.RITTER; APPLELINK: UGO194; or APPLELINK PE: D.RITTER.
Topping TOPS

There's a new distributed-file-transfer program that's the first direct challenger to TOPS, and it has a lot going for it. Like TOPS, Personal Server Network (PSN), from Information Presentation Technologies (IPT), passes files among computers without a dedicated file server.

Unlike TOPS, PSN is compliant with the Apple Filing Protocol (AFP), and the user interface looks exactly like AppleShare. From the Chooser, users can pick PSN published volumes as well as disks on AppleShare and other AFP servers. PSN uses AppleShare's scheme for passwords and file-access privileges. Published volumes appear on the desktop in the same way that local disks do.

PSN works with Macs, PCs, and UNIX machines that use IPT's uShare AFP server software. This capability allows a Mac network to start small and grow later, when it's connected to a bigger system. For example, a PSN network connected to a UNIX computer can take advantage of the large storage capabilities of UNIX machines. So users who want their local disks backed up can publish their disks at the end of the day, and a UNIX machine can automatically back them up at a convenient time, such as 2 a.m. — John Rizzo

Information Presentation Technologies
23601 Calabasas Road, Suite 208, Calabasas, CA 91302; (818) 347-7791. $149 per node

Up to Date

Changes New and Noted

PLUS — the German über-HyperCard that includes 8-bit color, cards up to 3,200 pixels square, six window types, full text styling, color animation, and more — is now available in the United States from Olduvai. PLUS is HyperCard-compatible and can open HyperCard stacks without conversion.

Olduvai, 7520 Red Road, Suite A, South Miami, FL 33143; (305) 665-4665. $199

THUNDER II is Electronic Arts' second-generation version of its venerable spelling checker. Since Thunder II is a cdev, it installs at boot-up and can load automatically with specific programs. It now packs five types of error recognition (spelling, two kinds of capitalization, double words, and some punctuation), as well as two dictionaries.

Electronic Arts, 820 Gateway Drive
San Mateo, CA 94404-2497; (415) 571-7171
$79.95; upgrade, $30 plus $3 handling and original Thunder disk

TIMBUKTU, Farallon Computing's screen-sharing package, now boasts file-transfer capabilities. Users can send files, which are sent in the foreground and received in the background, or exchange files. Security has been increased to seven levels (control, observe, send, exchange, read, write, and remove files).

Farallon Computing, 2201 Dwight Way
Berkeley, CA 94704; (415) 841-5770
$149; upgrade: if purchased prior to January 15, 1989, $40 plus $10 handling (single copy) or $40 for first copy, $5 for each additional serial number, and $10 per order for site licenses; if purchased after January 15, 1989, $10 handling only

QUICKKEYS, CE Software's popular macro maker, has some new features. Quick Timer lets you set a QuicKeys sequence for automatic execution on a daily or periodic basis. QuicKeys now comes with an installer, QKinstall, which installs the new version while preserving your existing QuicKeys.

CE Software, 1854 Fuller Road, P.O. Box 65580, West Des Moines, IA 50265; (515) 224-1995; (800) 523-7638 (orders only). $99.95, upgrade: $15

Apple Tops IBM

According to Dataquest, the market-research firm, Apple's total CPU sales (Macs and Apple IIIs combined) topped IBM's PS/2 sales in 1988 by 1.27 million units to 1.23 million.

NEWS

PERSONAL SERVER NETWORK

Information Presentation Technologies' Personal Server Network (PSN) offers UNIX connectivity and is the first direct challenger to TOPS.
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<td>Disk Holder (holds 40)</td>
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### MacPrint (Insight Development)

Introducing MacPrint - the easy-to-use software that lets you print virtually any application on virtually any printer including HP LaserJet II and IID. MacPrint displays your printer's font and true WYSIWYG performance. Prints text and graphics at printer's maximum resolution. After the simple installation, it's completely transparent in operation. It's the cost effective print option for your Mac. (utilities) $79.

### ACCOUNTING AND PERSONAL FINANCES

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<td>Brown-Wagh Publishing MacEdgers</td>
<td>159.</td>
</tr>
<tr>
<td>Service Industry Accounting</td>
<td>209.</td>
</tr>
<tr>
<td>DAC Dato-Easy Light</td>
<td>42.</td>
</tr>
</tbody>
</table>

### BLANK MEDIA

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<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intuit Quicken 1.5</td>
<td>32.</td>
</tr>
<tr>
<td>Managing Your Money</td>
<td>125.</td>
</tr>
<tr>
<td>Monogram Business Sense</td>
<td>279.</td>
</tr>
<tr>
<td>Dollars and Sense</td>
<td>81.</td>
</tr>
<tr>
<td>Peachtree Back to the Basics Professional</td>
<td>159.</td>
</tr>
<tr>
<td>Shopkeeper Software Bill II</td>
<td>59.</td>
</tr>
<tr>
<td>Softsync, Inc. Accountant, Inc. Professional</td>
<td>315.</td>
</tr>
<tr>
<td>Survivor MacMoney 3.02</td>
<td>61.</td>
</tr>
</tbody>
</table>

### THE HYPERWORKS ORGANIZER

The HyperWorks Organizer is a system of interconnected Hypercard stacks that help you manage and control your time, tasks, deadlines and expenses. Organize all your personal and business information, clients or customers data; daily, monthly and yearly calendars; projects and plans; expense accounts; Hypercard icons let you perform a variety of tasks. Hypercard environment combined with Quick-Start mini-manual, gets both novice and power user set up and running FASTI! (hyperware) $60.

---

### MARATHON 300 (Dove)

Put a fast running 68030 chip into your Mac II with the Marathon accelerator board. Features a 256Kbyte internal data instruction cache and full 32-bit microprocessor operating at 32 MHZ. Quick and easy to install. (memory) $999.

### FASTNET III

FastNet III launches you onto the Ethernet network and gives you access to today's most popular networking software products. You control the network file transfers, file access, program launching and task-to-task transactions by simple manipulation of desktop icons. It's the price performance choice for Ethernet connectivity. (memory) $375.

### MARATHON 500 (Dove)

Put a fast running 68030 chip into your Mac II with the Marathon accelerator board. Features a 256Kbyte internal data instruction cache and full 32-bit microprocessor operating at 32 MHZ. Quick and easy to install. (memory) $999.

---

### MACPRINT (INSIGHT DEVELOPMENT)

MacPrint - the easy-to-use software that lets you print virtually any application on virtually any printer including HP LaserJet II and IID. MacPrint displays your printer's font and true WYSIWYG performance. Prints text and graphics at printer's maximum resolution. After the simple installation, it's completely transparent in operation. It's the cost effective print option for your Mac. (utilities) $79.

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### THE HYPERWORKS ORGANIZER

The HyperWorks Organizer is a system of interconnected Hypercard stacks that help you manage and control your time, tasks, deadlines and expenses. Organize all your personal and business information, clients or customers data; daily, monthly and yearly calendars; projects and plans; expense accounts; Hypercard icons let you perform a variety of tasks. Hypercard environment combined with Quick-start mini-manual, gets both novice and power user set up and running FASTI! (hyperware) $60.
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PC Tools Deluxe (Central Point Software)
Best-selling MS-DOS utilities for the Mac. PC Tools Deluxe provides utilities for data recovery, file protection and disk management. Back up your hard disk drive or set-up floppy's. ADA finds files on a hard disk fast! $46.

Copy II Mac 7.2
One of the most useful and basic collections of utilities for the Mac. Includes Copy II, Hard Disk and MacTools (a collection of disk repair utilities). So you can undelete "erased" files, format and verify disks, repair damaged disks, and protect or unprotect disks, as well as backup, utilities $24.

StickyBusiness (William & Macias, Inc.)
StickyBusiness prints high-quality labels, cards, tags, and envelopes on Imagewriter and Laserjet printers, imports EPS, PICT, PICT2, and bit-mapped graphics, merges text, strike and basic files from any standard Macintosh database or word processing software, includes preformatted templates for more than 200 labeling projects, has a template maker so that you can design your own label templates, and much more. StickyBusiness solves your labeling problems. Utilities $99.

TimeMinder (Astris Software)
Save time and money. Keep track of the time you spend on each project. TimeMinder lets you enter data manually and accommodates the cost of materials and services. At the end of the month or billing period, it prints out reports and invoices in a variety of formats. If you work on retainer or on variable rates, TimeMinder takes care of all the details and lets you concentrate on the job! (business) $159.

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Gofer (Microlytics)

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Remove viruses and keep them out automatically! Repair virus damaged applications! A dual program of elimination and protection. A powerful decontamination application rids your computer of these pests while an INIT vaccine prevents initial contamination. (security) $69.

DISK DRIVES/BOARDS

Aristotle Industries, Inc.
Hard Pac Mac 20 Meg ........ 549.
Hard Pac Mac 40 Meg .......... 769.
Hard Pac Mac 80 Meg .......... 1195.
Hard Pac Mac 105 Meg ....... 1395.
CMS
MacStack 20 Meg ........... 529.
MacStack 30 Meg ........... 545.
MacStack 45 Meg ........... 629.
MacStack 60 Meg ........... 699.
MacStack 80 Meg ........... 799.
Cutting Edge
800K External Floppy Drive 149.
Under the Mac 20 Meg ....... 439.
Under the Mac 30 Meg ....... 499.
Under the Mac 40 Meg ....... 559.
Under the Mac 65 Meg ....... 649.
Under the Mac 80 Meg ....... 749.
Dayna Communications
Dayna File Single Side 360K (5 1/4") 529.
Dayna File Dual Side 360K & 1.44M 669.
Dolphin Systems Tech
Integra 20 Meg ........... 549.
Integra 30 Meg ........... 599.
Integra 40 Meg ........... 769.
Integra 60 Meg ........... 819.
Integra 80 Meg ........... 909.
Flipper 150 Meg Tape Backup 1439.
Flipper Removable 44 Meg .... 1195.
Kennect Technology
Drive 2.4 ........ 375.
Rapport ........ 229.
MiniScribe
20Mb Raw Int. Drive ........ 375.
45Mb Raw Int. Drive ........ 549.
Mobius
MultiScreen Video Card .... 315.
PCPG
MacBottom Hard Drives .... Call.
Peripheral Land, Inc.
Infini Turbo 40 Meg ........ 1235.
Turbo Fippy 3.5 ........ 629.
Quantum
Quantum 40 MB Raw Drive ...... 545.
Quantum 80 MB Raw Drive ....... 897.
EDUCATIONAL PERSONAL

BrightStar
Alphabet Blocks 3.01 .... 32.
Talking Tiles ........ 69.
Bootware Software
Resume Writer Pro .......... 60.
EDUCATIONAL PERSONAL

BrightStar
Alphabet Blocks 3.01 .... 32.
Talking Tiles ........ 69.
Bootware Software
Resume Writer Pro .......... 60.
Extended Keyboard Carrying Case
(Targus)
Pauper your Mac with a Targus carrying case Made of Silicorne treated nylon to give you waterproof durability and an impact absorbing high-density foam layer with a soft protective lining for complete protection. Cusioned molded pad and handl provide extra comfort and convenience. Plus there’s room for everything from your Mac, a hard disk drive, and the extended keyboard to pockets for your mouse, floppies, cables, and pens. Full Targus Macintosh line avaiable. (accessories) $75.
DaEasy Light (Da Software)
Ideal for the home and for sole proprietors, here's the perfect solution to your finances. DaEasy Light tracks a 12-month budget, writes checks, prepares invoices and reports financial statements. Two pre-defined chart of accounts, one for home and one for office, give you simple, easy accounting without having to know a debt from a credit. Password protection, pop-up calculator, and more are added features that make DaEasy Light fun to use. Again, whether at home or at work! (Mac) $45.

FastLabel 1.2.1
FastLabel labels with Fastlabel, the revolutionary way to print labels on the Apple IIe and Laserwriter. Performfine prints labels. One step text loading from any commercial database. Save hours of your valuable time! (business) $49.

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Dow Jones News/Retrieval membership package comes with E-Z Online communications software, provides the new user with 5 hours of free online time. Connects to more than 50 databases, up-to-the-minute news and financial data, plus extensive reference library. (communications) $24.

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Instant, convenient and reliable weather information direct from the nation's #1 weather service. Quickly download national weather data by modem, then display it in easy to read maps, graphs, charts and forecasts. Hourly updates are automatically for every region of the country. Ideal for aviation, boating, construction and travel. (business) $59.
FileGuard (A.S.D)
Operating totally transparently, FileGuard is the integrated encryption utility that provides the most comprehensive and transparent solution to today's security and confidentiality problems. Upon seeing a new document, FileGuard gives you the option to password protect it. Encryption is performed automatically when you quit your application. Opening protected documents is just as easy and automatic. When you double-click on an encrypted document, FileGuard asks for your password, then immediately decrypts and launches the appropriate application. The document is automatically re-encrypted when you quit. (security) $129.

Spectrum HoloByte
Falcon 2.0 ........................... 32.
PT 109 or Gato .......................... 32.
Solitaire Royale or Tetris .......................... 32.
Springboard .......................... 32.
The Software Toolworks
ChessMaster 2100 .......................... 32.
Life & Death .......................... 32.
The Hunt for Red October .......................... 32.

Adobe
Fonts (All Avails.) .......................... Call.
Forms and Schedules .......................... 249.
Newsletter .......................... 249.
Presentations .......................... 249.
Textures, Fills, and Patterns .......................... 139.
Alleys
Fontastic Plus 2.02 .......................... 52.
The Art Importer .......................... 69.
Beyond, Inc.
MenuFonts 2.02 .......................... 29.
General Computer Company
Fonts Plus Package .......................... 250.
Letterset .......................... 250.
LetterFonts (Various) .......................... 69.
Tactel Software
ArtFonts Vol.1 or 2 .......................... 55.
Orange Micro
Alphabets .......................... 69.

GRAPHCAS AND DESIGN
3G Graphics
Images w/concept .......................... 53.
Graphics & Symbols 1 .......................... 52.

MacEnvelope 4.1 (Synex)
MacEnvelope gives your mail that "special touch". You can create layouts, adjust fonts and styles, import graphics, and even print in color (on the ImageWriter II). It even prints Postal Bar Codes giving you the most reliable postal deliveries possible (saves money on bulk mailings). Stores up to 1000 names and addresses and sorts alphabetically or by zip code. (business) $59.

RafQuest
Offers hours of entertainment for those who enjoy adventure games with adult situations and sensibilities, features interactive, digitized graphics and sound. (entertainment) $19.

Smart Alarms and Appointment Diaries (JAM)
The ultimate reminder system. Smart Alarms desk accessory creates reminders which interrupt you at an appointed time. Features snooze up to 1 hour, printing, choice of beeps, and text editing reminders. Appointment Diary desk accessory calendar for appointments features: AutoLayout, Day Layout, set reminders directly into Smart Alarms. Week at a view, Month at a glance, printing. Multi User versions require AppleShare or TOPS. (accessories) single version $99. 5 - 8 users $199.

Business 1 .......................... 65.
Adobe
Illustrator 88 .......................... 299.
Streamline .......................... 239.
Aegis Development, Inc.
Showcase F/X .......................... 199.
Aldus
Freehand 2.0 .......................... 349.
Bergerbund
Drawing Table .......................... 75.
PosterMaker Plus .......................... 35.
Casady & Greene
Vivid Impressions Vol.1 .......................... 69.
Claris
MacDraw II 2.0 .......................... 300.
MacPaint 2.0 .......................... 99.
Cricket
Cricket Color Paint .......................... 170.
Cricket Draw .......................... 168.
Cricket Paint .......................... 99.
Doneba
Canvas 2.0 .......................... 159.
Dream Maker
Sirens, Business Images .......................... 85.
MacGallery .......................... 27.
Electronic Arts
Studio 1 .......................... 99.
Studio 8 .......................... 369.

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CasinoMaster (5 pack) .......................... 49.
Discovery Software
Arkanoïd .......................... 27.
HyperPress Publishing
Nemesis
Miles Computing
CasinoMaster
Starfleet I: The War Begins .......................... 36.
Electronic Arts
Fool's Errand .......................... 32.
Mindscapce
Puzzle Gallery .......................... 27.

FileGuard
The Software Toolworks
Starfleet I: The War Begins .......................... 36.

HyperPress Publishing
Silver Screen .......................... 42.
Miles Computing
Foot's Errand .......................... 32.
Puzzle Gallery .......................... 27.
Mindscapce
Nemesis
Go Master .......................... 49.
Joseki Tutor .......................... 30.

PCAI/XOR
Lunar Rescue .......................... 34.
MacGolf 2.0 .......................... 35.
MacGolf Classic .......................... 54.
Road Racer .......................... 39.

3G Graphics
Images w/concept .......................... 53.
Graphics & Symbols 1 .......................... 52.

Smalltalk/VMac
This Mac based object-oriented development environment provides developers with the power to create full-blown mainstream products at affordable prices. Compatible with Smalltalk/V on IBM PC's. Works under Multifinder and has complete access to the Mac Toolbox. Features multitasking, a debugger, supports large data structures and an extensive manual. (language) $103.

ReadIt OCR (Oldual)
Highest Rated (4 1/2 mice MacUser Rating) Brings Optical Character Recognition to your Mac. Use any scanner to input virtually any printed text, including typset and laser printed documents. New "Easy Learn" super-fast training option, built-in speech option and file export to any Macintosh application. Requires only one Megabyte of RAM. (desktop publishing) $249.

Smalltalk/VMac
The Hunt for Red October .......................... 32.

MacGolf Classic
MacGolf Classic .......................... 54.

Lunar Rescue
Lunar Rescue .......................... 32.

MacGolf 2.0
MacGolf 2.0 .......................... 35.

PT109 or Gato
PT 109 or Gato .......................... 32.

Silhouette Screen
Silhouette Screen .......................... 42.

Miles Computing
Miles Computing .......................... ea 32.

Starfleet I: The War Begins
Starfleet I: The War Begins .......................... 36.

HyperPress Publishing
HyperPress Publishing .......................... ea 32.

Starfleet I: The War Begins
Starfleet I: The War Begins .......................... 36.

Chuck Yeager Adv. Flight Trainer

HyperPress Publishing
HyperPress Publishing .......................... ea 32.

Silver Screen
Silver Screen .......................... 42.

MacGolf 2.0
MacGolf 2.0 .......................... 35.

Miles Computing
Miles Computing .......................... ea 32.

Starfleet I: The War Begins
Starfleet I: The War Begins .......................... 36.

HyperPress Publishing
HyperPress Publishing .......................... ea 32.

Silver Screen
Silver Screen .......................... 42.

Miles Computing
Miles Computing .......................... ea 32.

Starfleet I: The War Begins
Starfleet I: The War Begins .......................... 36.

HyperPress Publishing
HyperPress Publishing .......................... ea 32.

Silver Screen
Silver Screen .......................... 42.

Miles Computing
Miles Computing .......................... ea 32.

Starfleet I: The War Begins
Starfleet I: The War Begins .......................... 36.

HyperPress Publishing
HyperPress Publishing .......................... ea 32.

Silver Screen
Silver Screen .......................... 42.

Miles Computing
Miles Computing .......................... ea 32.

Starfleet I: The War Begins
Starfleet I: The War Begins .......................... 36.
Mac - 101 Keyboards (DataDesk Intl.)

Features 101 keys including a numeric keypad, a separate T-shaped cursor keypad, Cancel Key, Option and Command keys at both ends, definable function keys, plus scrolling, page control, and zooming keys. Manufacturer's two year warranty. (input/output)

$145. International Versions also available

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Tactic Software

Art Clips .................................. 59.
Zedcor Deskpaint 2.0 ..................... 69.

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Cambridge North America
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278 AC Adapter ........................... 9.
278 Pocket Modem ......................... 225.
278 512K RAM Cartridge ................. 359.
The Complete PC
Half-Page Scanner ........................ 379.
Page Scanner ............................. 799.
DEST Dest PC Scan Plus ................. SPECIAL 799.

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Backup (disk drives)

General Computing Company
WriteMove Inkjet Printer .................. 585.
Magnavox Color Monitor 14" ............. 599.
Sekirasha America
Sekirasha Printer (dot-matrix) .......... 235.
ThunderWare
LightningScan ........................... 499.
ThunderScan 5.0 .......................... 189.

HYPERWARE

Activation
Focal Point II ............................ 119.
Reports for HyperCard .................. 69.
Bantham
Complete HyperCard Handbook ....... 23.
Beacon Technologies
HyperBible International Version .... 199.
HyperBible King James Version ....... 149.
BrainPower
Architext .................................. 179.
Bright Star Technology
HyperObject
HyperWriter
HyperPublisher
Script Expert ............................ 49.
ICOM Simulations
HyperMOC ................................ 75.
MicroMaps
HyperAtlas .............................. 64.
Power Up
Hyper Tutor ............................. 29.

Trendware Corporation
HyperTools #1 or #2 .................... ea 52.

INPUT/OUTPUT

Cutting Edge
CE-105 ADB Keyboard .................... 125.
DataDesk Intl.
Mac 101 Keyboards ..................... 145.
Kensington
Koala
MacVision 2.0 ........................... 219.
Kraft
ADB Joystick Premium III (SE&II) .. 51.
Kurma
IS/ADB Tablet 8 1/2 x 11 ............... 259.
IS/ADB Tablet 12 x 12 ................. 385.
IS/ADB Tablet 12 x 17 ................. 625.
Cordless 4 Button Cursr .............. 65.
Mouse Systems
A+ Mouse (512/Plus or SE/II) ....... Call.
Summachrome
Bit Pad Plus ............................. 325.

LANGUAGES

Digital Ink, Inc.
Smallsuitk/V MAC ........................ 139.
Manx Software Systems
AzteC or Unitools ........................ ea 65.
Aztec CSDB or C-MPWP ................. ea 85.
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SAM (Symantec Anti-Virus for the Mac) detects any viruses by monitoring the suspicious activities that characterize them. It finds one, it eliminates it immediately, protecting your Mac and software from infection. SAM scans floppy disks whenever you insert them, and at your request, will scan a file, folder, or volume for both known and unknown viruses. SAM has an easy to use interface and online Help.

- **$65**

**Microlytics**
- Word Finder 8.0 ........................................ 33.
- Sensible Software
  - BookEnds ........................................ 53.
- Sensible Grammar .................................... 53.

**STATISTICAL ANALYSIS**

- Abacus Concepts
  - StatView II ........................................ 295.
- BrainPower
  - Data Desk Professional .................................. 289.
- D2 Software
  - MacSpin 2.0 ........................................ 189.
- Odesta
  - Data Desk Professional .................................. 289.
- Paracomp
  - Milo .................................................. 159.
- Select Micro Systems, Inc.
  - 64kExtable ........................................ 219.
- Woflfram Research
  - Mathematica (SE) ..................................... 450.

**UTILITIES**

- Abbott Systems
  - CanOpener ........................................ 65.
- Affinity
  - Tempo II ........................................ 89.
- Precision (ISi)
  - A high performance 2D/3D CADD solution for the Mac. This package offers extensive drawing and editing features such as global replace symbols, in-depth analysis, powerful macro files and complete dimensioning capabilities. Includes a complete range of plotter drivers, import/export utilities for DXF and IGES files, 800 phone support and over 1000 architectural and mechanical symbols. (cad/cae) $399.

**WORD PROCESSORS AND OUTLINERS**

- Access Technology, Inc.
  - MindWrite 2.1 ........................................ 95.
- Ashton-Tate
  - FullWrite Professional ................................ 265.
- Chars
  - MacWrite II ........................................ 239.
- Microsoft
  - Word 4 ........................................ 255.
- Niles & Associates
  - End Note ............................................... 82.
- Symmetry
  - Acta Advantage w/DA ................................ 65.
- T/Maker
  - WriteOn 2.0 ........................................ 119.
- WordPerfect Corp.
  - WordPerfect ........................................ 185.
  - Working Perfect .................................... 75.
  - QuickLetter ........................................ 75.

**CONTEST RULES**

1. Entries must be received on or before 1/31/90.
2. Winners selected in random drawings by attorneys for MacWarehouse Inc. Entries are final.
3. NEXT Computer will provide random drawings. Entries are final.
4. Winners notified by mail. Entries subject to change at the discretion of NEXT.
5. Odds of winning depend on number of entries. All prizes will be awarded.
6. NEXT Computer reserves the right to substitute wholesale cash value up to $100.
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10. Winners notified by mail. Entries subject to change at the discretion of NEXT.
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46. Winners notified by mail. Entries subject to change at the discretion of NEXT.
Microsoft Excel 2.2

Despite formidable competition, Excel is still the spreadsheet king. Version 2.2 offers eight-color support and finally allows multiple fonts and styles in a worksheet. The 1-megabyte limit has also been overcome, and dozens of new macro commands and other enhancements have been added.

— but Microsoft has implemented a level of integration that goes beyond Apple’s plans. For example, under MultiFinder, Word can automatically launch Excel, if it’s not already running, to get the changed data. Excel also interfaces with Microsoft Mail, and you can electronically mail an active worksheet or chart by selecting Send Mail from the File menu. (It’s not clear yet, though, whether the interapplication abilities of Microsoft’s programs will conflict with or complement Apple’s
forthcoming System-level approach.)

Excel 2.2 comes with a detailed 700-page reference manual, a 26-page Quick Reference Guide, and a 330-page Functions and Macros manual. For some reason, the tutorial, Getting Started with Excel’s status bar (bottom left) is similar to that of Lotus 1-2-3 accessed from the Window menu, and context-sensitive help is still available. Note the detailed help for 1-2-3 users, which is the first level of help. The more extensive Help dialog box is now Reference Guide, so next, the tutorial, Getting Started with Excel 2.2 comes with a detailed 700-page manual. For some reason, the tutorial, Getting Started with Excel doesn’t ship with the upgrade kits, but it is included with the retail edition. And for anyone needing help (regardless of which version you have), there is a 734K HyperCard Guided Tour. The status bar and expanded help function with a glossary make getting started with Excel fairly simple.

**HOW IT WORKS** Despite the improvements in Excel version 2.2, the program still lacks some of the features offered by its competition. Wingz has some sexier charting capabilities (notably 3-D effects) and supports more colors; Full Impact has an icon bar and wonderful default text colors. Both of these programs have application development and drawing capabilities that Excel lacks. So if these features are what you’re looking for, and if you’re willing to endure the hassle of file translation and retraining, you may find the competition preferable (see “Fitted Sheets,” April ’89 and “Wingz Weighs In,” June ’89). Just be aware that you’re going to find more people using Excel than Full Impact and Wingz combined.

The big-three spreadsheets are all roughly comparable. Each of them does one or two things better than the others, but the competition’s functionality isn’t a great enough improvement over Excel to displace the de facto standard in Mac spreadsheets. It’s up to the challengers to be demonstrably better, and while they are much better than previous versions of Excel, they’re only comparable to version 2.2. And for most users, parity isn’t enough of an incentive to switch — especially when the package is as stable and bug-free as Excel 2.2 is.

So the fight for the spreadsheet crown has shifted to the marketing front, with Informix selling Wingz to Excel owners for $99 and Microsoft bundling Excel 2.2 with Word 4.0, PowerPoint 2.01, and Mail 1.37 for $849 into The Microsoft Office, a sort of “buy two, get two free” promotion (a limited-time offer through December 31, 1989). But no matter what the outcome of the marketing strategies, Excel — with its huge installed base — is still the king, and version 2.2 goes a long way toward keeping it on the throne.

— Robert R. Wiggins

**DATABASES**

**Omnis 5**

Blyth’s comeback effort is a terrific developer’s toolbox, but it isn’t for the average Joe.

| OmniS | Anyone who follows the evolution of Macintosh relational-database languages will wonder why Blyth Software skipped from Omniss 3 to Omniss 5. Actually, Omniss 4 was released about two years ago for the Windows environment on IBM PCs under the name Omniss Quartz, but it was never ported to the Mac. Quartz was a giant technological step over Omniss 3, but it suffered from Windows’ slowness and inability to use extended RAM effectively. Omniss 5 is a generation beyond Quartz, and it’s not looking back.

Despite Blyth’s low profile, there are still more custom and vertical-market business-information systems written in versions of Omniss than in any other Macintosh database. Professional developers have complained about the Omniss product family’s lack of access to interface tools, the not-quite-adequate product documentation, and the lack of publicity about the true nature of this powerful language.

**WHAT IT IS** Omniss 5 is a graphically oriented, multiuser relational/hierarchical-database applications-development environment. As this lengthy description implies, it’s a programming language for creating information-management systems, which also means that it’s not the first choice for average users. The multiuser and relational/hierarchical aspects are among the features that elevate Omniss 5 above the capabilities of the other contenders in this field.

In multiuser mode, Omniss incorporates record locking into every command that can write to disk, so that multiple users cannot access the same record at the same time and potentially corrupt the data. Omniss 5 has features, such as a read-only file mode, that give further flexibility for multiuser programming.

Relational databases are notoriously clumsy in dealing with transactional data. Hierarchical databases are much more effective in storing and retrieving transactional information, but not all data structures are strictly hierarchical. Business-information systems generally need to be designed around transactions. By combining relational and hierarchical methods, Omniss 5 provides ease of programming and speed of data entry, retrieval, and reporting of complex transactional data.

The Omniss 5 interface has tremendously improved over previous versions. Programmers now have complete control over the size and position of any window (with the ability to span multiple monitors). There are check-box, push-button,
There are commands to launch other Omnir 5 applications, other programs, or DAs from a menu or a button or as a data-entry process.

Omnir has always had a sophisticated report generator, but Omnir 5 has reached new heights of flexibility and performance, including graphics fields, an extending field that expands to accommodate varying amounts of text up to 32K, and the ability to redefine sort fields (and other report parameters) on the fly from within a procedure.

While many database products claim that they can support an unlimited file size, Omnir 5 is limited to 2.56 gigabytes per data file in ten segments of 256 megabytes. The data file stores the data for up to 60 logical files, each having up to 12 indexes. The segmenting of an Omnir data file allows the data file to span volumes — a capability no other product has because the others are limited by the size of the storage media. Procedures are limited to 30K each.

Omnir 5 ships with a collection of HyperCard externals that turns HyperCard into a multiuser relational database that simultaneously accesses multiple Omnir 5 data files. Programmers who prefer HyperCard now have full access to the powerful Omnir database engine. These external resources can be used in conjunction with the Oracle HyperCard front end for simultaneous Oracle/Omnir 5 database access. There are no direct links to Oracle without HyperCard.

Omnir 3 was the first Macintosh database program to support Apple’s CL/1 procedures, and CL/1 is built directly into Omnir 5’s command set. There are also commands for selecting and configuring a port as well as sending and receiving text, which permits telecommunications to be built into Omnir 5 applications.

Blyth Software’s support staff gives competent and timely responses to users’ questions. Support is available by telephone or on MacNET. Blyth-authorized training courses are also available.

Omnir 5’s documentation shows a marked improvement over previous versions. There is an Application Designer’s Handbook, a Programmers’ Reference, and a tutorial called Getting Started. Each is well organized and concise.

HOW IT WORKS: It would be impossible for a program of Omnir 5’s complexity and power to be perfect, and it isn’t — although its flaws aren’t major. For example, in an effort to remain completely DOS-compatible, the interface isn’t entirely Mac-like: Not every tool palette is given a title bar, you can’t easily save a file in a sorted order, and there is no default search interface — you must either design a custom interface beforehand or build one on the fly. But there are also compensations. Unlike 4th Dimension, Omnir 5 lacks a charting function, but it easily calls up Cricket Graph, Excel, or Wingz to access their power.

In short, Omnir 5 is primarily a programming environment more suited to professional developers than to casual users. Programmers of traditional relational-database languages will have a few things to unlearn to take full advantage of Omnir 5’s power, but it’ll be worth it.

— David Swaine

DESKTOP PUBLISHING

TableTools

The Mac’s first dedicated table editor has lots of power — but power isn’t everything.

Until now, making tables on the Mac has been largely a job for spreadsheet applications. TableTools is the first dedicated table editor for the Macintosh that’s also compatible with page-layout programs such as PageMaker, PageWord, PageWorx, and QuarkXPress.

WHAT IT IS: TableTools sets up tables on a work space that is similar to a page-layout program’s. When you launch the program, a 4-x-4-cell table is automatically created. A cell can be formatted as
Text, Graphic, or None, and you can have as many as 127 x 127 cells, depending on your Mac’s configuration. (On an SE with 1 megabyte, you can have about 140 cells; with 2 megabytes, about 1,200.) You can build a table from within TableTools or import text or SYLK files. Importing SYLK files is slow, however (see Performance table). When you import an Excel spreadsheet containing formulas, the formulas are embedded in the TableTools cells and can’t be modified. You can, however, apply any of 25 number formats to the values of these cells, which enhances their on-screen and printed appearance.

TableTools is modal in that it operates from linked compartments. You can move between modes by using the Mode palette, menu item, or keyboard equivalent. During intensive editing, this switching can get annoying, especially since TableTools has three modes: Table, in which you edit tables; Text, in which you edit the text in the cells; and a From Within shuttle — a capability like hot links that lets you move between Excel and graphics programs (including MacDraw, Illustrator, and MacPaint).

TableTools’ comprehensive editing capabilities are presented on three levels: Beginner, Intermediate, and Advanced. (The program defaults to the Beginner level at startup.) TableTools can be edited and formatted like most spreadsheets, plus it features intercell diagonal lines and fills and the ability to group cells into regions where headers and other oversized elements can be placed. Cells can be set to automatically grow as you enter text.

The Intermediate level adds increased control over text formatting on a ruler with icons for tabs, indents, alignment, leading, paragraph spacing, font, size, and style. Pasteboard rulers and alignment guides allow the precise placement of elements within a table. On the Advanced level, you can set up hierarchical table and text style sheets for controlling regions and text formats. Style books can be copied from one document to another, and tables can be saved as a PICT or Color PICT document, as a PageMaker equivalent document, or in TableTools format.

**HOW IT WORKS** TableTools has power, but editing can be cumbersome. The Undo function is inactive for most operations. The Border Line and Diagonal tools are tricky to use, and some elements of TableTools’ nonstandard interface are annoying. A Hide/Show dialog box for Edit Settings, for example, lets you pull up a modified Key Caps keyboard for entering dingbats, but the keyboard won’t go to the rear when you select another window. Furthermore, modifying style sheets in the Style Manager and applying them to your table requires too many steps.

Performance on the Plus or SE is also hampered by the default Text format for cell creation (you really need a Mac II with 2 megabytes for serious editing). In this format, a 7-x-40-cell table requires 276K. The same table shrunk to 58K when I formatted it as None, which also reduced the RAM requirements (see Performance table).

Mansfield gets good marks for a methodical manual with good tutorials. Although TableTools is a decent first step, it falls short of being the definitive table editor for desktop publishers. Things that would make table editing more palatable — such as built-in charting, tabbing through cells, automatic scrolling on selection, intelligent footnoting, the ability to flip rows and columns, the ability to sort on column or row headers or to edit facing table pages, and a Preferences file for saving user level and edit settings — are missing.

Although TableTools has superior table-manipulation features, it lacks some of the power users need for financial and scientific purposes. If you have an in-house DTP operation creating complex tables, you might consider TableTools. But for simple tables, Word 4.0 is your best bet right now — and, for the same price, Word comes with a word processor to boot.

—Michael Miley
How we broke technology barriers, to deliver the world's most advanced 24-bit color board for just $995.

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Barrier: To see the effects of color corrections in real time, as you make adjustments to gamma, brightness and contrast.

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Both the Mac II family and SE/30 version of the RasterOps ColorBoard 264 are fully compatible with Apple's 32-bit Color QuickDraw. RasterOps is an Apple licensed supplier of the Apple 6.0.3 System Software, including 32-bit color QuickDraw. A copy is shipped with each ColorBoard 264.
**Dual Oscillators**

**Barrier:** With the rush of multimedia and video applications, our customers don't want to invest in a board that locks them out of video.

**Breakthrough:** Two separate oscillators. The left to support Apple's 13" color monitor at a resolution of 640 by 480, and the right oscillator to output 8-bit gray scale video directly to VCRs or TV monitors. It will also output RGB NTSC video for external encoding in 24-bit True Color. When you need video, (and it's coming fast), you're ready.

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**Barrier:** The accepted, easy way to manufacture a board is wave soldering. But this doesn't allow efficient use of robots, and doesn't create a "Clean" board.

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**Auto Sensing**

**Barrier:** Allow user to change monitors and frequency without setting a switch, changing an oscillator, or making a selection from the control panel.

**Breakthrough:** Circuitry that automatically senses which monitor you are using and switches automatically from 66.7 Hz to 30 Hz. You just plug in your Apple-compatible monitors, the board will take care of the necessary adjustments.

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**Barrier:** The NuBus transmits power spikes and bus noise. These can destroy data as well as circuitry on the displaycard. Spikes can also cause pixels to trip, causing spots on the screen.

**Breakthrough:** We designed sophisticated bus buffering circuitry to isolate the hostile NuBus environment from critical components on the board, protecting your video investment, and your data.

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**Power Draw**

**Barrier:** Power and heat. Your board draws its power through the NuBus. Apple specifies a maximum of 2.1 Amps per slot. Many boards require over 4.0 Amps. Amps mean heat, which is deleterious to your Macintosh, and a drain on the power supply.

**Breakthrough:** Through the extensive use of CMOS circuits, VLSI parts that replace multiple parts, low chip count, and 5 mil copper traces, the RasterOps ColorBoard 264 needs less than 1.0 Amp. Your system runs cooler. You can use other slots without fear of overloading your power supply.

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Business Sense

Monogram’s latest version of this integrated business-accounting package is an excellent effort on the verge of greatness.

The latest business-accounting product to enter the already overcrowded fray is Business Sense from Monogram Software, publisher of Dollars & Sense, a popular home financial-management program. Established programs such as Plains and Simple (from Great Plains), Rags to Riches (from Chang Labs), and Simply Accounting (which Bedford Software recently sold to Computer Associates) have been available for some time. Business Sense differentiates itself from these other full-function packages (which include the following modules: general ledger; accounts receivable; accounts payable; and, in the case of Simply Accounting, payroll) by offering the user all the functions on one disk — the ease-of-use approach.

Most of Business Sense’s limitations are well above the concern horizon of the kinds of businesses that should use it. The recommended number of employees and more than $5 million in sales shouldn’t even consider Business Sense, because it can’t handle the data volume of larger businesses. Despite that caveat, Business Sense offers many features and functions that its competitors lack and is clearly a winning low-cost small-business system.

**WHAT IT IS**

Business Sense is a fully integrated accounting system. When you update the accounts-receivable module, all changes that have to flow to the general-ledger system do so automatically. Automatic integration is a plus as long as you can operate your entire accounting system on one Mac. If you have several clerks doing your accounting, the system can’t be split up. Business Sense is also not designed for network operation or for subsystem consolidations — everything has to be on the same machine.

The general-ledger module manages multiple companies, but it can’t consolidate them. Each company can have up to 99 departments and five bank accounts (which may be a limitation for some users).

Recurring entries such as rent and lease payments are easy to set up and are automatically posted to the system, based on user-specified dates. The system also provides a full audit-trail capability and supports reversing entries. Twelve months can be kept open, but Business Sense runs only on a calendar-month basis. It doesn’t support flexible month ends.

Only two levels of security are built in to the program. The first level prevents users from accessing payroll, company information, account histories, and income statements. The second level yields unrestricted access.

Account numbers are four digits long, with a trailing eight-digit subaccount number, which makes it simple to assign accounts for reporting purposes. Unfortunately, all the reports in Business Sense are hard-coded. If you want ad hoc reporting capabilities, you have to export data to a spreadsheet (in either SYLK or ASCII format).

The accounts-receivable module provides detailed customer histories, credit-limit warnings, and automatic generation of credit memorandums. Finance charges and discount schedules are easily set up and automatically calculated.

An important feature of Business Sense is that it can readily track partial payments against open invoices and can account for sales commissions for up to 2,000 salesmen. A full aging subsystem generates aging reports by customer.

The accounts-payable system tracks the invoice date, due date, and discount date for all open invoices. Details for generating an aging analysis for cash-flow planning are automatically tracked — an important feature for small businesses that aren’t cash-rich. And instead of trying to fool the payroll system into paying independent contractors, you can use the accounts-payable module. This module also produces the IRS-required 1099 form.

**Get Info**

**Business Sense**

- **List Price:** $495
- **Published by:** Monogram Software, 531 Van Ness Ave., Torrance, CA 90501; (213) 533-5120.
- **Version:** 1.2
- **Requires:** Two 800K drives or hard disk
- **Compatibility:** 512KE or later
- **Application Size:** 256K
- **Copy Protection:** None
The payroll module can accommodate up to ten withholding categories and ten wage categories, plus tips and fringes. Any form of state or city tax can be accommodated. Full federal W-2 reporting as well as 914 reporting is supported. Using the receivables module, you can even track cash advances to your employees.

Stacked on top of the four main modules is a built-in budgeting system that tracks actual expenditures in relation to forecasts amounts in either tabular or graphic form. Budget reporting can be done for individual cost centers, for aggregations, or on a consolidated basis. Almost any report can be viewed graphically over any time span within the fiscal year that you specify.

**HOW IT WORKS** Business Sense fully exploits the Mac interface. You open each module in its own window, and each time you close a window, all the transactions are automatically posted. By clicking on information such as an account number in one window, you can easily move that data to another window, and hence another module, without retyping.

Business Sense has powerful productivity functions such as lookups of partial names and account numbers built into the program. In addition, the program's Find feature locates accounts, descriptions, and amounts in any journal or report.

As you would expect, Business Sense generates mailing labels and can export any of its files to another application.

Starting the program is straightforward. A sample chart of accounts can be easily modified. Setting up accounts is simple, thanks to excellent use of the Mac interface and to the step-by-step, easy-to-read printed documentation. A simple Help file is kept on-line, and it can be edited to accommodate company policies and procedures if necessary.

Full error-checking routines are incorporated into the entry screens. Error checking applies to entries that are out of balance, nonexistent accounts, posts to summary account, deletion of active accounts, adjusted closed invoices, credit limits, and missing tax tables for payroll.

The system does not offer incremental-backup capability; backups of all data files are necessary.

Business Sense has the potential to set new standards for ease of use, documentation, and functionality with the inclusion of a few significant enhancements, such as customizable reports, more-flexible data-security options, improved audit trails, and the ability to consolidate companies. Business Sense is smooth and fast and is clearly worth consideration by both novice business accountants and experienced bookkeepers.

— Ken Landis

**DESKTOP PUBLISHING**

**SmartForm Designer**

This is a handy tool for in-house production but not yet for professional use.

A few years ago, I was a forms designer for a small insurance company, and my only forms-composition equipment was a typewriter and an Apple III. Claris' SmartForm Designer would have been a godsend in that situation. But
Adobe Illustrator 88 by Adobe Systems

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Hyper Press Script Export 46
Manx Aztec C 65
Aztec C + SDB 99
Aztec C + MPW 99
Microsoft Quick Basic 65
Ondual Corporation Plus 1.1 109
Smathers & Barnes 129
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MacKNOWLEDGE is the latest communications software available for your Mac. Icon based scripts provide instant access to all major online services with just a click of your mouse. The TAL scripting language provides all the capabilities for customizing and automating your own online sessions or the record function will watch your session and create an icon based script automatically. $125.

CanOpener by Abbott Systems

CanOpener is the information retrieval utility for the Mac. It will search and retrieve text, pictures and sounds from just about anywhere. Which means you can extract information from almost any document, even if you don't have the application. Or, recover data from corrupted files. And CanOpener will scan disks, hard drives and networks to locate missing information. $65.

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PageMaker 3.0 369
Aston Tale
FullWrite Professional 265
Broderbund ODT Advisor 47
Core Omnigraff 559
Claris MacWrite II 185
Design Science
Math Type 2.0 99
ExpressWrite 65
Letraset
Design Studio 1 459
Ready, Set, Go! 275
LetraFonls (Various Vol. 1-45 ea.) 65
Microsoft Word 4.0 255
Niles & Associates EndLink 55
EndNote 82
Paragon Concepts Nisus 255
Microsoft WordPerfect 59
Preferred Publishers
Version 59
Quark, Inc. 265
QuarkXPress V2.0 499
QuarkXStyle 189
Symantec More II 255
Symmetry Acta Advantage 65
T/Maker Company
WriteNow V2.0 109
T.M.L 99
TML Pascal II V3.0 115
TML Source Code Library II 42
Zedcore ZBasic 5.0 99

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PixelPaint Professional by SuperMac Software

PixelPaint Professional is the first "true-color" paint program for the Macintosh. It is designed to grow with you — from 8-bit to 32-bit systems. From general painting to advanced design. PixelPaint Professional gives you the intuitive tools to do your work easily. Use powerful features like advanced masking, fill effects, dithering, anti-aliasing and transparency control for advanced graphics effects and photographic-quality images.

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MacInteriors is for all of us who have ever wanted to do our own interior design. Now for the price of a typical 20 package you can have 3D space-planning software that lets you work and examine creations in several views (inc. perspective and birds-eye), then print it out to a laser printer or plotter. You can create your own objects or use the ones provided. Soon you'll be designing everything from bedrooms to buildings. .... $199.

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PROGRAMS PLUS
now that I typeset forms, my ideal forms package must match extremely precise specifications. SmartForm Designer doesn't come close to the versatility or precision of professional typesetting equipment, but if you're currently creating forms with packages such as Excel or MacDraw II, SmartForm Designer may be the powerful drawing tool you've always needed.

SmartForm comes with a pleasant and well-paced HyperCard tutorial that guides you through a series of forms-design sessions. Extensively hands-on at first, it anticipates the user's impatience, gradually assuming more of the work itself and wrapping things up just as the user's attention span is likely to have expired.

What's missing is a short crash course in forms design and analysis. SmartForm does little to prevent you from designing an illogical or badly arranged form.

This shortcoming is partly offset by a third-party library of commonly used predesigned forms. Packaged under the name FLEXFORM Business Templates, it contains a wide assortment of well-designed general business forms that can be customized to suit the user's individual requirements. Major modifications may prove nerve-racking, because it's difficult to dismantle and reassemble these templates without knowing how the original designer pieced together the various fields and sections. But if you only want to use the forms without customizing them, you can use FLEXFORM with SmartForm Assistant.

**WHAT IT IS** SmartForm Designer creates forms one element at a time; you assemble a complete form from adjacent or layered boxes and rules. The program is essentially a drawing kit optimized for the special requirements of designing and composing custom business forms. The drawing Tool Kit contains the usual line-drawing and shape-creating tools, with a few appropriate additions for creating grids, combs (the toothy fields you often use for filling in Social Security numbers, for example), and data fields. Elements can be positioned freehand, or, more usefully, the components can snap to a user-definable grid. The grid's vertical and horizontal line spacings can be specified independently in standard forms increments (1/8 inch, 1/6 inch, 1/12 inch, 1/20 inch, or true picas, among others). PICT files can be imported and scaled to fit as needed.

SmartForm's companion program, SmartForm Assistant, lets your document serve as a data-gathering screen-entry form, but this function stops short of being an interface for a true relational database. It's really just an automated information-gathering system, best suited to small offices, where everyone might be expected to know the electronic-forms procedures by osmosis.

**LIMITATIONS** In a commercial forms-typesetting environment, I couldn't consider SmartForm as my only forms-composition tool. I have to be able to match design specifications, and short of scanning the whole thing in, it's difficult to make a SmartForm that closely matches a form created elsewhere. Professional forms design requires a more flexible grid and better control over text and graphic positioning. Even SmartForm's line tool is limited. SmartForm provides for 1/4-point, 1/2-point, and thicker rules in whole-point increments, but my customers often need 1/2-point rules.

Also missing are word-processing features of any consequence. Type sizes and leading can be fine-tuned nicely, but SmartForm assumes that your text requirements are limited mostly to captions or short instructional paragraphs. It doesn't provide an appropriate environment for composing a text-intensive form letter, nor does it support kerning.

SmartForm's specification display precisely shows the position and dimensions of selected rules and boxes. Perhaps the program's greatest strength — barely hinted at in the tutorial or documentation — is that you can forgo the mouse and alter selected items by typing their measurements directly into the specifications display. Even this feature falls short, however: It lets you modify the dimensions of a box but doesn't provide a means to reposition the box without distorting it. Repositioning requires use of the mouse or the Alignment menu.

If you're a professional looking for a better tool, this isn't it. But if you currently design your forms with a spreadsheet or object-oriented program, SmartForm Designer will probably save you some time.

— Jay Ziller

**Get Info**

**SmartForm Designer**

List Price: $89.95
Published by: Claris Corp., 5201 Patrick Henry Drive, Santa Clara, CA 95052-8168; (408) 987-7000.
Version: 1.0
Requires: System 6.0 or later.
Compatibility: Mac Plus or later. Hard disk recommended.
Application Size: 696K
Copy Protection: None

**FLEXFORM Business Templates**

List Price: $399.55 per volume
Published by: Antic Software, 544 Second St., San Francisco, CA 94107; (415) 957-0886.
Requires: System 6.0 or later. Hard disk recommended.
Includes SmartForm Assistant.
Compatibility: Mac Plus or later.
Copy Protection: None
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COLOR OPTIONS. MicroPhone II lets you assign color icons to your scripts, thus turning the icon bar, shown here, into your control panel. The icon bar can be scrolled, resized and placed vertically or horizontally anywhere on the screen, awaiting your next click. Choose icons from the large collection provided with the software, or create your own.

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Rumor Manager

Gossip, Guesses, and Goings-On

It’s time to the conclude the tour of the Apple engineering R&D labs that we started last month. (If you missed the first installment, you might want to go back and read it first.)

After we toured the laptop labs, the next area we came to was secured by a door. The entry device at the main door kept asking for our password in the main CPU lab. We were in the sprawling main CPU lab.

Machines of all sizes and configurations were scattered about. Methodically combing the room, we found a section dedicated to really large prototypes running what appeared to be a UNIX-like language. The main processors were mostly 68040s.

We found an area that had partially disassembled IBM PS/2 Model 80s and a few stray Sun workstations. And, yes, there was a NeXT machine there too. It sprouted numerous test leads and was hooked up to all sorts of electronic instrumentation.

As we moved on, we came to machines that looked much like the current Plus and SE, sitting in stock Plus and SE cases. Delicately opening them revealed that they were 68030- and 68040-powered. Not surprisingly, we couldn’t find a single 68000 or 68020 CPU anywhere in this lab.

There were so many prototypes that we didn’t have time to look at them all. We tried to determine the clock rate of the CPU in each case, however. Most of these machines were running at 33 megahertz and higher. We found several 44-megahertz chips, a couple of 50-megahertz units, and one 66-megahertz chip (which wasn’t installed on any board). There was also an open vault that held some very fast RAM chips (25-, 45-, and a lot of 65-nanosecond models). It looks like good caching won’t be enough in the future.

We left the CPU lab, locking the door — which said, “Have a good day” — behind us. We then moved on to the mass-storage lab.

As expected, we found lots of small hard drives. Some of these 3.5-inch units were marked to indicate data-storage capacities of 240 megabytes. Most of the hard-drive assemblies were made by Sony, confirming the recent change of drive-assembly suppliers. We were intrigued by the Sony 2-inch drives. The data sheets on these drives indicated that the baby hard disks held 36 megabytes each! They weighed a few ounces, and their electrical requirements were so low that it appears regular D cells will easily power them. We suspect you’ll first see these tiny hard drives in one of the laptops.

Storage media aren’t limited to hard disks. We saw optical read/write drives in 650-megabyte and 1.3-gigabyte sizes. These appear to be Sony-made units. Several were in slick plastic prototype shells, so they are nearly ready for release (at least preview). Other media included several tape units. The DAT unit was particularly impressive and also looked ready to ship. It’s about the size of a normal external hard disk and is very quiet. If Apple can hold its price down to a couple of thousand dollars (a faint hope, in our opinion), it should become a best-seller.

Heard any good rumors? If we use your rumor, we’ll send you a token of our appreciation and promise not to use your name. Anonymous contributions are also accepted.

Our U.S. Mail address is Rumor Manager, c/o MacUser, 950 Tower Lane, 18th Floor, Foster City, CA 94404. Our electronic addresses are MacUser (on MCI Mail), 74206,204 (on CompuServe), and MacUser.Edit (on AppleLink). No calls, please.

XTreeMac

XTree is a big hit in the DOS market, but its first Mac incarnation stops far short of seriously challenging the Finder.

It’s hard to imagine what XTree had in mind when it designed XTreeMac. Some features of this disk-management system are unique, and a couple could be handy, but the execution of the program as a whole leaves much to be desired.

WHAT IT IS

The chief task of Finder replacements and enhancements is to make the Mac even easier to use. XTreeMac has promise but doesn’t deliver. Worse, the program is plagued by bugs that disqualify it from serious consideration.

The basic metaphor of XTreeMac is a good one: Each mounted disk appears on a file card, and you pick the disk you want to make active by clicking on a tab. All folders, documents, and applications appear in alphabetical order, and you can select how many levels will be shown when you start the program.

XTreeMac lets you launch applications and documents by simply double-clicking on them and adds a function to move files across disks to supplement the Finder’s limited copying ability. A complete Get Info function gives you control over a file’s type and creator as well as over programmers’ status bits.

One fascinating feature of the package is Revive-A-File, an INIT and invisible-file combination that can restore as many as the last 100 deleted files on your system. When you drag a file to the trash, space opens up on your disk, but you can recover the file by dragging it out of a special Deleted Files folder. (If you save anything to disk, however, you might overwrite a deleted file before you can recover it.)

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MultiClip

If one Clipboard isn't enough, MultiClip is the utility you've been waiting for.

The Mac wasn’t the first computer with a Clipboard, but it did make cutting and pasting far more accessible to far more people. But as good as it is, the Mac’s Clipboard hasn’t kept up with the rest of the System. Its most significant limitation is that it holds only one item at a time. The next time you cut or copy, whatever was already on the Clipboard is irretrievably lost. And, in general, you can’t append anything to what’s on the Clipboard. (Appending to the Clipboard is supported by Apple system software, but very few applications have chosen to implement it.)

**WHAT IT IS** MultiClip, a Startup document (also called an INIT), adds several new dimensions to the Clipboard. It allows as many Clipboards (which it calls ClipFrames) as you have disk space for, lets you rearrange the order of the ClipFrames, allows limited editing of material in the ClipFrames, and can import from and export to Scrapbooks and some other documents.

This neat program can be used as a replacement for both the Clipboard and the Scrapbook, and it offers new power for users who do a lot of cutting and pasting. The cost is some additional complexity. MultiClip is a relatively large program, and it has lots of commands and options. You’ll need to take the time to master many — if not all — of them to get the most out of MultiClip.

**HOW IT WORKS** Installation is simple, as it is for all Startup documents. Copy or drag the MultiClip file into your System Folder and restart, and you’re ready to start using MultiClip. You’ll need to consult at least the reference card to get going. You invoke MultiClip’s basic Copy, Cut, and Paste operations by add-
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Retrospect can also be programmed to automatically archive and backup whenever you want. During off hours, when you're not around. So every Monday at midnight, for instance, you can have files older than a month archived.

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The bottom line: Retrospect lets you infinitely increase your storage capacity. Easily backup everything. And get your hands on any file, fast.

For details and a demo, see your nearest Macintosh dealer. Or write or call Dantz Development Corp., 1510 Walnut Street, Berkeley, CA 94709, (415) 849-0293, FAX: (415) 849-1708.

Because in storage and retrieval, Retrospect is the automatic choice.
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On the surface, this Apple appears to be a flawless, shiny Lisa. But get under its skin and you'll discover Macintosh Plus capabilities in all their glory. There's just one way this Apple doesn't measure up to a Macintosh. At $695, the Lisa falls impressively short of a Macintosh Price tag.

Meet the New Lisa with MacWorks Plus

We thought it looked like a perfect match: the highly efficient Lisa and the myriad of Macintosh software solutions. On the one hand, there was the Lisa, a professional business computer with an extra-large 12" screen, Macintosh graphic interface, familiar mouse, easy-to-reach internal components, space for an internal hard disk drive, and three expansion slots. Then there was the popular Macintosh Plus, with its amazing capabilities, functionality and software applications.

To bring the two together, we developed a software program called MacWorks Plus. MacWorks Plus brings Macintosh functionality to the Lisa, plus compatibility with every application that runs on the Macintosh Plus. With MacWorks Plus, the Lisa can run HyperCard, MultiFinder, WordPerfect, Adobe Illustrator and Cricket Draw. (To name a few.)

How we Support Lisa and MacWorks Plus

We do a lot more than market the Lisa and MacWorks Plus. We offer a complete line of out-of-production, new and used Apple-compatible products. And we're the only company authorized by Apple Computer Inc. to sell and service their out-of-production equipment. Because of this, we have invested sizeable resources in developing improvements for all of the out-of-production and reconditioned products we sell. Plus, every product that comes from us must pass rigorous Apple quality control tests. We also back our products with a 30-to-90-day, money-back guarantee.

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If you like the capabilities and compatibility of Macintosh, but don't like the price, pick the Lisa with MacWorks Plus. To order a Lisa, or get a copy of our product catalog, call 1-800-821-3221, ext. 369 and we'll send your order out today. All major credit cards accepted.

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See the Lisa perform like a Macintosh at Macworld Expo, Booth #5061, in the World Trade Center.

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MultilClip multiplies the power of the clipboard with multiple “ClipFrames.” It usually operates in the background, but the MultilClip DA is always available, letting you see, use, and modify all your ClipFrames.

Advanced Systems Outlook

BURLINGAME, CA — Workstations are the thrust of many of Apple’s plans for the Mac. What competition will these new workstation Macs face? The Advanced Systems Outlook seminar focused on two main application areas: 3-D graphics and scientific computing. In 3-D applications, the Mac needs a big hardware boost to compete with the mostly UNIX-based platforms built for dedicated graphics use (such as those from Pixar and Silicon Graphics). As Donald Gaubatz (group manager for workstations at Appleally Digital Equipment) put it, you can’t simply slap a third dimension onto hardware built for 2-D. That, he said, is like trying to make a car out of a motorcycle by adding two more wheels.

But in some scientific applications, the Mac’s interface gives it an edge, as revealed by a demonstration by Stephen Wolfram of his company’s forthcoming version (1.2) of Mathematica software.

John Moussouris, a founder of MIPS and now CEO of MicroUnity Systems, cited the closing of the bandwidth gap as the main factor driving the development of the next generation of workstations. In the past 20 years of computer-architecture development, dynamic-random-access-memory (DRAM) capacity has surged forward with a thousand-fold increase in density, while microprocessor bandwidth has shown only a tenfold increase, creating a bottleneck in microcomputer performance.

But as RISC (reduced instruction set computer) technology penetrates the workstation market, this gap will close, and RISC-based workstations — with CPUs that integrate processing and memory caching — will have, in the early 1990s, computing capacities exceeding 100 million instructions per second (MIPS), which outstrips mainframe performance. This power, says Moussouris, will transform workstations from the fancy calculators of yesterday and the thinking machines of today into the intelligent workhorses of tomorrow.
IBM has announced another software family to accompany its newest version of the Extended Edition OS/2 operating system (so far, you can still count all of IBM’s operating systems on one hand—just barely), and—surprise, surprise—it looks like Macintosh software. Yep, that means icons, menu bars, mouse-driven object-oriented graphics—they’re all there.

And Big Blue claims that its OfficeVision products will have the same interface across all IBM platforms—from PCs to mainframes. Sounds familiar, doesn’t it? Maybe if IBM had snuck into Xerox PARC back in ’79 . . . .

And to give Macintosh users a taste of the same medicine, Apple will now have two Macintosh operating systems. Adding to the confusion, with System 7.0—whenever that is—an application won’t have to be a desk accessory to be available as a desk accessory, a LaserWriter driver won’t have to be called a LaserWriter driver to drive a printer, and fonts won’t have to be installed with the Font/DA Mover.

First, you start with ideas. And they change as you continue to refine them. You need tools that work with you. To help you realize your visions and bring them to life.

It all began with MacDraft. Now we bring you Dreams.

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are both user-controlled.

A particularly nice feature is the ability to import Scrapbook files into MultiClip files. You can import whole Scrapbooks or, using the View button, import only selected items.

MultiClip comes with a good and complete manual (notwithstanding the lack of an index). A reference card clearly indicates all the commands and includes space for two custom sets of keyboard commands. The manual has a good troubleshooting section, and Olduvai offers capable telephone support. The manual doesn’t mention a toll-free number, but there is one: (800) 822-0772.

I’ve customized my copy of MultiClip extensively. I have it set to Always On (in the Preferences on MultiClip’s private File menu), which means that all normal Cuts, Copies, and Pastes go through MultiClip (so I don’t need to remember to press the Option key), and I’ve set the Paste mode to Reverse, so that the last item entered is the first Pasted. That makes MultiClip act like the regular Clipboard most of the time but gives me its extra power whenever I need it.

There isn’t much I’d want changed or improved. Opening can be slow if you have lots of ClipFrames in the active file. And the occasional incompatibilities — which never caused crashes or data loss during my testing — are generally the fault of programs that don’t follow Apple’s explicit programming guidelines. I would like MultiClip to be customized to take account of these known problems (private Clipboards in Word 3 and Illustrator, for example), but the program is already big, and I’d hate to see anything added that might reduce its excellent stability. The DA window can be enlarged, but, unfortunately, it doesn’t remember its size and has to be enlarged each time it’s opened. The dialog boxes and subwindows all appear on the main screen (if you use multiple monitors), regardless of where the DA window is placed. That can be awkward. None of these problems is serious.

Some users have reported conflicts with some programs. Although I’ve tried to recreate the problems, I’ve never been able to. I use MultiClip all the time.

— Steven Bobker

Get Info

MultiClip ★★★1/2
List Price: $69.95
Published by: Olduvai Corp.,
7520 Red Road, Suite A,
South Miami, FL 33143;
(305) 665-4665.
Version: 1.0
Requires: System 6.0.2 or later.
Compatibility: Mac Plus or later.
Can be disabled with programs
such as Word 3 and Illustrator
that use a private Clipboard.
Application Size: 137K
Copy Protection: None

Test and line art tools
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Illustrator

DREAMS
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resolution and faster output. From A to E size. It works with most of the popular
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Until now, Macintosh dot matrix printing has meant only two things: 9 pin, narrow carriage output for about $600, or high quality, wide carriage output for about $1400. The Grappler LQ opens up a world of dot matrix printers for the Mac, at a fraction of the cost. These include popular Epson, Okidata, NEC, Toshiba and Star Micronics models, as well as all compatibles.

Now the choice is yours! For example, consider the Panasonic 1124 printer. With output at 180 DPI and the ability to run continuous feed or multiple part forms, this sturdy printer will get the job done with crisp and clear efficiency. The Grappler LQ uses a standard Apple printer driver so your printer will act the way your Macintosh expects it to. The Grappler LS is fully compatible with hundreds of popular software titles including Excel®, MS Word®, MacDraw II®, Power Point®, Super Paint®, and PageMaker®. And because the Grappler LS comes complete with cable, Apple driver, Installer, fonts and a powerful spooler, there is no need for additional purchases.

GRAPPLER LS list price: $149

GRAPPLER LQ list price: $149

*Average total selling price. Printer suggested retail $529.95

**Average total selling price. Printer suggested retail $529.95
Voyager

This desktop planetarium is perfect for everyone with stars in their eyes.

When I was a child, one of my prized possessions was a star finder, bought on an excursion to New York's Hayden Planetarium. At first glance, Voyager might seem like a computerized descendant of those simple cardboard disks, but it's really more closely related to the planetarium I visited than to the star finder I took home.

WHAT IT IS The core of Voyager is a 14,000-object database, which includes 9,100 stars (including 1,600 binary and 160 variable stars); 3,000 deep-space objects (galaxies, clusters, and nebulae); 88 constellation outlines; the nine known planets of our Solar System; and the major moons of Jupiter.

The sky can be displayed as a star chart, a celestial sphere, or a view from any place on earth. Viewing locations may be entered as longitude and latitude or from any of 135 major cities. You aren’t earthbound, though. Voyager also lets you view the universe from any planet or from any fixed location within a range of 100 astronomical units (1 astronomical unit = 93 million miles, the mean distance from Earth to the Sun) — yes, even outside the Solar System. And Voyager is just as flexible with time. It can show you the firmament at any date from 1000 B.C. to A.D. 4000.

Click on any object, and Voyager pops open a data box. For example, star data includes name, Yale number, type, distance, magnitude, location coordinates, and more. The program also incorporates a search routine that locates objects by name, number, or descriptive adjective.

Voyager is chock-full of features — too many to detail here. It displays the outlines and names of constellations, such as the Southern Cross. It denotes Messier objects as well as binary and variable stars. It allows adjustment of magnitude (brightness) limits to control the number of objects displayed. It rotates the sky at a variety of rates. It can track the planets, showing their orbital paths with dot trails. It can display an orrery view (from above) of the Solar System. And it even permits you to define the orbit of a new object, such as a newly discovered comet.

Voyager comes with a selection of interesting astronomical phenomena (eclipses, planetary occultations, and some famous comets) ready to be loaded. It can save your settings for later use and output sky charts (use the White Sky option) on standard printers. Printed charts are automatically stamped with identification data.

HOW IT WORKS Voyager is fast. It doesn’t keep you waiting for information, and it moves you across the galaxy in warp drive. It’s also stable. In Finder or MultiFinder, the program is as dependable as Halley’s comet. Improvement? How about the ability to make your viewing location the startup default. Currently, you must save your settings and launch with that file. Picky? Well, there isn’t much to complain about.

Voyager is billed as “the interactive desktop planetarium,” but that’s only half of its potential. At the trade show where I first saw it, Voyager was interfaced to a good-sized motorized reflector telescope. When an object on the screen was clicked on, the telescope moved to the coordinates of the target. With the proper hardware interface (check with Carina Software), the Voyager database can serve as the foundation of an automated observatory — astronomy departments, take note.

Get Info

Voyager
List Price: $99.50
Published by: Carina Software, 830 Williams St., San Leandro, CA 94577; (415) 352-7328.
Version: 1.0
Requires: Two 800K drives or hard disk
Compatibility: All Macs with 1 megabyte
Application Size: 619K
Copy Protection: None

If you have any interest in astronomy or simply wish to have the universe in your Mac, buy this program. Voyager will never replace the experience of shivering in the darkness beneath a canopy of stars, nor will it match the theatricality of a real planetarium — but it delivers an unprecedented amount of astronomical information at an incredibly low price, and that’s no small feat.

Voyager is so good that it may even pry some users away from their Macs and into the nearest planetarium. Voyager will not only assist the current generation of astronomers but may also inspire the next.

— Carlos Martinez
One of the best arguments for owning the new generation of Macintosh personal computers is the new generation of Macintosh software.

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city-planning director stands at the front of a boardroom explaining how the city will expand its residential and commercial zones. The audience sits, ready to hibernate. On the screen, a digitized photo of a building site fades in. As the planning director speaks, roads extend themselves and buildings sprout in a simulated downtown. The presentation’s background music changes as statistics on city traffic appear on the screen in the form of a chart whose bars are composed of slowly accumulating cars. The audience watches intently for new changes as cars and buses move along the city streets, illustrating transportation bottlenecks. A subsequent scene shows new streets and freeways popping up around town. Inspired rather than expired by the presentation, the planners spend the next few hours hammering out the finer details of the city’s plan.

Once considered only an art form, animation is now being used in business for presentations, training, and simulation. Adding animation to presentations can give clarity and punch to a visual explanation. It also works wonders to lengthen short attention spans. An ordinary presentation seems passé when compared with the message that animation packages can convey.

Me, Animate?
Consider whether the message of a presentation or demonstration can come across better with the aid of animation. If the subject is sleep-inducing, you should definitely try to get movement into the show. For complex subjects, animation supports explanations, reduces hand waving and verbal garble, and saves time for everyone concerned.

You don’t have to be a highly trained professional to put together an animated presentation. With the programs we’ll be examining, MacroMind Director and Studio/l, all you really need is some familiarity with paint, draw, and perhaps presentation programs. With a little practice, you can create a decent animated presentation.

Animations are not as simple as still graphics. You’ll need to spend some time with samples, tutorials, and manuals. You’ll find easy shortcuts for effects that could have taken hours to achieve by hacking and guesswork. Both MacroMind Director and Studio/l come with sample animations and their components, such as cast members, graphic documents, and sound files. You can open them, examine their workings, and see what techniques were used. Experiment on your own, when not under production pressure, to see what you can create.
**Animation**

**Director: AutoAnimate a Graph**

Using Director's AutoAnimate dialog box, you can select predefined animated-text effects or self-rendering charts, and then fine-tune their action. The bars of the chart automatically grow from the minimum value to the value you specify. You can set the speed, start delay, and how long they linger after finishing. The Preview option is handy for making sure you have the effect you want.

---

**Interactive Animation**

After you’ve given movement and sound to your presentation, you can go one step further. The best demos and training programs are interactive, drawing users into the action and letting them navigate freely by choosing areas of concentration and skipping over unnecessary parts. Neither Director nor Studio/1 offers much interactivity beyond starting and stopping. Director, with its links, ease of use, and wide availability, is ideal for creating and using interactive training programs, but it offers no power animation tools. SuperCard builds on HyperCard’s features with color, movable objects, multiple resizable windows, and other enhancements, including script-driven animation, but it lacks the rough-and-ready animation horsepower built into Director and Studio/1. Fortunately, with a little help from some friends, you can combine the two Cards’ interactive abilities with the visual powers of sophisticated animation.

**A Seasoned Director**

MacroMind Director is currently the highest-powered animation tool for the Mac. Although it can’t single-handedly create everything you need, it can combine or animate just about anything you have. With its ability to synchronize a wide variety of graphic elements, text, sounds, transitions, and visual effects, Director is the lone choice for creating Macintosh-based high-end animated presentations.

Director’s still-thriving predecessor, VideoWorks II, was a breakthrough product in its ambitious scope and its interface. Director is far more capable than VideoWorks II, yet it’s even easier to use. To really rev up its dormant animation engine, however, you must read its excellent user manual to understand its symbols, options, and window-related modes.

Director can create text and graphics, as well as import art in MacPaint, PICT, and PICT2 formats from such programs as Studio/8, PixelPaint, Canvas, SuperPaint, MacPaint, and Glue. It can also import color palettes and sounds from various sources and animations saved as...
Scrapbook pages or in PICS or VideoWorks format.

**The Director's Overview**

Director has two easily switchable modes: Overview and Studio. The Overview mode is like a post-production facility in which all the elements of a show are assembled, tweaked, synchronized, and blended. This mode is the key to creating quick and slick presentations from existing art and built-in effects.

The AutoAnimate facility is a power tool that lets you create and control the timing and duration of animated effects with charts and text. It also serves as one of three direct links to the Studio portion of Director, allowing you to create custom film clips for presentations.

The Overview environment is much more than a slide sorter. It lets you easily sequence complex sets of events such as color fading in, music starting, and an animation sequence kicking off the presentation. If you were simply to lay in a sequence of scenes, your presentation would look a little rough and low-budget. Director includes strong editing capabilities for polishing a presentation.

**SuperCard Animations**

SuperCard (see "A Wilder Card," March '89) offers real windows and resizable, restackable, reshapable objects that you can animate with SuperCard's Move command. SuperCard's math, logic, and mouse-sensing functions let you calculate an object's intended path and speed on the fly, to suit the event, which means exceptional flexibility and power for interactive productions.

To create an animation entirely with SuperCard, you need objects and a script. The script identifies the object to be moved and the points it must visit. You can move the object from one point to another, along the perimeter of a polygon, or along a freehand curve. You don't even need a path object — any set of comma-separated x,y-coordinates will do. To simulate a car on a road, you create or import the car graphic, name it Car, and then draw a freehand or polygonal roadway and call it Road. Finally, write a short script containing the statement Move graphic Car to the points of graphic Road. That's it. You can optionally specify the speed of the motion and record the frames of action as a PICS file, which is exportable or playabale by SuperCard.

**Animated Agents**

Beyond interaction, there's another way to enliven your stacks — HyperAnimator (see NewsLinks, May '89), from Bright Star, contains an XCMD, RAVE, that lets you place talking characters into your stacks. Each actor has 16 images with eight facial expressions and seven lip positions. When the actors talk, their lips move to the correct positions and their expressions change. You create or import an actor in HyperAnimator's dressing room; save it to a stack; and create buttons to access and play it, a field into which to type what the actor will say, and a Talk button to cue the actor to speak.

Close on the heels of SuperCard comes a hyped-up HyperAnimator called SuperAnimator (release of which is planned for September). SuperAnimator is a stand-alone application written in SuperCard that provides color and gray-scale resizable actors. You can have a grand total of 127 images in an actor's file, with 32 speaking images. Bright Star promises better synchronization of lip movements with digitized sound and the ability to call up talking actors from as many authoring environments as are in common use on the Mac.

Claris and other software giants have included demos and help stacks with products such as MacWrite II, but the same processes are available and affordable for small-business and even home users. Occasional users may stick with HyperCard. For relatively little money, more sophisticated animations can be added with Studio/1 or animation and color with VideoWorks II. Or you may find that SuperCard alone — with its color, animation, and programmable capabilities — is the ideal, inexpensive way to go.

SuperCard is priced at $199. Silicon Beach Software is located at 9770 Carrel Center Road, Suite J, San Diego, CA 92126; (619) 695-6956. HyperAnimator costs $189.95. For information about it and SuperAnimator, contact Bright Star Technology at 14450 N.E. 29th Place, #220, Bellevue, WA 98007; (206) 885-5448.

— Laura Johnson
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Dr. David Brown of the All Creatures Veterinary Hospital in DeWitt, Iowa, knows what he wants. And he relies on Double Helix software to help him get it.

"I hate spending all my time on paperwork," he explains. "Now that we've got Double Helix, I'm not trapped in my back office anymore. So I can spend more time with my patients...and with my kids."

Dr. Brown's dogs, cats and horses create data-storage requirements every bit as demanding as those for human patients.

"With all the records we keep on the patients, their histories and their owners, we needed a really flexible program to manage our database. See, it used to take me all day to sit down and handwrite statements for accounts receivable. I hated it. And it kept me from seeing more patients, or from spending more time with each one."

Now, whenever Dr. Brown enters new information, Double Helix updates his patient files, mailing list and financial records simultaneously.

"I'm freed up now from billing, daily accounting and filing. A year ago, I didn't even have a computer. But I had a good idea of the format I wanted, and Double Helix adapted to it.

"It's incredible what Double Helix and the Macintosh® can do, and how simple it is to do it. If I ever go into joint practice, they've even got a 'multi-user' version where several users can get into it at once. I'm really just scratching the surface of what it can do."

Now that Dr. Brown has found a new source of leisure time, he knows exactly what to do with it.

"We'll never be rich, but we've got three great kids—10, 7 and 4. That's what it's all about, for me anyway. You know, small-town America."
Animation

Director: Make a heap of cars
Cars will climb the line and leap off onto a growing stack. One car was hand-done, and rotated copies were created automatically by Director's Auto Transform feature. The set of rotated cars was dubbed a film loop, and it was tweened by definition of four key positions. After tweening, the developed event in the score was pasted into other channels, a few frames apart, producing multiple staggered climbing sequences.

Director: Add more with Overview
In Director's Overview mode, you can assemble a custom presentation from existing animations and stills, and then add audio, textual, color, and transition effects. Here, the graph movie produced earlier is preceded by the sound of decelerating machinery, a short delay, and a venetian-blind transition. The show ends with a built-in sliding-text effect on a blue background.

and they're relatively easy to learn and use.

The most common need is to rearrange the order of presentation. By dragging a document icon to a new position, you can change the order of slides or the order in which items appear on a given slide. To help smooth the presentation and highlight key slides, you may use one of the built-in, customizable transition effects, such as fade or dissolve.

Sounds, such as music and lifelike speech, can emphasize particular slides or change the tempo of a presentation, but they might also cause problems—a slide might advance before a playing sound ends, for example. To ensure that the current scene will be displayed until the end of a sound, you must adjust the length of time the slide will be on the screen. Director uses stopwatch icons to time events. After you install one, you can set and change its time to whatever duration is needed.

Call Your Editor
The Launch Editor is a valuable shortcut for changing documents in your show. It bypasses the Finder and takes you directly into the program that created the document. Highlight the document and select Launch Editor from the File menu. Once you've made the changes, save the document and quit the program—you'll return to the Overview window, where your changes will be automatically reflected.

Fortunately, an Overview document doesn't actually contain its component documents—it serves as a table of contents for the presentation and has links to the elements, wherever they are. One document, such as a background, logo, or animation, can be used by more than one Overview document. Even though the Overview remembers where its component documents are on any mounted disks, it's a good practice to put all the documents into one folder. Director can even do this for you with its Gather Documents option.

Universal Studio
Director's Studio mode puts you closer to the backroom details of animation. It's a stage and movable-character animator in which movie frames are built from image layers—similarly to conventional animation. You draw characters or parts of characters onto individual transparent overlays and then stack them in the appropriate order for viewing.

Director supplies a full-featured painting environment for creating and editing the elements of the animation. Each element is a free-floating, separately controllable object, which makes a movie much easier to manage and change.
Most computer printers are sentenced by their own sheer bulk to lifelong confinement on a desktop.

But now GCC Technologies™ has created a printer for the Macintosh® with considerably more freedom than that. It's called WriteMove™, the "biggest" printer ever to come in an incredibly small package.

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Animation

Painting the Picture

Director paints in both black-and-white and 8-bit color. Although it's not immediately apparent, the program's bit-mapped--graphics power is on a par with that of the higher-end Macintosh color paint programs. It has the standard tools, including a widely configurable airbrush; special effects such as graduated fills, free rotation, perspective, and distortion; and a nearly unlimited variety of special paint effects such as lighten, darken, and blend, the degree of which can be user-specified.

Each painted object has an invisible registration point that helps line it up with preceding objects during playback. Director also has tools for rendering basic QuickDraw shapes that can serve as memory-efficient background objects and animated elements with special object properties.

All the World's a Stage

The stage, cast, and score are the metaphors of a Director animation. The stage is where the action occurs. Any created or imported graphic is automatically placed in the cast and considered a castmember. Director gives each castmember a short identifier for referencing and managing purposes. The Cast window is like a set of dressing rooms, where all the actors wait, ready to go onstage. Unlike real theater, however, Director lets you have multiple copies of the same castmember onstage simultaneously, each in a different location, stacking order, and size.

The score is a script—a to-do list that controls the location, stacking order, apparent size, and other attributes of each castmember, plus the start of transitions and sound effects. Like a 24-channel tape deck, it can control up to 24 simultaneous activities in each movie frame. Objects controlled by higher-numbered channels pass in front of objects in lower-numbered channels. Four additional channels control sound, film speed, palette changes, and transitions such as fades and dissolves.

Events recorded in the score can be copied and pasted from one part to another like spreadsheet cells. This system makes it easy to set up complex motion, change the location or synchronization of events, or alter the stacking order of castmembers—all without error-prone manual tweaks to the graphics themselves. Hundreds of frames can be dealt with as easily as one. Double hats off to MacroMind on that one.

To include a castmember in the action, you select the channel and frame number where its action will begin and then drag the castmember from the cast and place it on the stage. Director automatically annotates the score. Once your object is on the stage, you can drag it around while Director records its movement or move it incrementally and advance one frame each shift, or have Director tween it to your specifications. Although its tweening function is strictly 2-D, it can produce straight or curved paths between two or more...
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Animation

Key frames. You can vary the type of path curvature, as well as the acceleration and deceleration of the tweened object.

If you don’t mind the characters’ having a Swedish accent, they can even talk, using MacInTalk speech, which is text that has been converted to spoken English. You can import and play digitized sounds and music or pass timing cues to a MIDI sequencer (which can be another Macintosh) that drives one or more musical instruments.

Occasionally in theater, one actor takes over a role from another. The role remains the same, but someone else goes through the motions. You can do the same with Director’s cast members. You select the piece of the score that describes the path of cast member X, select cast member Y from the cast, and choose Switch Cast member from the menu. Poof! Instant understudy. You can replace, for example, an older model of a demo product with a newer model.

To obtain such effects as revolving titles, flashing signs, and shattering words, Director lets you create and animate bit-mapped text. Once set in place, it can’t be edited as text. Permanent text is available. It can be animated or globally searched and replaced and have its attributes changed at any time. Special effects with permanent text are severely limited.

For some color magic, Director offers color cycling and palette transitions. Basically, cycling is a wave of color sweeping through an area. With it you can produce intricate visuals such as shimmering oceans, flashing lights, and moving backgrounds, all in one frame. The palette transition is a gradual scenewide change from one color scheme to another. It can be used to mimic a sunset, sunrise, or weather changes or make other mood-altering shifts that can enhance a presentation.

To manage an animation project better, you can attach comments to any frame to note important changes in the action, characters’ entrances and exits, names of sounds, plans for future action, or notes to other mem-

### Different Kinds of Animation

**Painted Frame**

*Painted Frame*

This is simple flip-book animation. The background, characters, props — everything you see in a frame — is one painting. Editing can involve slow and intricate work in repositioning items and patching holes. This type of animation can play back at high speeds, regardless of the complexity of the scene, but generally it uses up substantial disk space.

**Stage and Movable Character Animation**

*Stage and Movable Character Animation*

Everything floats and is not permanently attached to anything else. Even though most of the items can be bit maps, each bit map is treated as an individual object. So it’s easier to do small positioning tweaks and major edits. The action slows as more animated elements are brought onstage. This type of animation produces relatively compact files. — Salvatore Parascandolo

### 3-D Animation: Super3D and Swivel3D

In its true sense, 3-D animation is somewhat like clay animation. Currently, several modeling applications provide it. Some have features for simplifying both the creation and recording of frames. These applications manipulate objects in fully-lensed 3-D space. You can rotate an item and see its previously hidden sides. There are true perspective and realistic lighting effects, with no need for mental calculation or guesswork.

Super3D from Silicon Beach and Swivel3D from Paracomp are two widely used world makers. They can create complex shaded renderings, execute tweaking and export frames as either Scrapbook pages, sets of individual files, or PICS files. When a movie is exported in any of those forms, it loses its 3-D nature and becomes a series of sequential snapshots of the 3-D world. Both programs work in monochrome and color and provide a wide range of hues. They offer options such as wire-frame or fully shaded display; extensive abilities to create, combine, and edit objects; and the ability to change the viewpoint on the world in both angle and magnification. Each can also build, modify, and animate a 3-D scene from simple text instructions. There are some important differences between these two programs, however.

Super3D’s interface looks like that of an object-oriented drawing program. Objects have handles that can be used to stretch, compress, and reshape them. An object can be dismantled into its component polygons and the parts removed or replaced. The program can use multiple copies of a master object and automatically reshapes all the copies when the master is changed. You can even make all copies of a given master object invisible when you don’t need them, which lets you powerfully control the contents of a scene without manually removing and adding items.

Swivel3D’s interface is less orthodox but more natural. Screen redrawing is exceptionally fast. You create an object by entering the construction mode and drawing the object’s cross-section, side, and top views. You can reposition, resize, and spin objects by dragging them with the mouse or with a modifier key depressed. Objects can be combined into swiveling, sliding, or locked mechanisms while retaining their editable individuality. Each object’s pivot point can be set for more-natural motion. Swivel3D objects can cast real shadows, and colored images can be wrapped onto the curved surface of a 3-D object. A painted rocklike texture on a 3-D lump can add striking realism to your world.

Swivel3D costs $395. Paracomp is located at 123 Townsend St., Suite 310, San Francisco, CA 94107; (415) 543-3648. Super3D is priced at $495. Silicon Beach Software can be contacted at 8770 Carvel Center Road, Suite J, San Diego, CA 92126; (619) 695-6956.

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Animation

You select any text or image-area object and apply an animation effect to it. You can either specify starting and ending positions, using x,y,z-coordinates, or use one of the predefined animation templates that are included. As you browse for effects, the preview window shows an animated sample of the highlighted template. This one is a home brew. Trailing images are a built-in option.

Both the profits bar and the pollution pile were grown with tweened distortion. You select an area, opt to distort it, and then set up its beginning and ending shapes and the number of in-between frames. The profits bar was grown first, and then the pile began its growth after a two-second pause. After vertical growth, the pollution pile was further tween-distorted toward the profits bar.

Direct from the Desktop

Director is a professional tool that lets you easily add interest and clarity to conventional graphics. With its Overview mode, you can hit the ground running — assembling a custom presentation in minutes from existing components. In the Studio mode, you can import or create simple or sophisticated graphics, and you have the means to create plain or complex motion. You won’t instantly become Walt Disney or produce a space-shuttle simulation in your first five minutes, but with experience and experimentation, you can be a prime mover.

The Little Studio That Could

Studio/1 has two basic talents: It’s a full-featured monochrome painting program and a painted-frame animator. Its tool sets are complete and rich with intelligent options, shortcuts, and special effects — and they’re easy to use.

Studio/1 can be used for low- or high-resolution painting, scanning and editing 1-bit TIFF images at resolutions of up to 300 dpi, obtaining dynamic titling effects, illustrating mechanisms and processes, or producing action segments that can be played back from within Director or by HyperCard or SuperCard under interactive control (see “Interactive Animation” sidebar).

The program shows obvious efforts to overcome some inherent limitations of paint-only animation. For example, new objects and selections can temporarily float above the painted background. While floating, an object...
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Its selection tools include a free-form lasso, polygon, and rectangle. When combined with different selection modes, these tools let you quickly isolate parts of an image, which you can alter, using transformations such as rotation, perspective, bending, and free-form distortion. An area can even be masked to protect it from any editing action, including a full-document erase.

The draft page, a serious goof-reducer, is a spare work area that overlays the document and that can be painted like any other document. The draft page can be transparent so that you appear to be working over existing art without disturbing it. You can cut and paste items from the draft page or merge the entire draft page with the underlying document.

Your Anim Mate

Studio/1's extensive set of animation tools can help you pack plenty of movement, excitement, and entertainment into your frames. Studio/1 can tween motion, rotation, size changes, and distortions when supplied with the beginning and ending states of an item.

You may want a logo to revolve as if it were painted onto a slowly rotating cylinder, or you may need to send a propeller spinning off into the sunset along a diagonal path, going faster as it moves away. No sweat.

Although Studio/1's world is a flat, 2-D surface, Studio/1 can apply distortions, visual perspective, and scaling to objects as if they were moving in 3-D space. Because your object is only 2-D, it behaves like a paper cutout dancing in space. As it spins, you won't see its back faces come around. Even with this limitation, the effects can be quite striking.

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tween and adjust key frames. You may even specify the pivot point of an object so that rotations and other operations occur relative to that point rather than to the object’s visual center.

If you feel too green to tween, Electronic Arts supplies a set of tweening-effects templates with proper x, y, and z start/end values already filled in. All you do is select a part of the drawing as the subject and go shopping for an effect. As you browse, you can automatically preview each effect’s action. You can use the templates as they are, customize them, or make your own.

Studio/1’s version of a film loop is the animated brush. You first produce several frames of animation, such as the poses of a flying bird. You then select the bird in all its frames with a multiframe “cookie cutter” option and use the selection as a brush. As you move the brush across the screen in Recording mode, the frames play in a cycle, causing the bird to flap its wings. When the sequence is played back, you see a bird flapping from one end of the screen to the other.

Sounds can be associated with any

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**MacroMind Director**

Folllows Mac Interface 5
Printed Documentation 5
On-Screen Help 5
Performance 5
Support 5
Consumer Value 5

Comments: Clearly the best-equipped tool for creating color Macintosh animations for demos, presentations and entertainment. Best Features: It can import, sequence, and orchestrate truly impressive audiovisual events. Its self-contained, object-oriented animation capabilities provide virtually limitless editing freedom. Worst Feature: Large or numerous objects on stage slow the action significantly. List Price: $695.

Published by MacroMind, Inc., 410 Townsend St., #408, San Francisco, CA 94107; (415) 442-0200. Version 1.0 reviewed. Requires Mac Plus or SE with two 800K drives for monochrome work, Mac II with hard disk and 2 megabytes or more of RAM for color productions, System 6.0.2 or later. Not copy-protected.

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At ZIPATONE, Inc., we’ve been creating transfer lettering for design professionals for the past 35 years. So you know our standards are high.

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We’ve created what every Mac user wants: professionally executed Postscript display typefaces at an affordable price.

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We teamed up with Brendel Informatik GmbH, one of Europe’s leading typographers, to lower the cost -- but not the quality -- of professionally designed Postscript typefaces.

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918 Postscript text typefaces arranged in 145 families.

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We can’t show you all 918 Postscript typefaces in this ad.

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Since 1985 Ehman has been manufacturing the highest quality Macintosh peripherals since 1985, giving us advanced technical design skills, manufacturing expertise, and back-up service from skilled personnel.

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*Good on Macintosh II only, not RF Drive also available. All product names mentioned are trademarks of their respective companies. Please circle 131 on reader service card.
Moving Write Along

With the 1.4 Mb capacity of Apple's new, high-end computers and no upgrade for older computers, your Macintosh is becoming extinct. So, just throw it away and buy a new one.

Too extreme? Well PLI has the practical solution: the TurboFloppy 1.4.

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Two time-saving utilities are included FREE: Turbo Cache, a disk accelerator using transparent caching for up to 300% increase in drive performance, and TurboBack, the fast and easy back-up application for people who don't like to back-up.

Avoid extinction with TurboFloppy 1.4.

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frame. You simply go to the frame where you want sound to start; click on the Sound button in the animation-control panel; and choose a sound, which can come from any file that has SND resources, such as the System file or a MacRecorder sound document.

Studio/1 imports MacPaint, PICT, TIFF, EPSF, and PICS files from applications such as Swivel3D, Super3D, and VideoWorks. It exports files in MacPaint, PICT, TIFF, and PICS formats. Its Open dialog has a time-saving thumbnail preview facility that lets you see single illustrations or multiframe animation documents. You can preview MacPaint, PICT, TIFF, PICS, and Studio/1 files. Animation files actually move during preview.

Final Frame

Studio/1 is an excellent and versatile black-and-white painting program and capable animator. The painting and animation interfaces mesh well. With Studio/1's special effects, applied artistry, and time, you can produce animations of biblical proportions, but when you plan to create big, complex projects, you'll want to migrate to MacroMind Director and use Studio/1 as a respected contributor to the production.

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See us at MacWorld World Trade Center Booth #5344

Please circle 144 on reader service card.
As the font wars heat up, you need a map to navigate the alphabet soup. Here's your Guide to Fonts, from hints to metrics.

By Steve McKinstry

My earliest encounter with typefaces came in the first grade. I had a choice of two: cursive and printing. Changing fonts was easy. For boldface I pressed hard on a black crayon, and for italics I used my left hand. This newly discovered typographic control went largely unnoticed, thanks to teachers who thought my letters more cuneiform than uniform.

I finally turned those hen scratches into perfect type with the Macintosh, using sophisticated typographic tools once available only from expensive typesetting machines. The Macintosh's abilities are now famous, and type manufacturers who once saw the Macintosh as a typographical footnote are now falling all over themselves to make headlines. In the wake of these new type designs, Apple and Adobe Systems are in a feeding frenzy over font-technology standards, adding further confusion to the issue of which printers and libraries to buy.
As manufacturers of PostScript clones and font utilities fight over the leftovers, users blitzed with new buzzwords such as hints, encryption, metrics, and font-ID conflicts must also consider the quality of type design. Even if you like a typeface, it may not like your programs, your printer, or your pocketbook.

To keep you afloat, we've compiled a typographic primer, with some basic facts on how type works and who's making the type you want, as well as some fundamentals of good type design, while warning you of hidden hazards. We'll also throw you some lifesaving utilities for font management and manipulation.

The ABCs of Digitized Type

The advent of digital type has made type design more flexible, portable, and accurate than ever before. What's more, its movement to the personal computer gives you access to virtually any digitized face, delivered on one piece of affordable machinery.

Today, companies such as Adobe (Mountain View, California) and Bitstream (Cambridge, Massachusetts) use large workstations and proprietary software to digitize original typefaces or to convert already digitized outlines to PostScript format. Some companies, like Adobe, use artificial-intelligence programs to add hinting—the process by which quality font rendering is produced at small point sizes on low-resolution printers (see Figure 1). Companies with more limited resources use off-the-shelf font editors such as Fontographer from Altsys (Plano, Texas) to create original Mac typeface designs by using Bezier curves (mathematically optimized lines and arcs).

After the originals have been digitized, fonts on the Mac are developed in two basic formats: bit maps for the screen and ImageWriter output and PostScript fonts for laser printers. New font technologies, including Adobe's ATM (Adobe Type Manager) and Apple's outline format (see Fine Print in this issue's DTP section), will allow fonts for display and printing to be generated from the same PostScript description, but for now, it's a world divided. (Both schemes provide high-resolution type on-screen without the bitmap jaggeries we have come to know and hate.)

As it is, the screen fonts you see are not what you want. They're mapped to a crude 72-dot-per-inch (dpi) matrix of square dots or pixels. Bitmaps do not enlarge or reduce without distortion, so fonts loaded into the System file must be optimized for a particular point size to get the smoothest resolution on-screen. This means you must load screen fonts for every size into your System, since fonts look increasingly jagged the more they're scaled from an optimized size (see Figure 2).

PostScript typefaces, on the other hand, are independent of the screen and consist of a series of PostScript commands that mathematically define the line paths and arcs that make up each character's outline. A printer equipped with a PostScript interpreter uses a single outline description of a font to scale it up or down within a range of 2 to 127 points.

PostScript fonts are either resident in the printer's ROM or downloaded into its RAM, and they're substituted for the screen fonts for printing (for more on PostScript printing, see "Fit to Print" in this issue). The printer looks for the outline first in ROM, then in its RAM, next on a hard disk attached via a SCSI port to the printer, and finally in the System Folder. Apple's current System continues to download fonts as needed. If it can't find a PostScript description for a font, the printer substitutes a similar font—Times for Baskerville, for example—or constructs a bitmap equivalent that produces ragged results. Downloaded fonts stay in the printer's RAM until you switch the power off.
Type separates into general categories of display and book fonts. Display fonts are used for larger text such as titles or headlines and usually require no hinting. Book fonts are meant for smaller sizes such as long runs of book, magazine, or newspaper text. Without hinting, they can provide excellent results at 600 dpi or higher and proof-quality type from a printer at 300 dpi or less. With hinting, they can provide excellent results on 300-400 dpi machines, but some people believe that important design information is lost at higher resolutions.

On the Font Battlefront

The LaserWriter is built by Apple, but the PostScript interpreter and 35 standard fonts (11 faces) resident in the LaserWriter’s ROM are licensed from Adobe. Most of the typefaces Adobe uses are, in turn, licensed from Linotype or ITC via digitized originals created by URW (West Germany). Adobe converts these outlines to PostScript format, adding hints and encryption that encode the fonts in a format only the PostScript interpreter can translate. Until now, this situation treated any downloadable font not playing by Adobe’s rules as a second-class citizen. A printer or font manufacturer wanting to print with Adobe’s encrypted-font technology (classified as Type 1 fonts) needed to license Adobe’s PostScript interpreter or font technology, which made printers more costly and type slower to process.

Relief was forthcoming. This year, Bitstream and RIPS broke Adobe’s font-encryption code. Bitstream now supplies most of its high-end library in Type 1-compatible encrypted fonts for use on high-resolution typesetters equipped with Adobe’s PostScript interpreter. RIPS manufactures PostScript-clone interpreters for use in PostScript-compatible printers. At the same time, font manufacturers such as Bitstream and URW are digitizing huge libraries of type with hinting schemes of their own. Apple jumped in with its QuickDraw (non-PostScript) font technology for producing high-quality screen and printer fonts, complete with hints (called instruction sets), and made it available to any third-party developer.

Adobe responded to this pressure by licensing its font encryption and hints to other type manufacturers such as AGFA Compugraphic (Wilmington, Massachusetts), Monotype (Chicago), and VariType (East Hanover, New Jersey) and its interpreter or controller to printer manufacturers such as Canon and AutoLogic. If the libraries from these typemakers are converted to the Adobe format, they will form the largest electronic-type library in the world at about 6,000 fonts. Of the 3,000 faces now available in the Linotype library, about 487 are available for the Macintosh from Adobe, including original designs such as the Stone family.

The Typemakers

More than 25 font companies are currently marketing PostScript downloadable fonts. Bitstream, formed in 1981 by former Linotype employees,
The BigBin 1000.
Because 200 sheets is not enough.

The BigBin is a motorized paper tray that replaces your LaserWriter II's old 200-sheet paper tray to give you 1,000 sheets of paper. That means you can print bigger jobs unattended. Satisfy the paper-hungry needs of a Macintosh network. And spend less time refilling paper.

**Sizable advantages** BigBin lets you load 1,000 sheets of letter-size paper. All at once. You can even add a kit that handles legal-size.

**Simple addition** BigBin is a simple addition to your computer system. Just replace your printer's paper tray with BigBin and plug it into the wall. It's fully approved by Apple Computer for use with Apple LaserWriter IISC, LaserWriter IINT, and LaserWriter IINTX. And BigBin is covered by a limited 90-day warranty.

Despite the big name, BigBin needs only about a foot of space in front of your printer, and it weighs in at only 14 pounds.

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Fonts from A to Z

During the 1700s, typestyles slowly evolved from Old Style such as designs of the punch cutter Francesco Grifo, to Modern and the designs of Giambattista Bodoni. Typefaces from the middle of the eighteenth century, including those by John Baskerville, are called Transitional. The contrast between thick and thin strokes is greater than in the Old Style faces. Lowercase serifs are more horizontal, and the stress within rounded forms shifts to a less diagonal axis away from handwriting.

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offers stiff competition to Adobe. With the Bitstream Type Library, MacFontware, and SoftFonts for the Macintosh, and with comparable fonts in the PC market, Bitstream is taking the high road to type quality by remaining true to original typefaces. The majority of its nearly 1,000 faces are available as encrypted, unhinted fonts (classified as Type A) for printing on high-resolution printing devices that use Adobe’s PostScript interpreter (such as the Linotronic) or as unencrypted, unhinted fonts (Type C) for low-resolution PostScript printers. Plans call for hinted fonts (Type B) for printers equipped with Bitstream’s FontWare Typescaling Technology.

MacFontware is a 40-face, 16-family library of unencrypted, unhinted fonts that print on LaserWriters and PostScript-compatible clones. Designed to be device-independent, MacFontware installs like Adobe’s fonts and delivers proof-quality type at small point sizes on low-resolution machines. SoftFonts, a 35-face, 11-family library, are bit-mapped screen and printer fonts designed to print well on QuickDraw printers such as the LaserWriter SC and the ImageWriter. Bitstream supplies PostScript versions of these faces, which match Adobe’s metrics and are used as the resident faces on clone printers.

AGFA Compugraphic has released its library of CG fonts in the Studio Series. Created in Fontographer format, they were chosen to complement rather than duplicate what is already available elsewhere. Its Professional Series will offer fonts under the company’s license with Adobe.

URW’s 2,000-typeface library is being marketed by The Font Company (Phoenix, Arizona). As the official digitizing agent for ITC, it digitized many of the original typefaces licensed by companies such as Adobe. It differs from Adobe by producing unhinted type, maintaining that hinting requires “generalized” font designs with reduced control-point information (see Figure 3). It’s aiming instead for the high-resolution (greater than 600 dpi) typesetters. Because of the extra font information, URW’s fonts require more disk space and printer memory. Also, URW faces include many special characters (ligatures) and kerning pairs. More than 200 faces are currently available in its Typographic Series. The Display Series is available as PostScript fonts and as files that can be opened in Illustrator 88 or FreeHand.

Kingsley/ATF (Tucson, Arizona) is one of America’s largest type foundries with 20,000 typefaces. Its first product, ATF ProType, will be sold in packages of up to six fonts. Some packages will offer ATF’s hinting technology to compete with Adobe’s, but the library will be largely display faces. Each package will have utilities to generate screen fonts and modify kerning. Another product, ATF Type Foundry, is similar to the
**SOFTWARE**

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Fonts from A to Z

Font Toolbox Revisited

Aldus’s FreeHand and Adobe’s Illustrator 88 each have typographic-manipulation tools for custom effects on typefaces already in the System file or on type examples scanned and traced with Bezier curves. Font outline (stroke) and interior (fill) can be set to individual weights, shades, and colors. Colors can be separated into CMYK, gradated, or created in tiled patterns. Typographic effects such as leading, letter spacing, and the ability to rotate, skew, flip, and scale are offered by both programs. FreeHand also gives you text bound to a path, horizontal spacing, and special zoom effects and lets you mix text in different fonts, sizes, styles, and colors in the same text block. Adobe’s Collector’s Edition comes with a generic serif and sans serif face with editable lines and arcs. Aldus is located in Seattle, and Adobe Systems is in Mountain View, CA.

QuarkXPress 2.1 from Quark (Denver) includes a feature for accessing the kerned pairs on PostScript fonts. Changes in kerned pairs can be exported from or imported to other fonts in the same family. Unfortunately, the information is stored in the data file and is not available to other systems or a service bureau, unless they use your copy of the program and data file.

MacKern from ICOM Simulations (Wheeling, IL) lets you adjust the font metrics for kerned pairs and optionally update them to new settings. The program can check resource-ID numbers and allows the user to reassign numbers if there is a conflict.

SmartArt from Emerald City Software (Menlo Park, CA) is a DA that creates special effects such as shadows, fades, and angled text from any Postscript font in your system. You can select the text’s size, rotation, kerning, angle, and percentage of gray. Results are saved in EPSF for pasting into other programs.

LetraStudio from Letraset (Paramus, NJ) manipulates the fonts of the LetraFont Library. These fonts are not installable or downloadable but exist as graphics files. Effects include the ability to color, reshape, skew, distort, create a drop shadow, overlap letters, rotate, scale, and change fill and stroke weights. Eighteen basic shapes can be applied with movable handles to bend, stretch, shrink, curve, or slant text. The program has basic drawing tools and can track, kern, size, print, save, and paste into other page-layout applications in PICT or EPSF formats.

LaserFX from Postcraft International (Valencia, CA) was one of the earliest programs available to upgrade to 30 special PostScript effects on system fonts. Drop shadows, gradations, skewed and angled outlines, and decorative fills are among the features. Type can be saved and pasted into other programs.

Broderbund’s (San Rafael, CA) TypeStyler can apply an array of special effects to type created in Fontographer. Type can be saved in PostScript outlines, complete with editable anchor points. These outlines can be exported to graphics programs for additional manipulation. Results can be printed directly or saved in several standard graphic formats.

LeiTack from EDCO (Tampa, FL) lets you choose a font to edit, select a kerning pair from a table, and adjust its spacing. This information becomes permanently attached to the font for any application you use. Files can be reedited at any time.

Access to fonts is available through font-management utilities, some page-layout programs, or the font-metric files shipped with typefaces. Shown here is the kerned value for LV edited in Quark XPress 2.1.

program ATF uses in-house to digitize fonts and will let users create outlines for their own fonts.

Casady & Greene’s Fluent Laser Fonts were some of the first downloadable fonts in Fontographer format. Now, Image Club (Calgary, Alberta, Canada) plans a 600-typeface library of PostScript fonts on CD-ROM discs. Fonts will also be available in editable outlines that can be manipulated in programs such as Illustrator 88. Altsys, creator of Fontographer and an early supplier of PostScript fonts, is not currently adding to its library but may have its fonts distributed by a third party in the future.

Other companies marketing type designs worth looking into include Alphabets, T/Make, ElectricTypographer, MacTography, Olduvai, Treacy Faces, Springboard Software, Studio 231, EmDash, and Dubl­Click Software.

Type and Meter

On one level, selecting from this embarrassment of riches is one of preference. Either you like the way type looks or you don’t. But good type design is also based on traditional principles of shape, spacing, weight, and rhythm as guided by the eye of a good type designer.

Metrics establish the basic height and width of the area surrounding a letter, dictating the spacing, or “set width,” between characters. If the basic metrics of a font’s set width aren’t to your liking, you can change them in certain programs with kerning controls that adjust the spacing between letters and words. Most page-layout programs have a tracking feature that allows custom kerning, but kerning can also be set in the typeface through the use of kerned pairs that optimize the spacing between certain problem characters (a capital A next to a capital V, for example). A well-designed typeface can have 120 to 500 kerned pairs.

The basic building block for a typeface is the em square: The letter M has the largest width and height dimensions of any character of the alphabet. Letters are designed on an em square broken into units to establish vertical measurements of baseline, meanline, x-height, ascender, descender, and cap height. Horizontal measurements, called side bearings, maintain the width of a character.

Differences in measurements are nothing new, but now that type manufacturers are producing type with their own metrics on their own machines,
discrepancies are more evident from font to font and system to system. For example, if you create a document in Bitstream’s Baskerville and open it in a system that has only Adobe’s Baskerville, the first problem will be a font-ID conflict, because the font-ID number of Adobe’s font is already taken by Bitstream (for more on font-ID conflicts, see “Fonts by Number,” July ’89). Selecting the text and switching the two will correct the ID problem, but the line endings and page breaks might not be the same as before (see Figure 4).

The problem is compounded when measuring systems and font attributes such as stem weights (the vertical strokes of a letter) are not kept to traditional standards. Normally a designer makes small variations in the stem weight from character to character for a more pleasing look. Some type designers, however, use the same stem weight for all vertical strokes, compromising the design quality and changing the overall set width of a line when compared against the same face from another manufacturer (see Figure 5).

Adobe, for example, is standardized to 72 points to an inch, the same as the pixel resolution of the screen. Bitstream, on the other hand, maintains 72.289 points to an inch, in keeping with the original standards of the American Point System. At large point sizes, this discrepancy can show up, especially if you’re trying to maintain the same typographic values when switching your publication from traditional typesetting to the Macintosh or when you’re mixing and matching typefaces on different systems.

Bitstream uses the same metrics in MacFontware that it does on the PC, so line endings are the same from the two systems. Before buying, check display and book samples for basic character spacing and line-count matches. Bitstream supplies 35 resident faces from 11 families for the Quine CrystalPrint Publisher, for example. These fonts are Set Width Adjusted (SWA) to exactly match Adobe’s resident fonts in the LaserWriter.

**True to Form**

The quality of a typeface can also be judged by its adherence to its original forms. Often, the roots of an original typeface are blurred by copies made at different times by different font developers. In contrast, when Bitstream wanted to include a Palatino face in its library (Palatino is licensed by Adobe), Bitstream brought in Hermann Zapf, the original designer, to supervise the design of a new Palatino-like face. The result was Zapf Calligraphic.

In turn, Adobe has introduced a new line called Adobe Originals, which includes Utopia and a new version of Garamond that was extensively researched from recasts of original Garamond matrices in the collection of the Plantin-Moretus museum in Antwerp, Belgium. The Original Series has a special 144-character Expert Set that features extended sets of ligatures, titling caps, old-fashioned numerals, flourished caps, and more.

Nostalgia aside, many designs have been improved by new technologies and better printing methods. Bitstream Charter, for example, straightened serifs to avoid curves, which print poorly on low-resolution machines. In exchange, a unique typeface was born that was economical in construction and design (see Figure 6).

Consistency of stem weights, hairlines, and serifs from character to character (or between italic, bold, and bold italic) also indicates precision in designing a face. On the other hand, some letters such as the O and A should vary from the other letters, extending beyond the cap height because of an optical illusion that makes them look shorter if they don’t.

To evaluate type, you must also consider its use and mix with other type. With thousands of fonts to choose from, don’t overdo it. Pick a few faces that provide unique tex-
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In this illustrated glossary, some typical typesetting terms are defined by example. (Note: Thin space defines half an em space and refers to a fixed amount of space between words or characters, although it's shown here as a ratio.)
tural contrasts of heavy and soft, light and dark, serif and sans serif, and you'll have the beginning of a well-designed page.

**Future Fonts**

Time will tell if PostScript clones, type libraries, and Apple's new outline-font technology erode Adobe as de facto Macintosh type standard. Adobe plans to support Apple's technology with utility-conversion software, but don't expect typeface support for third-party QuickDraw printers or PostScript clones. To compete, clones may need hinted typefaces of their own and their own conversion utilities to support Apple's new font technology.

Service bureaus will also be under pressure to support the typefaces and printers customers eventually choose.

Supporting and fixing incompatibilities from font-ID conflicts and different metrics may result in higher charges from your bureau and more work and expense for you. Adobe's ATM may reduce your reliance on screen fonts, but before you drag them into the trash, consider the expense involved. Many designers use screen fonts lent from their service bureau. Switching to ATM will require the printer font as well.

Users concerned about typefaces and printers may see Adobe's fonts as their safest choice, at least for now. They are proven performers on thousands of installed printers and well supported at the service-bureau level. In addition to Adobe's own type design releases, more are on the way from licenses, but not necessarily with the same metrics. For those who want their typefaces to look good on printers of varying resolutions, Adobe's hints are the envy of the industry, and ATM will work on any Adobe font you own.

Even so, limiting yourself to one type manufacturer may deny you some unique typefaces, and you won't be able to take advantage of the savings offered by competitive fonts and printers. It's possible to mix and match, but only by shopping around, asking the right questions, and defining your output needs will you and your Mac be able to put on — to use a bad pun — a happy face.

Steve McKinstry works with DPI In San Francisco, specializing in design consultation and the conversion of publishing companies to DTP. His clients include U.S. News & World Report, PCW Communications, and The Chicago Tribune.
The Expert Is In

Figure 1: An Overview of Nexpert Object

This diagram describes the interplay of Nexpert's objects, rules, and control structures. Objects are Nexpert's way of understanding the world. Nexpert's rules determine those objects, and its inference capabilities include forward and backward chaining. The non-linear model emphasizes abstract relationships: Turned sideways and upside down, it can still make sense.
Expert systems are like idiots savants. Like Dustin Hoffman's character in the film Rain Man, they have exceptional ability in only one area, the task they're built for. But that's the secret of their success. In fact, expert systems are the most commercially viable part of the multifaceted field of artificial intelligence (AI).

Expert systems first proved their practical power at Stanford University in the early '70s with MYCIN, a program that provided advice on bacterial blood infections and meningitis to physicians who weren't experts in hematology and neurology. MYCIN was viable but not as a general-purpose savant. It could explain why it required information and how it drew a conclusion, but it could make a diagnosis only after precise input, and it was accurate only 65 percent of the time. (If that seems low, consider that MYCIN's human counterparts accurately prescribed treatment only 42.5 to 62.5 percent of the time. Idiots savants indeed.)

Expert systems are decision-making tools. They capture knowledge from human experts and make it available quickly and accurately. But expert systems don't provide black-and-white answers as tax-deduction programs do. Their answers are good rather than perfect. That's because expert systems manage expertise. When we speak of data repositories on computers, we call them databases. But data is only a small part of a business equation. A human being must look over the data to identify meaningful patterns — using a unique ability we identify as intelligence. AI researchers hope to capture that intelligence one day, but in the meantime, in the limited areas in which expert systems are applied, they have made tremendous progress. In many cases, expert systems perform more consistently and more quickly than their human counterparts.

Expert systems are currently in use in a wide range of business areas. BehaviorTech, for example, has developed an expert system called Exemplar to help reinforce learning in training situations. Federal Express moves your overnight deliveries through rapid and complex trails by means of inventory-control and customer-service expert systems. At Motorola, home of the microprocessor that powers your Mac, an expert system called Helpdesk walks customer-service representatives through service-request calls and then guides callers through hardware and software solutions for the computers it is programmed to offer advice on. In the financial area, Peat Marwick Main & Co. has developed another expert system, Loan Probe, to evaluate loan applications.

If expert systems can serve in such important roles, then why do many management-information-system (MIS) directors continue to deride them? The first reason is political. In many cases, an expert system is a grass-roots effort that travels paths outside traditional MIS development procedures, threatening the MIS "priesthood." The second reason is technical: Expert-system technology is difficult to introduce when you're up to your neck in broken-down FORTRAN code and inundated with requests to enhance existing manufacturing, accounting, and engineering systems.

The technical issues should be easier to deal with than the political ones. Expert systems are not that complex if they are programmed well. When the MYCIN experiments were over, Stanford researchers realized they had done some fundamental research on a new class of programs. By stripping out the expert knowledge on blood from MYCIN, they retained the shell of the program. Today we continue to call expert-system programming packages shells.

A dozen expert-system shells are now available for the Macintosh. We provide some quick takes on them here. Newcomers to the field can take a detour now to get some basics on the structure of such shells by reading the "Anatomy of an Expert-System Shell" sidebar. Those who are already familiar with expert systems should stay in line to read about Nexpert Object, one of the hottest expert systems on the Mac.
The Expert Is In

At Koller Partners AG, Nexpert Object, a solid-modeling system, and the Oracle database are used to transform design ideas into production documents and machine data about factors such as machining time and machining costs. Koller, like many other manufacturing companies, faces the problem of keeping its design engineers in touch with manufacturing reality. Koller's system, CP-ES (Computer Aided Planning-Expert System), interacts with design engineers to verify that designs are correct. The CATIA solid-modeling system is for building detailed views of machined parts. At any point during the designing process, Nexpert can be invoked to check the consistency of a design against engineering standards or to verify that a part can actually be manufactured. Design engineers can also call expert-system functions to obtain accurate estimates of machine time and costs for the incipient part.

Nexpert's knowledge-processing skills are also valuable inside factories. At Pirelli Tires, total quality control means a visual inspection of each tire. As details about defects are brought to the quality manager, he must make changes in the manufacturing process to prevent future defects. The quality manager often has to choose among several possible solutions to decide which is the most cost-effective and most important to implement. With Nexpert Object, two knowledge engineers, two experts, and about six months of intensive work, Pirelli developed the Total Quality Assistant, or TQA. TQA gathers defect data from the factory, defines repair actions, and computes the cost of various solutions. TQA is currently installed in one of Pirelli's Italian tire factories.

Navigating with Nexpert Object
As the glow of Mac II screens cascades over cubicles that seem ripped from the side of a Sherman tank, Neuron Data engineers are honing one of the most innovative programs on the Macintosh. Nexpert Object, a $5,000 hybrid expert-system shell, may seem esoteric and costly for the practical Macintosh, but this AI tool, with its sophisticated interface, is far from esoteric. With an estimated 40 percent of the high-end expert-system market, Nexpert Object competes with LISP-based tools such as Intellicorp's KEE, Inference's ART, and Carnegie Group's Knowledge Craft. All of these systems are hybrids, mixing the traditional AI world of logical declarations with the expressiveness of intelligent object-oriented programming, but they require $35,000 to $200,000 LISP machines, plus $10,000 to $50,000 in software. No wonder such systems have been branded esoteric.

Nexpert functions on a Mac Plus with 1 megabyte of RAM for the comparatively low startup cost of $5,000. And with the exception of custom interfaces, Nexpert systems developed on the Macintosh are fully transportable to IBM PCs; Apollo, Sun, and Hewlett-Packard workstations; VAX minicomputers; and IBM mainframes — another key reason for its market share.

Lower-priced and less-capable expert systems such as MacSmarts, Instant-Expert Plus, and Level5/Macintosh are excellent products for small stand-alone applications. Many of these shells can be linked to HyperCard or Excel, but they lack the richness of the Nexpert Object environment. Nexpert's ability to act as an embedded logic engine in computer-aided-design (CAD) software or gather information from mainframe databases puts it in a class above its entry-level cousins.

The Structure of Nexpert Object
Developing systems in Nexpert is a pleasure. Nexpert's hybrid design combines rules for inferencing and control with objects for representing things and ideas (see Figure 1). A highly graphical interface provides editors for rules, objects, classes, and other Nexpert elements. Nexpert's editing environment makes extensive use of pop-up menus to help simplify entry and save keystrokes associated with commands. Systems such as OPS5 and Level5/Macintosh, on the other hand, restrict developers to text editors during development. OPS5 works in the LISP environment, so its rules become available after entry, but syntax checking is nonexistent. Level5/Macintosh uses a compile-and-run method that checks syntax when it is compiled, so its rules are not available until a successful compile is completed. With Nexpert, rule syntax is checked rule by rule after the OK button is clicked. Once the rule is entered in the editor, it becomes an active member of the current knowledge base. Objects, classes, and other elements are also incrementally compiled.

With OPS5, graphic representations of rules are impossible unless you write your own LISP code or travel to expensive OPS5 environments such as ART or Knowledge Craft. And Level5/Macintosh provides only a simple and difficult-to-read rule tree. With Nexpert, network...
windows visually describe the relationships between rules and objects in a knowledge base (see Figures 2 and 3). These networks are not snapshots in time but living documents updated during a Nexpert consultation that illustrate what rules have been "fired," the direction Nexpert is heading, and what objects and classes have been affected by the session.

The editors make Nexpert easy to use, but it's the inference engine that gives Nexpert Object its reasoning power. Nexpert's primary inference methodology is called opportunist reasoning. In most expert systems, designers must choose between a forward- or backward-inferencing engine. Backward-chaining systems such as Level5/Macintosh begin their inference with a conclusion, such as "My picture tube is blown." The inference engine then goes backward through the knowledge base, trying to confirm or deny the statement. Most diagnostic systems are backward chaining in nature. Forward-chaining systems, such as Charles Forgy's OPS5 algorithm, take data as input and then search for rules that use this data and try to determine what advice to provide.

Nexpert Object combines these two methods so designers can create expert systems that more precisely emulate the human expert. If you enter "My picture tube is blown" into Nexpert and it proves to be false, Nexpert may recommend, "Fix the color PC board" because during its attempt to confirm that the picture tube was blown, it found that the color PC board was the problem. Nexpert's choice of inference methods depends on static and dynamic strategies that the designer controls. Static strategies globally control what type of information is placed in the knowledge queue. They can be changed by rules and objects to engage or disengage several fact-for-
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<tr>
<td>ACUS 4th Dimension 1.06</td>
<td>389</td>
</tr>
<tr>
<td>Adobe Illustrator 68</td>
<td>297</td>
</tr>
<tr>
<td>Streamline</td>
<td>238</td>
</tr>
<tr>
<td>AEC Management Systems AEC Information Manager</td>
<td>415</td>
</tr>
<tr>
<td>Affinity Microsystems Tempo II</td>
<td>79</td>
</tr>
<tr>
<td>Aldus Freehand</td>
<td>397</td>
</tr>
<tr>
<td>PageMaker 3.0</td>
<td>379</td>
</tr>
<tr>
<td>Persuasion</td>
<td>375</td>
</tr>
<tr>
<td>Alo Systems MacPro 3.21</td>
<td>114</td>
</tr>
<tr>
<td>Asysultan DeskExpress 1.5</td>
<td>45</td>
</tr>
<tr>
<td>Master Juggler</td>
<td>62</td>
</tr>
<tr>
<td>MultiDisk</td>
<td>45</td>
</tr>
<tr>
<td>Ashton-Tate eBASE Mac</td>
<td>294</td>
</tr>
<tr>
<td>fulldisk</td>
<td>248</td>
</tr>
<tr>
<td>FullWrite Professional 1.1</td>
<td>264</td>
</tr>
<tr>
<td>Bedford Simply Accounting</td>
<td>208</td>
</tr>
<tr>
<td>Berkeley System Design Stepping Out II</td>
<td>51</td>
</tr>
<tr>
<td>Blynthia Software Omnis 5</td>
<td>379</td>
</tr>
<tr>
<td>Bookware Software ResumeWriter - Professional</td>
<td>60</td>
</tr>
<tr>
<td>ResumeWriter - Student</td>
<td>18</td>
</tr>
<tr>
<td>Borland International Eureka: The Solver</td>
<td>126</td>
</tr>
<tr>
<td>Reflex Plus</td>
<td>180</td>
</tr>
<tr>
<td>Sidekick 2.0</td>
<td>66</td>
</tr>
<tr>
<td>Turbo Pascal 1.1</td>
<td>66</td>
</tr>
<tr>
<td>Turbo Pascal Tutor 1.0</td>
<td>45</td>
</tr>
<tr>
<td>Bright Star Technology Hyper Animator 1.5</td>
<td>77</td>
</tr>
<tr>
<td>Bruderband PosterMaker Plus</td>
<td>35</td>
</tr>
<tr>
<td>Print Shop</td>
<td>35</td>
</tr>
<tr>
<td>Careware OmniPage 1.1</td>
<td>558</td>
</tr>
<tr>
<td>Cassady &amp; Greene QuickDEX</td>
<td>31</td>
</tr>
<tr>
<td>CE Software CalendarMaker 3.0</td>
<td>26</td>
</tr>
<tr>
<td>DiskTop 3.04 - Laser Status &amp; Widgets</td>
<td>26</td>
</tr>
<tr>
<td>ModPack Plus Utilities 4.4</td>
<td>26</td>
</tr>
<tr>
<td>QuickKeys 1.2</td>
<td>52</td>
</tr>
<tr>
<td>QuickMail 2.0 (1-5 Users)</td>
<td>156</td>
</tr>
<tr>
<td>Central Point Software Copy II Mac 7.2</td>
<td>CALL</td>
</tr>
<tr>
<td>CENTRAL POINT SOFTWARE</td>
<td>CALL</td>
</tr>
<tr>
<td>Check Mark Software Cash Ledger</td>
<td>125</td>
</tr>
<tr>
<td>MultiLedger 1.3</td>
<td>254</td>
</tr>
<tr>
<td>Payroll</td>
<td>189</td>
</tr>
<tr>
<td>Claris</td>
<td>625</td>
</tr>
<tr>
<td>Fieldmaker II</td>
<td>229</td>
</tr>
<tr>
<td>FrameMaker II</td>
<td>305</td>
</tr>
<tr>
<td>MacPaint 2.0</td>
<td>99</td>
</tr>
<tr>
<td>MacProject II</td>
<td>377</td>
</tr>
<tr>
<td>MacWrite II</td>
<td>169</td>
</tr>
<tr>
<td>SmartForm Designer</td>
<td>307</td>
</tr>
<tr>
<td>Connex MacNet</td>
<td>CALL</td>
</tr>
<tr>
<td>Cricket Software Cricket Draw</td>
<td>168</td>
</tr>
<tr>
<td>Cricket Graph 1.3</td>
<td>114</td>
</tr>
<tr>
<td>Cricket Presents</td>
<td>285</td>
</tr>
<tr>
<td>DataVis Mac Plus w/Cable 4.0</td>
<td>135</td>
</tr>
<tr>
<td>Denoba Software Big Thesaurus</td>
<td>53</td>
</tr>
<tr>
<td>Canvas 2.0</td>
<td>150</td>
</tr>
<tr>
<td>Coach Professional</td>
<td>104</td>
</tr>
<tr>
<td>Comment 2.0</td>
<td>54</td>
</tr>
<tr>
<td>Dubl-Click</td>
<td>189</td>
</tr>
<tr>
<td>Microsoft - bit mapped clip art</td>
<td>47</td>
</tr>
<tr>
<td>World Class Fonts - ImageWriter Fonts 1 &amp; 2 (Originals)</td>
<td>39</td>
</tr>
<tr>
<td>3 &amp; 4 (The Stylish)</td>
<td>39</td>
</tr>
<tr>
<td>5 &amp; 6 (Giants)</td>
<td>39</td>
</tr>
<tr>
<td>7 &amp; 8 (Triples)</td>
<td>39</td>
</tr>
<tr>
<td>World Class LaserType - Laser Fonts</td>
<td>39</td>
</tr>
<tr>
<td>Volume 1, 2, 3, 4, 5, or 6</td>
<td>39</td>
</tr>
<tr>
<td>Electronic Arts</td>
<td>47</td>
</tr>
<tr>
<td>Disk Tools Plus</td>
<td>30</td>
</tr>
<tr>
<td>Studio Eight</td>
<td>309</td>
</tr>
<tr>
<td>Studio One</td>
<td>95</td>
</tr>
<tr>
<td>Thunder II</td>
<td>49</td>
</tr>
<tr>
<td>Envision City Software Smart Art 1</td>
<td>88</td>
</tr>
<tr>
<td>Fastball</td>
<td>107</td>
</tr>
<tr>
<td>Fastball II</td>
<td>107</td>
</tr>
<tr>
<td>PrintStation 2.5</td>
<td>29</td>
</tr>
<tr>
<td>Pyrol 3.3</td>
<td>14</td>
</tr>
<tr>
<td>Suclis II</td>
<td>44</td>
</tr>
<tr>
<td>Foundation Publications Comic Strip Factory</td>
<td>39</td>
</tr>
<tr>
<td>Comic People (vol 1 - Office Days)</td>
<td>22</td>
</tr>
<tr>
<td>Fox Software FoxBASE+/Mac Multi User 2.0</td>
<td>CALL</td>
</tr>
<tr>
<td>FoxBASE+/MAC Runtime 2.0</td>
<td>CALL</td>
</tr>
<tr>
<td>FreeSoft</td>
<td>89</td>
</tr>
<tr>
<td>Red Ryder 10.3</td>
<td>53</td>
</tr>
<tr>
<td>Red Ryder Host 2.0</td>
<td>CALL</td>
</tr>
<tr>
<td>Generic Software Generic CADD Level 1</td>
<td>84</td>
</tr>
<tr>
<td>Hayes Smallclip 3.0</td>
<td>87</td>
</tr>
<tr>
<td>SmartForm Designer</td>
<td>307</td>
</tr>
<tr>
<td>ICOM Simulations HyperTNOM</td>
<td>59</td>
</tr>
<tr>
<td>On Cue 1.3</td>
<td>35</td>
</tr>
<tr>
<td>TMON 2.82</td>
<td>89</td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
</tr>
</tbody>
</table>

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Harrier Strike Mission II ............... 31. 
Puzzle Gallery ‘At The Carnival’ .... 28.

Mindscape 

PBI Software
Nettrek or Strategic Conquest 2.0 .... 34.

PCAI Software Too/works
Shodan

Davidson
Bright Star Technology
Bible Research Systems
Great Wave Software
Mindscape
Simon
Three Sixty

The Word (KJV, NIV, NKJV, RSV) .164.
Trust And Betrayal, Uninvited .......... 29.
Warlock ........................................... 29.

Apache Strike ................................... 26.
Mac Packs - Gray, Navy, or Wine ImageWriter Bag .................. 45.
Mac Plus/SE Bag ........... 55.
Mac SE Bag X (extended keyboard) .... 69.
Mac Zone
Mouse Pad - Black, Blue, Gray, Red, SCSI Tesler .................. 39.
Mac Tool Kit w/Grounding Strap .... 15.

Mobilus
Fancy Mac (Beige or Platinum) .......... 59.
MSC Technologies
At Mouse (512k & Plus) ........... 65.
At Mouse ADB ........... 85.

Orange Micro
Grappler C/MacGS ..................... 78.
Grappler Mac LS .................. 99.
Grappler Mac LS .................. 99.
Grappler Spooner .................. 38.

Scanco
Mac Table w/Cabinet (w/shipping) .... 445.

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TEAC
60 Meg Backup Tape (O600h) .......... 19.
Williams & Macias
myDiskLabeler (ImageWriter) .......... 29.
myDiskLabeler (LaserWriter) ........... 33.
Sticky Business ................... 35.

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The Expert Is In

Figure 2: An overview of the rule network shows how complex a system can become. The miniature overview can help you move around within the actual rule network. This display is from an expert system for evaluating AI projects. This pop-up menu illustrates navigation throughout Nexpert.

Figure 3: Nexpert's object browser provides a vivid depiction of the object world within a knowledge base. This screen shot clearly shows a factory, its machinery, and its staff. The factory class has properties that are not inherited by its subclasses. Machines and staff, however, show the inheritance of properties through specific machines and people. The Windows editor overlaying the object-network overview demonstrates the convenience built into the Nexpert Object environment.

warding mechanisms, such as forward chaining on false rules or explicit actions described in a rule or object. Several tools, including Current Rule, Current Hypothesis, Transcript, and Full Report windows, give developers insight into Nexpert's reasoning methods. A skilled Nexpert developer can also use the Rule Network to watch the progression of newly programmed sets of inferences.

Working through a problem serially, however, is not what makes an expert an expert. The capacity to adapt is what's important. Like human experts, Nexpert Object has the ability to rethink a problem as situations change. This ability, known as non-monotonic reasoning, allows facts to be forgotten and beliefs to be revised, based on the condition of a model. If Change slots in Nexpert objects are invoked when an object's value is changed. These slots enable non-monotonic reasoning because they're the first to detect a change in the surroundings.

LISP-based products such as ART and KEE allow designers to drop into the LISP programming language to modify the expert-system environment. Although Nexpert does not have interactive language extensions as LISP shells do, Nexpert's open interface accommodates programs or specific functions written in C or Pascal. In an expert system for manufacturing, for example, it could incorporate a C routine that performed mathematical visualization functions that would be difficult, if not impossible, in the Nexpert environment.

For many users, outside programs may hold little interest, but outside databases are a key concern. Nexpert's ability to integrate with databases far surpasses that of any tool in its price range. Nexpert can communicate with SYLK spreadsheet/database files, Excel files saved in Lotus 1-2-3 format, or Oracle through Structured Query Language (SQL). With the CL/1 connectivity language, Nexpert can retrieve records from mainframe and minicomputer SQL databases.

No Objections
Creating objects is Nexpert's way of representing the world. You can easily represent a coffee table or the philosophical gleanings of Rabbi Moses Ben Maimon as a Nexpert object. Nexpert's abundant object base consists of classes, subclasses, objects, sub-objects, and properties. No other expert system running on a standard Mac has the object-creation and inheritance talents of Nexpert Object.

The highest level of object abstraction in Nexpert is the class. A class in Nexpert is similar to a class in taxonomy. All members of a class have certain things in common, although there may be local variations. Say you have a class of all tables. The class has several properties related to it, such as color, number of legs, and style. The local variations can be subclasses or objects. Subclasses are fine-tunings of the class. A subclass of tables might include all country-French tables, all modern tables, or all sixth-century-B.C. dirt tables of Gondwanaland.

Class and object properties not only store values but also have control mechanisms that they use during an inference session. These control mechanisms are called meta-slots. When an object, such as a table, is linked to a class, it inherits properties and meta-slots. The washed-pine country-French table that resides in my living room is an instance of the table class. This particular country-French table, when represented in an expert system, inherits the properties
A bakery that supplies Italian bread to grocery stores is interested in determining the type of display most effective in generating bread sales. The bakery is interested in the effect of the height (high, medium or low) and the width (regular or wide) of the shelves on which the bread is displayed. Twelve grocery stores, similar in size and sales volume, are used in the study. Two stores are assigned at random to each of the six possible combinations of height and width.

Two-factor Factorial (from Neter and Wasserman, pg 369)

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of color, number of legs, and style from the table class.

Inheritance in Nexpert does not occur in one direction only. The ability to inherit values from "children" is one of Nexpert's important differences from other object systems. Called upward inheritance, this ability can be applied in the design when several objects suggest a class after they are entered. A value such as the color might be inherited by a "parent" object called table if the color of the legs is always determined first. Nexpert's inheritance schemes can be fully controlled with rules and meta-slots.

Every Nexpert object or class that is born without a property is automatically given a property called value, which is a generic property that is used in objects that have no definition and cannot be inherited. Such an object with no parent or child objects is called a flat object. Properties in Nexpert, like classes, do not hold information themselves; they are only definitions. The property hypo might be created for all hypotheses. This property resides in the system as a simple Boolean description until it is attached to an object in the following way:

Determine Windows Covering hypo, at which time it can receive a TRUE, FALSE, or NOTKNOW value.

Meta-slots are Neuron Data's implementation of classic AI methods called demons, which are suspended processes that wait for a particular kind of event to occur. When it does, they automatically perform their job and either terminate or suspend themselves, waiting for the next event. You access meta-slots by clicking on the meta-slot box in the object editor or by calling the meta-slot editor from the Edit menu. All demons are stored in the If Change or Order of Sources slots of the properties. An If Change slot is invoked only when the value of a slot changes. Order of Sources slots determine where an object will look for its value.

Immediately after the value of an object property changes, the If Change slot is invoked. The If Change slots connected with properties can assign values through LET and DO; force backward chaining by invoking a rule's hypothesis with DO; reset rules, objects, or strategies through Reset and Strategies; or perform 11 other Nexpert functions. If Change slots are very important to real-time expert systems that monitor operations. If the voltage an instrument measures changes from 50 to 60 volts, that condition may require a completely new look at the world. By writing an If Change slot that evaluates the value of a voltage every time it changes, Nexpert can always process the best rules for its current situation. The If Change slots are executed sequentially until all functions have been performed.

The Order of Sources slot is also in the meta-slot editor, and it tells a Nexpert property how to obtain a value. Default values can be established with InitValue. DO and LET assign values, and inheritance operators modify the object so values can either be obtained from parent objects/classes, child objects/classes, or sibling objects/classes or be turned off so no inheritance takes place. If nothing is entered into the Order of Sources slot, the system first looks backward for rules that will establish a value and then at inheritance from parent objects. If upward inheritance is established, it will try to inherit from child objects. When Nexpert cannot establish a value within itself, it asks the user for the answer. Order of Sources ceases to be active when Nexpert finds an answer.

Nexpert's default question reads something like "What is the value of ...." With the meta-slot prompt line, you can write questions that give your query more precision. Using the @V function in the prompt, you can add variables to the question for clarity. The ability to add values in the prompt line, also found in Level5/Macintosh, is an important interface-design tool for portability. Both Nexpert and Level5/Macintosh run on several platforms, and custom interfaces are often too costly to develop. By using values from the knowledge base in question, you are able to create a more-custom-looking delivery environment.

Nexpert objects are also important links to the outside world. With their ability to call external routines and map to databases, they can bridge the information available in...
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5 It Works
Unlike other programs which claim to give you large system functionality at a fraction of the price, TextPert works... with an error rate of less than 1/2% on high quality originals.
common applications such as AEC Information Manager, Excel, FileMaker II, and Double Helix. When the selected information is read into Nexpert, each record becomes a dynamic object that inherits properties from a class. If you were retrieving a table description from a database of interior design, you would map database fields to object properties. Meta-slots from the class are also inherited by the dynamic objects. Nexpert turns information about real-world objects into dynamic representations that act not only as repositories but also as changing and reasoning entities.

Much of Nexpert's power comes from its ability to create and interact with dynamic objects. Dynamic objects differ from static objects in that they disappear when you restart an inference; static objects are a fixed part of your knowledge base that you must delete to remove. By capitalizing on Nexpert's facility with dynamic objects, you can create virtual factories in which parts interact and combine to become assemblies, schedules change because an object is not available, and random failure is introduced by rules to add shadows to the idyllic silicon and electronic workplace.

**Ruling the Roost**

We spend our entire lives trying to break rules, but rules are what we learn in school and on the job, and they're the knowledge we pass on to others. A virtual factory can be thought of as a set of things in an actual factory that are controlled by rules that govern how they behave. Processes and logic in Nexpert Object are built with rules. Rules in most expert-system shells are composed of English words arranged in IF/THEN statements. Nexpert Object augments the IF/THEN rule with the IF/THEN/DO format, which allows Nexpert to incorporate many complex structures such as rule-modified inferencing and creation of new object collections.

Nexpert's rules are a bundle of objects categorized as conditional statements, a hypothesis, and actions, all displayed in the rule editor (see Figure 4). Its rules also contain various control fields that help resolve conflicts between two rules that otherwise seem equally valid. On the left-hand side (LHS) of the rule editor are the conditions, the set of items that must be satisfied before a hypothesis is true. If a hypothesis is true, Nexpert processes the right-hand side (RHS) of the rule, or actions. Here is an example of a rule:

```
IF YES The_sky_is_cloudy and 
I_do_not_possess_an_umbrella 
THEN I should_have_an_umbrella 
EXECUTE Robotic_umbrella_bringing_routine
```

The YES and NO statements are Boolean conditions, the THEN statement is the hypothesis, and the EXECUTE statement is an action. The Nexpert Object language is rich and diverse. All the terms are easily accessible through pop-up windows. It is impossible to forget what reserved words are available, but their syntax is a bit tricky.

Conditional statements can use 1 of 19 reserved words to compare what the expert system is told against what it is looking for. Boolean YES and NO test black-and-white answers. Since a hypothesis is a Boolean object, YES and NO are very important in structuring a knowledge base.

A hypothesis in a condition of a rule forces Nexpert to backward-chain to the referenced rule and prove it before proceeding. This type of linkage is called a **strong link**. Nexpert rules can also be weakly linked through a Context. The Context lists a group of hypotheses that the system must examine before ending a consultation, even if the hypotheses do not have anything in common. Contexts can be used to group loosely organized items such as a series of checklists.

The symbols >, <, <=, =, >=, and <= test numeric values. Numeric values in Nexpert can be numbers entered by a user or can be calculations performed within the rules. Equal and NotEqual are for comparing variables with each other. If Door.color and Frame.color both have the value blue, they are equal. IS and ISNOT test for string variables or
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This type of rule might be written as IS HYPOTHESISX KNOWN.

Name and Show are not tests but assignment operators. Name sets a variable to a given value, and Show displays a text file or PICT or MacPaint picture to help the user through the question. Name is also for passing messages between objects. An action such as Name Door.color Frame.color passes the current value of Door.color to the Frame.color slot.

Manipulating lists is very important in AI applications and makes Nexpert an excellent database front end. The Member and NotMember operators are used to check the elements of a list. Nexpert's pattern-matching capabilities allow lists of objects to be created from the examination of a class or group of objects. Existential pattern matching might test to see if any draperies in stock are paisley, and Universal pattern matching might verify that all items of a checklist are completed.

The final part of a rule is called an action. Actions can perform 12 functions. With actions, you can assign variable values with DO and LET. You can reset rules and other Nexpert elements. Resetting, for example, is used to make Nexpert forget that it knew something. When the weather changes from sunny to rainy, you might reset items in a traffic-control expert system such as number of in-
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intersection patrol persons and issue raincoats. Create and Delete Object are used in Nexpert to create new groups of objects or to delete objects that are no longer useful. If pattern matching has honed down a list of eligible cars for a purchaser, Create Object can be used to link that list to a new class called eligible_cars. The Execute operator calls external routines that enhance the data-processing capabilities of Nexpert. Show displays PICT and MacPaint graphics. Retrieve and Write are used in database functions.

The LoadKB (where KB stands for knowledge base) and UnloadKB operators are for dynamic management of knowledge bases. After your initial session with an accountant, the accountant’s expert system might unload its preliminary knowledge base and load either the long-form or short-form knowledge base. Knowledge-base loading and unloading is an excellent opportunity to use Nexpert’s interpreted statements. When you put backslashes around an object, the object becomes generic. An interpreted statement such as \filename\ can be set with LET to the name 1040short or 1040long. This way the same rule can be used for both conditions.

Nexpert’s rule language is full of intricacies and possibilities. It is not something you will master over a cup of coffee and a doughnut. But once you’ve mastered it, you can transform your Macintosh into a reasoning machine. Level5 offers simple rules with mathematical capabilities, but Nexpert’s interplay of objects and rules offers infinitely more possibilities than Level5 does. And although OPSS is blessed with excellent pattern-matching skills, its arcane LISP-based architecture and difficult-to-master syntax make it undesirable unless you are willing to make consultants a permanent fixture of your operation. With patience, most computer-literate people will easily acclimate to the Nexpert Object rule-editing environment, with
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Macintosh Expert-System Shells

OPSS is the classic LISP-based expert system that is more programming language than environment. OPSS was the development language for Digital Equipment's XCON, XSEL, and Dispatcher expert systems. The basic algorithm was developed by Charles Forgy at Carnegie-Mellon University. OPSS is a forward-chaining expert system with excellent pattern-matching capabilities. Versions on the Macintosh are available from ExperTelligence (ExpertLisp, ExpertCommon Lisp, and ExpertCommon Lisp II). ExperTelligence 5638 Hollister Ave., Third Floor, Goleta, CA 93117; (805) 967-1797. ExpertLisp, $495; ExpertCommon Lisp, $995; ExpertCommon Lisp II, $1,195.

Cognate This $250 set of libraries from Peridom puts the pattern-matching power of OPSS into your applications. Cognate, based on NASA's CLIPS expert-system shell, is also available as a stand-alone product for $150, but its real potential lies in embedding the libraries in your own code. Cognate has few editing capabilities, and its rules are entered through text files, but it is fast and efficient during execution. The syntax of rules, based on LISP, can be difficult for users not versed in OPSS and LISP. If you are an ART, KEE, or Knowledge Craft user looking for an inexpensive shell, Cognate is a good delivery tool. Peridom, Inc., P.O. Box 1812, Bowie, MD 20716; (301) 390-9570. Stand-alone version, $150; developers' version, $250.

ExpertFacts LISP expert systems for less than $10,000 are hard to find, but if you own ExpertLisp from ExperTelligence, $495 will bring you an adequate expert system to learn with. The strengths of ExpertFacts revolve around its tight integration with the Macintosh Toolbox. LISP functions can interact with ExpertFacts' forward-chaining rules to give you some interesting programming possibilities. ExpertLisp and ExpertFacts are aging Macintosh 512K programs, however, that have a hard time competing with newer, more extensive products. ExperTelligence, 5638 Hollister Ave., Third Floor, Goleta, CA 93117; (805) 967-1797. $495.

Flex, from Programming Logic Systems, is a Prolang-based expert-system shell. Flex has a full frame-description language and accommodates both forward- and backward-chaining techniques. The control structure for Flex can be a little confusing, and the manual's poor layout doesn't help. But once you've mastered it, Flex is a powerful expert-system development environment. Programming Logic Systems, Inc., 31 Crescent Drive, Milford CT 06460; (203) 877-7680. $495.

Humble Xerox PARC and its Smalltalk language first breathed life into the menus, windows, and bit-map editors that evolved into the Macintosh. Humble, an expert-system shell written entirely in Smalltalk, uses rules and objects to create complex expert-system applications. Although Humble is a well-designed system, it is mainly for Smalltalk developers who need to integrate intelligence with their applications. I like Humble, but if Smalltalk is not your bag, look at another shell with a learning curve that does not include a complete language with new concepts and constructs. Xerox Special Information Systems, 250 N. Halstead, P.O. Box 7018, Pasadena, CA 91107; (818) 351-2351. $395. Requires the $995 Smalltalk language from ParcPlace Systems.

HyperX If you have ever wanted to play with artificial intelligence and expert systems, HyperX is an ideal place to start. The new 3.0 version of the product incorporates many of the characteristics of expensive AI products, at a fraction of their cost. Astute students will find forward and backward chaining, demons, and object-value pairs. Object-value pairs are a bit more sophisticated than simple English sentences and make HyperX a more expressive system. Unlike the functions and editors of Intelligent Developer, which uses an external program for knowledge-base development, all of HyperX's functions and editors are written completely in HyperCard's HyperTalk. Millennium Software, 1970 S. Coast Highway, Laguna Beach, CA 92651; (714) 497-7493. $99.95.

Instant-Expert and Instant-Expert Plus With Instant-Expert 2.0, the low end of Human Intellect's program has matured to include an excellent editing environment that retains the old version's simplicity and understandability. With Instant-Expert Plus, developers will find much power lurking in its 79 commands. Instant-Expert Plus is very good for report-writing expert systems. Its text-file-handling capabilities are unsurpassed on any of the Mac shells. At $49.95, Instant-Expert is a steal, and the $495 price of Instant-Expert Plus makes it very competitive with products such as Level5/Macintosh. Human Intellect Systems, 1670 S. Amphlett Blvd., Suite 326, San Mateo, CA 94402; (415) 571-5939. $49.95 for Instant-Expert, $495 for Instant-Expert Plus.

Intelligent Developer was originally designed as a stand-alone expert-system shell with limited distribution rights for its nondevelopment version, but then came HyperCard, and Intelligent Developer added some pizzazz. The $395 price of Intelligent Developer includes the original software and a HyperCard delivery environment that supports all Intelligent Developer functions except its built-in database. Once you're in the HyperCard environment, animation and sounds can make a boring knowledge consultation intriguing. For real knowledge-engineering types, the debugging and reporting capabilities of ID are hard to surpass. Hyperpress Publishing Corp., P.O. Box 8243, Foster City, CA 94404; (415) 345-4620. $395. Levels5/Macintosh For PC developers whose users have joined the Macintosh ranks and refuse to look at DOS prompts, Levels5/Macintosh makes a great delivery tool. None of the work done on the PC is lost in the translation, but nothing is gained either. Levels5/Macintosh knowledge bases are entered in a very plain text editor. To catch errors or run a consultation, you must compile Levels5's Pascal-like rules. Errors return you to the text editor, but you get only minimal guidance. Graphics, including 256-color Mac II drawings, can be displayed, but they must be closed before their associated questions can be answered. Levels5 2.0 on the PC will be delivered in Windows. When this new interface is ported to the Mac, the product will benefit from a much-needed face-lift. Information Builders, Inc., 1250 Broadway, New York, NY 10001; (212) 736-4433. $695.

MacSmarts is a simple expert system that allows entry of rules through a spreadsheet-like environment. MacSmarts can handle only simple text strings, lacking variables or calculations. MacSmarts' main attribute is its easy-to-implement hypertext interface. The program is ideal for an entry-level system to automate help-desk functions. MacSmarts Professional, which should be shipping as you read this, adds variables and calculations to the standard MacSmarts fare. Cognition Technology, 55 Wheeler St., Cambridge, MA 02138; (617) 492-0246. $195.
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The Expert Is In

Executive Summary

If you can afford Nexpert Object, its list of features makes it the ideal tool. But when cost is a factor, a lesser shell must be chosen. For many diagnostic and personal-assistance applications, any of the established products are solid buys. If you have to embed your expert system in an application, however, Nexpert and Cognate are your only choices. For easy custom interfaces, Instant-Expert Plus and its “hot spot” graphics can’t be beat.

The bottom line is to buy the best shell you can afford. Although an expert system such as Nexpert may seem overwhelming at first, you’ll soon outgrow a simple product such as MacSmarts as your projects get more complex.

At the Frontiers of Knowledge

Although Nexpert is an excellent companion for knowledge engineering, it is not without deficiencies: My training required the excellent classes of the Bechtel AI Institute, contracted by Neuron Data. Nexpert is an involved product to learn, and its manual is a complex document to read. Now that I know the basics, I use the manual as a reference for its finer points. New users, however, can lose their way quickly in its maze of cross-references and allusions.

Nexpert is a relatively complete knowledge-engineering tool, but certain technical elements, such as multivalued variables and true intelligent objects, are missing. There are annoyances such as the inability to cut and paste between fields because other platforms, such as UNIX workstations, can’t handle this function. Nexpert also has a frustrating copy-protection scheme that won’t let you make archival copies. To install Nexpert, you execute the floppy-disk version and install it on your hard-disk drive and get another, you can’t use the floppy disk to reinstall the software. On the PC, Neuron Data uses security hardware that is equally aggravating.

But these flaws are minor compared with the usefulness of the tool. The development environment of Nexpert is an excellent example of what Macintosh applications need to evolve into. Notebooks that hold data, objects, classes, or rules can, with a single click of the mouse, become editors. Sprawling overviews of your knowledge-base or object representation can be focused for clarity or expanded for context. Clicking on almost anything in Nexpert reveals a pop-up menu that simplifies data entry or eliminates the time-consuming shuffling of windows.

Nexpert Object is an elegant product for developing knowledge-based software. Occasional users will complain of complexity when returning to Nexpert after an absence, because it’s a tool that must be used constantly and consistently to be learned well. Nexpert Object is a program racing toward the convergence of hypertext, databases, and intelligent assistants. Future versions of Nexpert will incorporate more features, such as direct links to Oracle and HyperCard. An upcoming module, Nextra, will add a powerful tool for knowledge acquisition. And with the release of the Open Interface ToolBox (OIT), on which Nexpert is built and which enables Nexpert’s well-known portability, Nexpert users and software engineers alike will benefit from OIT’s machine-independent resources. When that happens, Nexpert will be a key link in the Mac’s ability to adapt to the future, where data and information are transformed into knowledge.

Dan Rasmus is manager of Computer Assisted Manufacturing at Western Digital. He also frequently writes and lectures on the Macintosh and artificial intelligence.

Nexpert Object

Follows Macintosh Interface 5
Printed Documentation 3 1/2
On-Screen Help 1
Performance 5
Consumer Value 4 1/2

Comments: An excellent C-based expert system for the Macintosh. Nexpert has proven itself in several extensive real-world systems. The graphic editing environment improves on the standard Mac interface. Best Features: Quickly mastered entry of rules and objects. The program lets you learn the language and concepts without bogging you down with operation issues. The ability to port knowledge bases to other machines without rewriting is a strong plus. Worst Features: The copy-protection scheme makes backing up the software impossible. It must be removed before you can run a disk-optimization program. Lack of Cut and Copy commands within editors is also annoying. List Price: Nexpert Object, $5,000; Nexpert Object under A/UX, $6,500; run-time version, $750; run-time version under A/UX, $1,000; AVision Interface Builder, $500; one-year upgrade, $1,000; one-year upgrade to A/UX version, $1,200; Nextra, $4,000. (Discounts are available to volume customers.) Published by Neuron Data Corp., 444 High St., Palo Alto, CA 94301; (415) 321-4488. Requires Macintosh Plus, SE, or II and 1 megabyte of RAM. Best if used with a hard-disk drive and color monitor. Works with the Mac IIX, A/UX, and MultiFinder (requires a 1,200K-to-1,500K partition). Takes up 668K. Version 1.1 reviewed. Only one copy can be installed from a disk.
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Networking

Novell's NetWare moves to the Mac, competing with AppleShare on its own turf.

Tying the Net

When you look at a good map, rivers both great and small are depicted accordingly: The main streams are like trunks, and the tributaries feed into them like branches. With the introduction of Novell's NetWare for Macintosh, tying the Mac into the big, broad mainstream of PC networks just got more involved for PC cartographers. Using NetWare for Macintosh, Macs running AppleShare client software can now hook up to a NetWare file server and share files with PCs.

Connecting PCs to Macintoshes is not new. The point here is that now you can connect them via NetWare. NetWare, which has more than 400,000 servers worldwide (approximately 60 percent of the PC market), is a corporate favorite for multi-platform connectivity. NetWare currently supports more than 90 network adapters (including Ethernet and Token Ring), 30 network architectures, and both asynchronous and X.25 serial connections at rates up to 56 kilobits per second (Kbps).

Although this is great news for corporate PC NetWare users who want to add Macs to their network, NetWare for Macintosh, in its initial release, has serious drawbacks as a server for an all-Mac network. To begin with, it's expensive: depending on the configuration, it costs $1,595

By Brenda McLaughlin and Stephan Somogyi
Tying the Net

Both AFP and NCP can be sent via Ethernet; the server's Ethernet driver differentiates between the two and sends the data either directly to the server engine or to be translated first. AFP data is translated by the SPG into NCP on the way into the server. The server's response, initially in NCP, is translated back into AFP on the way back to the AFP client. Any data coming into the server over LocalTalk must be AFP and automatically goes through the SPG.

to $4,895. Furthermore, with NetWare for Macintosh, you can't use a Mac as a server or as a workstation to administer the server. You need an 80286- or 80386-based PC or compatible to act as a dedicated server — and a second PC to do network administration. Not only that, the administration PC cannot be on LocalTalk; you need to buy a pair of Ethernet cards — one for the server and one for the administration PC — just to perform management tasks. Mac users can save money by running the Entry Level System PC server in nondedicated mode, but they'll pay for it with reduced performance.

Getting NetWare Aware

NetWare for Macintosh is a "value-added process" (a software add-on to the usual NetWare software) that runs with all three levels of NetWare, version 2.15 or later. Entry Level System (ELS) Level II NetWare 286 supports up to 8 concurrent users; Advanced NetWare 286 supports up to 100; and the System Fault Tolerant (SFT) NetWare 286 configuration, the one we tested at MacUser's NetWorkShop, adds enhanced server
reliability to the 100-node package. Macs on LocalTalk or Ethernet (not presently Token Ring) can access a NetWare server with the NetWare for Macintosh add-on.

NetWare is a network operating system that takes over the server machine. Because a NetWare server understands only file-service requests that are made in NetWare Core Protocol (NCP), Macintosh requests made in the AppleTalk Filing Protocol (AFP) over LocalTalk or Ethernet need translating. Such AFP requests are passed to the Service Protocol Gateway (SPG), which is the key value-added process of NetWare for Macintosh. In the wonderful world of acronyms, then, the SPG translates AFP into NCP. When the server answers the request, the translation is reversed, with the SPG turning the NCP data packets back into AFP for transmission to the client Mac. This process is transparent to users, but it adds significant processing time.

NetWare lets Macs on LocalTalk share files, via NetWare, with PCs on other networks. PCs on LocalTalk — with the appropriate LocalTalk card and its PC software — can either access AppleShare servers on LocalTalk or share files with PCs on other NetWare-attached networks, again via the NetWare server. But it is important to note that PCs on non-LocalTalk networks cannot “see through” the NetWare server to access files on an AppleShare server that resides on a LocalTalk network.

NetWare and AppleShare

NetWare installation is not for the faint-hearted. It is a complicated procedure and requires a good deal of expertise. Novell recommends that it be done by the NetWare reseller or a consultant familiar with NetWare, thus raising the user’s costs. To install NetWare yourself, you must generate workstation shells for individual users and install NetWare on the server PC. You must then install NetWare for Macintosh from the administration PC; this installation cannot be done over LocalTalk.

From a Mac perspective, a NetWare server looks pretty much like an AppleShare server. The only difference is that NetWare depicts MS-DOS .COM and .EXE files as Mac application icons with a DOS inset (see Figure 1). MS-DOS data files are represented by a generic document icon (a rectangle with a folded corner), again with a DOS inset. Note, however, that DOS data files on the NetWare server cannot be launched directly from the Finder but can be loaded only from within the compatible Mac application. And DOS applications cannot be launched from the Mac because they can’t run on the Mac. On the PC side, Mac files appear on MS-DOS machines with standard DOS filenames, which contain eight characters, a period, and a three-character extension.

NetWare’s printing services are also similar to AppleShare’s. Mac users can either print directly, using a networked Mac-compatible printer, or they can send their documents to a NetWare print queue. Note that PC printers hooked up to a NetWare server cannot be used by Macs. However, PCs running software that supports PostScript output can print to a Macintosh printer through a NetWare print queue regardless of which network they reside on.

Rights and Privileges

NetWare uses a system of “rights” — similar to AppleShare privileges — to restrict access to folders on the server. You can use either NetWare’s Control Center application or its NetWare DA to set these rights. The NetWare manual recommends using this NetWare software and discourages you from using the standard AppleShare software for setting privileges. In our tests, however, although the Control Center worked fine, its DA equivalent was buggy — and neither could see a NetWare server in another zone.

You do get some advantages with the NetWare rights, however. A folder on an AppleShare server can
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What’s more, because TrueForm is actually two programs—Set-Up and Fill-Out—you won’t have to buy the entire TrueForm package when you add users. Simply purchase additional Fill-Out packages whenever you need them.

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belong to only one group and have only one set of privileges. On a NetWare server, a folder can have multiple “trustees,” each with its own set of rights. NetWare offers eight definable rights as opposed to the three AppleShare privileges. Unfortunately, the NetWare DA is more difficult to use than the AppleShare DA. Furthermore, the additional rights won’t be seen by users using the AppleShare DA, and they might have unexpected results when accessing folders (see Figure 2).

We found two other problems with NetWare for Macintosh version 1.0. One is the case of the disappearing server. We noticed that if the server had been up for a short period and if no users had logged in during that time, the NetWare server would disappear from the list of available servers in the Chooser. A free software upgrade that fixes this problem should be shipping by the time you read this. The other problem is the case of the drowned network. If a user was logged on to the network but was idle for a long time, the server began to flood the network with LocalTalk packets. Novell could not determine whether this problem originated with its LocalTalk card or with the NetWare for Macintosh software and so could not say when the problem would be fixed.

**Tolerating Faults**

In addition to the added levels of security, NetWare offers several fault-tolerance features. All three types of NetWare use duplicate directories; directory verification on power-up to check for errors in the file system; read-after-write verification to make sure a file that was just saved is, in fact, readable; and Hot Fix, which marks defective areas on a disk found by read-after-write verification and then resaves the data on a good area of the disk. SFT NetWare’s features go even further. Added are disk mirroring, disk duplexing, and the monitoring of rights. NetWare offers eight definable rights as opposed to the three AppleShare privileges. Furthermore, the additional rights won’t be seen by users using the AppleShare DA, and they might have unexpected results when accessing folders.

---

**The DaynaNET Solution**

For an all-Mac network, DaynaNET is an alternative to NetWare if you find a full version of Novell’s product too expensive and don’t need all of its features. DaynaNET is a licensed version of Advanced NetWare 286 version 2.15. It doesn’t include SFT NetWare’s disk mirroring and duplexing, but it has all of NetWare’s security and file/folder permission features. Currently, it works only on LocalTalk networks and doesn’t support all the other networks and connections that Novell’s product can. Future upgrades will add other AppleTalk-supporting networks.

One great advantage that DaynaNET has over NetWare is that the only PC required is the one acting as the server; you can do administration from a Mac. Also unlike NetWare, DaynaNET has a Stamper utility that maps MS-DOS file extensions to Mac applications — for example, all files ending in .WKS can be “stamped” to be Wingz or Excel spreadsheet documents.

PCs communicate with a DaynaNET server via AFP. To let them do this, you can install a DaynaTALK card, priced at $249. Macs connect through their built-in LocalTalk hardware or through a DaynaTALK connector box that retails for $189. DaynaTALK allows Macs to communicate at speeds of up to 850 Kbps over LocalTalk wiring versus the standard 230-Kbps speed. (See next month’s Bridges for a comparison of DaynaTALK and TOPS’ competing product, FlashBox.)

DaynaNET costs $1,249, for which you get server software, a DaynaTALK card for the server, and its driver. An EtherTalk driver is scheduled as an upgrade for about $500. Through an agreement with Novell, buyers of DaynaNET will be able to upgrade to Novell’s SFT NetWare without having to buy SFT in its entirety. Pricing for the upgrade was not available at press time.

DaynaNET appears to hold great promise as an AFP server. We will have a full product review in a future issue.

Dayna Communications, Inc., 50 S. Main, Fifth Floor, Salt Lake City, UT 84144; (801) 531-0600.

— Stephan Somogyi

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**Costing Chart**

<table>
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<tr>
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</thead>
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<tr>
<td>Advanced NetWare System</td>
<td>$18,468</td>
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<td>AppleShare System</td>
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</table>

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— Stephan Somogyi

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NetWare is not the cheap way to get a server. AppleShare, although it doesn’t offer many of NetWare’s security and reliability features, is considerably cheaper than the most basic NetWare configuration, a dedicated ELS Level II setup that allows only up to eight users.
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of uninterruptible power supplies (UPSs). Disk mirroring automatically saves your data to two separate hard disks using the same controller; users wouldn’t feel the loss of one hard disk. Disk duplexing is functionally identical to mirroring, except that it requires one controller per hard disk. With a duplexed volume, you can lose a hard disk and/or a controller without users’ noticing it. Duplexing also gives you first-priority access from the hard disk whose heads are nearest to the data. Thus, duplexing provides both an added degree of reliability and a performance increase. UPS monitoring causes the server to shut itself down if the main power is off for too long. A proper shutdown guarantees retention of all data. SFT NetWare is optionally available with the Transition Tracking System (TTS), which is a scheme that ensures the integrity of data from transaction-based server operations.

These features ensure system reliability, but all of them, except TTS, require extra hardware. Because of the necessary extra equipment, the cost of NetWare can get pretty high.

Performance of SFT NetWare
Our suite of tests (see the Performance Charts) showed that NetWare’s performance was roughly equivalent to AppleShare’s running on an SE/30. The one exception was in the node-to-server file-copy test: NetWare took at least 10 seconds longer. AFP translations to NCP, as well as the fact that NetWare clears a disk block before writing to it (and then verifies the write), account for this. Adding more nodes improved its performance relative to AppleShare’s. AppleShare’s times went from 26.9 to 31.4 seconds; NetWare’s times increased from 42.5 to 45.2 seconds, suggesting that NetWare is superior to AppleShare on larger networks.

Should You Get NetWare?
If you are currently running NetWare and want to add Macs, buy NetWare for Macintosh. For $200 (owners of the Entry Level System get the Mac value-added process free after sending in a coupon), you can get PCs and Macs talking on a reliable network.

If you don’t currently have Net-
Disposable

There are a lot of removable storage systems that work today but are expensive disposable systems tomorrow. There will probably be a lot more.

There are a lot of fly-by-night mass storage companies that are here today but gone tomorrow. There will undoubtedly be a lot more.

There are a lot of "crash and burn" "at your own risk" "unbootable" and "unreliable" storage systems out there. There will frightfully be a lot more.

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Tying the Net

Ware installed, or if you are running a mainly Macintosh network and are shopping for a server, the choice is not so attractive. AppleShare (50 nodes) is $799; ELS Level II NetWare (8 nodes) is $1,595. Furthermore, to get a functional configuration, you'll have to invest in two MS-DOS machines, at least one of which is a '286, and two non-LocalTalk cards in addition to the server's LocalTalk card. And unless you're already a NetWare expert, its complexity means you're going to have to hire someone else to install it. That's a large investment for any network. Until NetWare can be administered from a Macintosh, it cannot be considered a good Macintosh networking solution. Novell expects to implement this capability by the end of the year.

Brenda McLaughlin is the former senior editor of A+ and former associate technical editor at BYTE, Stephan Somogyi is MacUser's NetworkShop Coordinator.

Novell NetWare for Macintosh

Comments: Although NetWare for Macintosh offers a range of functions and reliability, for a Mac-based network it's difficult to install and requires a big investment in non-Mac equipment. On the other hand, if you are already running a NetWare server, NetWare for Macintosh is a cheap and efficient addition to your network (it earns a rating of four mice for owners of existing NetWare networks).

Best Features: High reliability, file exchange with non-Mac computers connected to a server.

Worst Features: Expensive; high additional-equipment cost; difficult to install and maintain when compared with AppleShare.

List Price: For Mac networks starting from scratch: ELS Level II, $1,595; Advanced, $3,195; SFT, $4,895. If you have Advanced or SFT Netware 286 version 2.15 or later, $200; free if you have ELS NetWare 265. Published by Novell, Inc., 122 E. 1700 S., Provo, UT 84606; (801) 379-5900. NetWare for Macintosh version 1.0 and SFT NetWare version 2.15 reviewed.

Requires any NetWare 286 configuration, version 2.15 or later. One installation per copy.
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PostScript-Printer Comparison

MacUSER LABS

Fit to Print

PostScript
Testing, testing . . . MacUser Labs puts 16 popular PostScript printers through their paces.

It seems a distant memory now, but a mere four and a half years ago, only one PostScript printer was available — Apple's LaserWriter. It cost $7,000 — you can buy a LaserWriter IIINTX for that price now — and it was S-L-O-W. But more than even the Macintosh itself, the LaserWriter ushered in the era of desktop publishing.

Before the LaserWriter appeared, would-be desktop publishers had to put up with the ragged appearance and poor readability associated with dot-matrix printers, which output bit maps at a resolution of 72 dots per inch (dpi). The LaserWriter changed all that, offering higher resolution (300 dpi) and a PostScript interpreter. PostScript, a page-description language (PDL) developed by Adobe Systems, could convert an electronic page of text and graphics into crisp, highly legible output at any size or resolution. Finally, the Mac had an affordable, newsletter-quality printer to team up with.

PostScript printers have come a long way since the early days of the LaserWriter. More than 40 Adobe-licensed PostScript printers are currently on the market, ranging in resolution from 300 to 2,540 dpi. Engine speeds for the toner-based, black-and-white models are rated from 6 to 40 pages per minute. There are also several high-end PostScript imagesetters, which use photographic-imaging technology rather than toner. In addition, PostScript has gone color (see Figure 1). Color printers from two companies are on the market, with more undoubtedly on the way.

And those are just the Adobe-sanctioned printers. PostScript clones are now entering the market. These PostScript-compatible printers have non-Adobe interpreters and impressive throughput performance.

Configurations and capabilities vary widely among PostScript printers. Some come with a single paper tray, others come with two or three. Some can emulate Diablo 630 printers, others imitate HP LaserJets, and one (the Camintonn TurboLaser) can even pretend to be a DEC LN03. They all come with LocalTalk, Centronics parallel, and serial connections. A growing number support external hard disks to which you can download large font libraries from the Mac.

A Motley Crew

With all these variables, buying decisions are no longer simple. What better reason for MacUser Labs to round up 16 of the most popular desktop models and put them through their paces? We looked at one model from each vendor that markets a LocalTalk-compatible, 600-or-fewer-dpi PostScript printer. We let vendors that sell more than one model choose which one to send for evaluation. (Some chose not to send one at all.) We let Apple enter two contestants, the NT and the NTX.

The printers we tested fall into four categories. Most are 300-dpi models that are more or less variations on the theme of the LaserWriter Plus or IIINT. We call them the "standards."

Three printers are notable for their throughput speed. Based on Motorola 68020 microprocessors, they are significantly faster than first-generation 300-dpi PostScript printers, which are all based on the 68000 chip. These three we refer to as "high-performance" printers.

Three other printers — they're actually the same machine, sold by different companies — don't use Adobe-licensed PostScript interpreters, although they are PostScript-compatible. These are the "clones."

Finally, two printers have higher-resolution print engines, which produce better-looking type and subtler shades of gray. These "high-resolution" printers also have high prices, and people buy them specifically for their increased resolution, not because they are faster or easier to maintain. We included them to give you a taste of the future — or, at least, the future of PostScript printers.

By Henry Bortman, Aileen Abernathy, and the MacUser Labs staff
Each printer was evaluated based on its performance, print quality, and ease of use. Performance simply means raw printing speed, and, needless to say, the high-performance printers did best here. To evaluate print quality, we examined both type and graphics output. The clones did surprisingly well, as did Varityper's 600-dpi printer. Finally, we noted how easy each printer was to set up and maintain. For the specific results of these investigations, see the Capsule Reviews.

What Does PostScript Do, Anyway?
The intricate code of the PostScript page-description language describes the lines, curves, halftones, and characters that compose the image on a page. PostScript tells a printer where to put each element on the page, how large to make it, what angle to rotate it to, whether to draw only the object’s outline or to fill it in, and what color or shade of gray it should be.

When you print to a PostScript printer, you tell the Mac to send it a PostScript program describing the pages of your document. Inside each PostScript printer is a computer (don’t be shocked), usually the same Motorola 68000 or 68020 chip that is the heart of many Macs. But unlike the CPU in your Mac, which can be programmed to do a variety of tasks, the microprocessor in a PostScript printer is dedicated solely to interpreting PostScript instructions.

Other PDLs exist, but Adobe’s PostScript has captured the dominant position in the Mac market and so has become the de facto standard. QuickDraw, the Mac’s imaging model, can also be considered a PDL, although Apple doesn’t call it that. It can display to a Mac screen or output to a printer such as the ImageWriter II or LaserWriter IISc. Even though QuickDraw offers some features...
that PostScript lacks, such as the ability to place one image transparently on top of another. PostScript has several major advantages over it.

Outline Fonts

PostScript's most significant advantage is that it stores descriptions of font characters as outlines, rather than as bit maps (see Figure 2). No matter how wretched the type looks on your Mac screen, it comes out clean on a PostScript printer. And you can manipulate type as easily as you can graphics. If your application allows it, you can scale type to any size — we recently produced some 1,100-point type for a project — and still get crisp, smooth characters from your printer. Programs such as Illustrator and FreeHand let you squeeze, stretch, shear, and rotate type, and because PostScript is manipulating outlines, it still comes out looking good.

QuickDraw, in contrast, yields printed output that suffers from the same jaggies that Mac screen displays do. To minimize the jaggies, you must install a screen font for each point size of every font you want to use. Your System file can quickly grow to gargantuan proportions if you use many type sizes and install a screen font for each. (You can use Font/DA Juggler or Suitcase to keep the size of your System file down, but the fonts will still take up a lot of space on your hard disk.) For larger font sizes (say, 72-point) or odd sizes (31-point), the screen fonts required to produce optimal QuickDraw output aren't even available.

The entire Macintosh typographic scenario will soon change. In the next few months, Adobe will release Adobe Type Manager, which lets you use PostScript printer fonts to produce better-looking type on the Mac screen, with no jaggies.

Performance results are normalized against those for the LaserWriter INXT. If another printer performed faster, its number is larger. The clone printers are identical, so their times are shown only once. The Dataproducts and ATI printers also share a set of performance data.


<table>
<thead>
<tr>
<th>Performance Results</th>
<th>PostScript (LaserWriter INXT)</th>
<th>QuickDraw (LaserWriter INXT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MacDraw II</td>
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Figure 2: PostScript versus QuickDraw

The LaserWriter INXT (output on left) contains a PostScript interpreter, and the LaserWriter INSC (output at right) relies on Apple's QuickDraw. As a comparison of this 13-point Times Roman type shows, PostScript does a far better job of imaging type at odd sizes. PostScript is also better at handling rotated images and hairlines (1-pixel-wide lines).
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When you issue the Print command, the printer's driver converts the QuickDraw image of the page into PostScript commands and ensures that the printer has the correct fonts. As part of the conversion process, screen fonts, which are 72-dpi bit maps, are translated into the corresponding PostScript outline fonts. This data is sent to the printer, which has a circuit board containing ROM with built-in fonts and the PostScript interpreter, plus the RAM used for downloading fonts and creating bit-mapped images of the pages. Once the printer has scaled and rotated the outline fonts, they are converted into 300-dpi bit maps for printing (a printer can output only dots).

Chip Carman

1. When the printer is first turned on, the PostScript interpreter builds a font directory of its built-in outline fonts and of those stored on any attached hard disks.

2. As the interpreter begins processing a document, it checks the requested fonts against its font directory. If a desired font isn't on the list, the interpreter searches your System disk for an outline-font file to download. As outline fonts are converted to 300-dpi bit maps, they are sent to the page-image buffer and also stored in the font cache. (Very large fonts are placed only in the page-image buffer. Large fonts are stored in the cache in compressed form and must be decompressed when used again.)

3. When the interpreter locates a desired outline font, it is downloaded either to RAM or to a hard disk. (Downloading to RAM is temporary; downloading to disk is permanent and saves time.) If no outline font is available, a 72-dpi screen font is downloaded.

4. The font cache is a portion of RAM that contains 300-dpi bit maps of each size and orientation of every character processed. The stored bit maps are instantly available to the interpreter, which greatly speeds up processing times. Another technique to increase processing speed is idle-time caching. When the printer is idle, it automatically finds built-in printer fonts, converts them to bit-mapped fonts, and places them in the font cache.

5. When no more memory is available in the RAM cache, the least-accessed bit maps are flushed to make room for new ones. If the printer has a hard disk attached, the cast-out bit maps are transferred to it.

6. After the entire page has been assembled in the page-image buffer, each line is transferred in a serial bit stream to the print engine. The zeros and ones in the bit map act as on/off codes to control the light reaching the photosensitive drum.

Font caching improves printer performance tremendously. We printed a document that contained more than 1,000 different characters, each of which had to be converted from an outline to a bit map by the PostScript interpreter. Without caching, the document took 3:18 minutes to print on the LaserWriter IINTX and 6:12 on the GCC Business LaserPrinter. With characters cached in the printers' RAM, times dropped dramatically (29 seconds for the NTX; 38 for the BLP). Times were almost as good for characters cached on an attached hard disk.
even at large point sizes. Apple, for its part, recently announced its own outline-font format, which will be incorporated into System 7.0. It will give Mac users a way, without relying on PostScript fonts, to improve the appearance of type, both on the Mac screen and when printed to non-PostScript printers. (For more on the Adobe and Apple announcements, see Fine Print in the DTP section.)

These new strategies from Adobe and Apple are making big waves in both the font and printer markets. Because we don’t know exactly how the technologies will work (and neither company has committed to a shipping date), it’s a little early to say how these changes will affect the market. For the near term, however, PostScript printers are unlikely to be toppled from their current dominant position. Even Apple has too high a stake in PostScript output to abandon them.

**PostScript’s Other Pluses**

The PostScript imaging model also employs Bezier curves, which let you create graphic images that are more complex than what you get with QuickDraw’s simple arcs. Illustrator, Cricket Draw, and FreeHand were the first to take advantage of Bezier curves, but many of today’s drawing programs offer a Bezier tool. Each program must produce the curves with special code, however, because QuickDraw doesn’t provide the underlying technology.

PostScript also lets you rotate any object, including type, to any angle and still obtain sharp, clean output. QuickDraw is not inherently as versatile. Again, QuickDraw-based programs such as MacDraw II now support this capability, but they must “step outside” QuickDraw to accomplish it. And when you print a document that includes rotated objects to a printer that relies on QuickDraw, it won’t look as clean as the same document printed to a PostScript device — unless the application has some fancy programming to improve the QuickDraw output. Apple has specifically stated that the QuickDraw imaging model won’t be enhanced in System 7.0 to include support for rotation; application developers will still have to pull this one off on their own.

Finally, PostScript is “device-independent.” That is, it automatically takes advantage of the maximum resolution of whatever PostScript output device you use, from a 300-dpi desktop printer such as the LaserWriter to the 2,540-dpi Linotronic imagesetter. This ability extends to Display PostScript as well. For example, the same PostScript code that drives the 90-dpi display of a NeXT machine can be sent to a PostScript printer; each device will make maximum use of its available resolution and gray-scale/color capabilities to create the final image. QuickDraw is not nearly as flexible.

**Choosing the Right Printer**

Of course, we’re preaching to the converted. You’re already sold on the value of a PostScript printer. What you want to know is which one to buy.

Start by analyzing your needs. What kind of documents do you plan to print? What about a year or two from now? You’ll probably have your printer for at least that long. Do you plan to use lots of different typefaces, or will you be using only those that come resident in the printer? If you won’t be using nonresident fonts, you may find a PostScript clone a more attractive choice. Will you be printing many gray-scale halftone images? If so, focus your selection on those printers that did well on our gray-scale-quality tests.

How many people are going to share the printer? Will PC users as well as Mac users be printing to it? All the printers work with PCs as well as Macs, but some are better designed for this task than others. Look for one that supports multiple connections or can emulate the other printers you already have.

Will you be using different paper sizes — legal-sized paper and envelopes as well as letter-sized paper? You may want a printer with two trays. Will you be using this printer to produce camera-ready copy for reproduction on an offset press? Consider a printer with a resolution greater than 300 dpi.

These are some of the questions you should answer before going shopping. Knowing your particular requirements is the best guarantee that you won’t end up...
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INTERNAL KITS FOR SE & II

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Speed</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>20Mb Seagate</td>
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</tr>
<tr>
<td>30Mb Seagate</td>
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<td>45Mb Seagate</td>
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INTERNAL KITS FOR MAC II ONLY

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<td>$479</td>
</tr>
<tr>
<td>160Mb MiniScribe</td>
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<td>$1222</td>
</tr>
<tr>
<td>340Mb MiniScribe</td>
<td>16ms</td>
<td>$1795</td>
</tr>
</tbody>
</table>

These complete internal drive kits include the drive, UniMac™ formatting & partitioning software, hardware mounting kit, all necessary cabling, and How-To manual.

EXTERNAL DRIVES FOR MACINTOSH PLUS, SE & II

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Speed</th>
<th>Price</th>
</tr>
</thead>
<tbody>
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<td>20Mb Seagate</td>
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<td>$599</td>
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<td>80Mb Quantum</td>
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<td>$919</td>
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<td>160Mb MiniScribe</td>
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<td>$1275</td>
</tr>
<tr>
<td>340Mb MiniScribe</td>
<td>16ms</td>
<td>$1895</td>
</tr>
</tbody>
</table>

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11 A.M.  
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Most desktop PostScript printers use laser beams to create images. Two new technologies, light-emitting-diode (LED) array and liquid-crystal-shutter (LCS), provide cost-effective alternatives. All three use light to form an image on a photosensitive drum. Laser beams scan across the drum one dot at a time; LED and LCS engines print an entire line simultaneously. Once the image is formed on the drum, toner is applied and then transferred to the paper, after which it is fused onto the paper and the image emerges from the printer.

---

1. The light source

A. Laser imaging

Laser-based engines use a single beam of light to scan across the photosensitive drum. The laser is focused on a rotating polygonal mirror. The mirror deflects the beam through a focusing lens, which directs it toward the rotating drum. As the beam scans across the negatively charged drum, it's turned on and off to create the pattern on each line.

B. LED imaging

These engines use 2,400 light-emitting diodes to produce an entire line of dots at once. Individual diodes are turned on or off to create the necessary patterns. Dot positioning using LED technology is always accurate because the array of LEDs is fixed, while laser engines require an optical system that is more susceptible to misalignment due to vibrations. LEDs are also less sensitive to heat, dust, and humidity, but current LED printers are limited to 460 dpi. Overlapping arrays will allow for higher resolutions in the future.

C. LCS imaging

Similar to LED-array engines, LCS technology forms an entire line simultaneously. Each of the 2,400 liquid-crystal shutters can open or close, controlling the amount of light that reaches the photosensitive drum. The shutters are matrices of liquid-crystal cells, which have molecules arranged so that light passes through them when the power is off. When a charge is applied, the crystal untwists, preventing light from passing through the cell.

---

with a printer that has features you couldn't care less about but that is a poor choice for the tasks you bought it for.

**Speed Demons**

If you've ever waited around for a page to come out of a printer, you know how important printer performance is. When we say *performance*, we mean speed, pure and simple. Output quality and ease of use are separate considerations.

In the past year and a half, two printers have raised users' performance expectations to new heights: Apple's LaserWriter II/NTX and the Qume CrystalPrint Publisher (also marketed by Jasmine and LaCie). The NTX is important because it was the first 300-dpi printer to use a 68020 chip in its PostScript controller. Just as the 68020 gave the Mac II a significant performance edge over the 68000-based Plus and SE, the 68020 in the NTX makes that printer 75 percent faster than the 68000-based NT. Since the introduction of the NTX, other 68020-based printers have come to market, some of which — the Dataproducts and ATi models, for example — perform even faster. Both QMS and NEC have announced 68020-based PostScript printers (which should be available as you read this), and others undoubtedly will follow.

The NTX additionally introduced a
2. Preparing the OPC
The drum is coated by a layer of optical photoconductor (OPC), such as amorphous silicon. This material can hold an electrical charge, which it loses when exposed to light. An electrostatic charger, called the primary corona, prepares the OPC to receive an image by giving it a negative charge.

3. Creating the image
Light hits the OPC, producing positive charges wherever it touches; these areas are surrounded by negatively charged regions. This invisible image, formed through the difference in surface charges, is called the electrostatic latent image.

4. Adding toner
Toner is composed of magnetic particles, pigment, and resin. It also receives a negative charge. The internal magnet in the developer roller attracts the magnetic particles in the toner, creating a thin layer of toner on the roller. As the drum rotates, the latent image passes by the roller. The negatively charged toner jumps to the OPC, where it adheres to the positively charged image and is repelled by the negatively charged regions.

5. Putting it on paper
Beneath the drum is the transfer corona, a narrow trough with a few twists of thin wire. As paper moves through the printer, the corona gives it a positive charge. This positive charge attracts the negatively charged toner, pulling it from the OPC to the paper. As the drum rotates, the image is transferred onto the paper.

6. Fixing the image
The paper moves through pressure rollers. The upper roller is heated to the melting point of the toner’s resin (about 160 degrees centigrade). This process of pressing and melting, called fixing, forces the toner to bond with the paper.

7. Cleaning up
After the image is transferred to paper, a blade wipes the drum clean of any remaining toner, and an eraser lamp neutralizes the charged OPC, enabling it to begin the process again.

Second innovation. It was the first desktop PostScript printer to offer a dedicated SCSI hard disk as an option. Printer fonts are downloaded to this hard disk, which dramatically speeds the printing of documents that use lots of different typefaces or many sizes of the same typeface.

The Qume CrystalPrint Publisher is also fast. Very fast. But it’s a very different animal from the other printers tested. It’s a clone, the first mass-market PostScript clone. The PostScript interpreter in this printer isn’t licensed from Adobe, and it can’t use Adobe fonts. Instead, Qume developed its own version of PostScript in-house, and the 35 resident typefaces are supplied by Bitstream. Furthermore, the interpreter is fueled by a RISC chip from Weitek, not by a Motorola 68000-family microprocessor (see the “Worth the RISC?” sidebar). The Qume clone is 50 percent faster than the NT, and it lists for $500 less (the Jasmine and LaCie machines list for $1,500 less than the NT).

To test the performance of our 16 printers, we fed them documents from Word, PageMaker, Excel, Illustrator 88, MacDraw II, SuperPaint, Digital Darkroom, and Adobe Separator. The speed of the LaserWriter II was the standard for performance comparison. Figure 3 shows the relative speeds for each of our
test documents and an average of all the tests. As expected, the high-performance printers (NTX, Dataproducts, ATI) led the pack, with the clones finishing a respectable second. (Actually, the high-resolution printers were the runners-up, but people buy them specifically for their resolution, not for their speed.)

**Performance Factors**

Several factors—including microprocessor speed, RAM, and print-engine speed—affect performance. The most important of these is the speed of the printer's microprocessor. As previously indicated, printers with 68020 chips are inherently faster than those with 68000s. The clones, which use RISC technology, perform somewhere in between, usually closer to the 68020-based machines.

RAM can also affect throughput. Most

### Table 1: Features of PostScript Printers

<table>
<thead>
<tr>
<th>High Performance</th>
<th>Dataproducts LZR 1269</th>
<th>ATI LaserPrint 1275</th>
<th>The Clones</th>
<th>LaCie Panther PDX</th>
<th>The Standard Apple LaserWriter INTX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail price</td>
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<td>$7,095</td>
<td>$8,595</td>
<td>$4,499</td>
<td>$3,495</td>
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<td>Engine model</td>
<td>Canon LBP-SX</td>
<td>Toshiba A-739</td>
<td>Toshiba A-739</td>
<td>Casio LGS 130</td>
<td>Casio LGS 130</td>
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<tr>
<td>Engine type</td>
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<td>Laser</td>
<td>Laser</td>
<td>Liquid-crystal shutter</td>
<td>Liquid-crystal shutter</td>
</tr>
<tr>
<td>Engine life (pages)*</td>
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<td>600,000</td>
<td>600,000</td>
<td>180,000</td>
<td>180,000</td>
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<td>Microprocessor</td>
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<td>Motorola 68020</td>
<td>Motorola 68020</td>
<td>Weitek XL-8200 RISC</td>
<td>Weitek XL-8200 RISC</td>
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<td>16.7 MHz</td>
<td>16.7 MHz</td>
<td>4 MHz</td>
<td>4 MHz</td>
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<tr>
<td>Speed (pages per minute)</td>
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<td>12 ppm</td>
<td>6 ppm</td>
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<tr>
<td>Resolution (dots per inch)</td>
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<td>300 dpi</td>
<td>300 dpi</td>
<td>300 dpi</td>
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<td>4.7</td>
<td>4.7</td>
<td>4.7 clone</td>
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<tr>
<td>Resident fonts (number)</td>
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<td>35</td>
<td>35</td>
<td>35 BiStream</td>
<td>35 BiStream</td>
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<tr>
<td><strong>Paper handling</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Paper output (lace up/down)</td>
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<td>up/down</td>
<td>up/down</td>
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<tr>
<td>Paper weight</td>
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<td>16 to 21 lb</td>
<td>16 to 21 lb</td>
<td>16 to 24 lb</td>
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<td>Paper trays, capacity</td>
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<td>letter</td>
<td>letter</td>
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<td>yes</td>
<td>no</td>
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<td>leg tray, $95</td>
<td>leg A4, B5 trays,</td>
<td>leg A4, B5 trays,</td>
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<td></td>
<td>$99</td>
<td>$95</td>
<td>$95</td>
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<tr>
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<td>none</td>
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<td></td>
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<td>19 x 26 x 9</td>
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<td>20 x 19 x 18</td>
<td>13 x 16 x 9</td>
<td>13 x 16 x 9</td>
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<td>Warranty</td>
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<td>1 yr (50 days on-site)</td>
<td>1 yr (50 days on-site)</td>
<td>1 yr (30-day return)</td>
</tr>
</tbody>
</table>

*Ratings based on manufacturers' estimates. Actual engine life may vary. 1 LaCie also includes 84 Casady & Greene downloadable fonts (from $1,000 value). 2 Fuji's RX7100PS offers 4 megalcals of RAM for $995. 3 AGFA has 13 fonts in ROM, 60 in attached hard disk. 4 Dimensions include paper trays.
PostScript printers now come with at least 2 megabytes of RAM. Higher-resolution devices, such as the 400-dpi AGFA and 600-dpi Varietyper, require more memory to handle the greater number of dots they must image on a page. For 300-dpi printers, however, extra RAM speeds the processing only of documents that contain many different typographic characters. A portion of RAM stores downloaded outline fonts. Most 2-megabyte machines let you download as many as 17 typefaces at once — more than enough for most documents. However, the Fujitsu printer, despite its 2-megabyte RAM endowment, can handle only seven fonts at once.

If you’re not a heavy font user, this limitation won’t matter to you. But if you are, seriously consider a printer’s download capacity. The RAM in some printers
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Capsule Reviews

The Standards

Most of the PostScript printers we tested are based on the Motorola 68000 microprocessor and offer resolution of 300 dpi and average performance.

Apple LaserWriter IINT

The NT is the second-slowest printer we tested. It prints nice type but suffers a little on gray scale. Priced near the high end of printers in this group ($4,995), this is a solid machine but not a winner.


Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010
$4,995

Camintonn Turbo-Laser/PS-PLUS 3

Not a particularly high performer (13 percent faster than an NT and costing $700 more), the TurboLaser has one claim to fame: It's a good machine for use in a multivendor environment. It's the only printer that allows simultaneous connections on its LocalTalk, serial, and parallel ports. It can emulate DEC's LN03 family, as well as the HP LaserJet Series II, Diablo 630ECS, and Tektronix 4010/4014 printers. If you don't need all these emulations, note that Camintonn (formerly a division of AST Research) also offers the TurboLaser/PS, a PostScript-only version that goes for $4,795.

Pros: Good grays and blacks. Multiport and multiprinter emulation capabilities. Engine life rated at 600,000 copies. Cons: Type plugs up. Exposed OPC. Can't handle legal-sized paper, envelopes, or manual feeding. Too expensive. 90-day warranty.

Camintonn Corp.
2332 McClave Ave.
Irvine, CA 92714-9820
(800) 943-8336 or (714) 553-0247
$5,995

Fujitsu RX7100PS

This LED-array printer performs slightly better than an NT and costs $500 less, but its overall output quality is not as good. Furthermore, while most printers with 2 megabytes of RAM can handle 17 downloadable fonts, the Fujitsu can deal with only 7. Not recommended.


Fujitsu America, Inc.
3055 Orchard Drive
San Jose, CA 95134
(800) 626-4686 or (408) 432-1300
$4,495

GCC Business LaserPrinter

This printer uses the same Ricoh engine that the Ricoh and IBM printers have, but we obtained better grays with this machine. Perhaps Ricoh has a quality-control problem. The GCC had marginally weaker performance than the Ricoh machine, and it costs $300 less. At $4,199, the GCC has the best price/performance ratio of all the Adobe-licensed printers we tested, and we’ve seen street prices as low as $2,949. GCC offers a SCSI hard disk for font downloading as an option — IBM and Ricoh don’t — which boosts performance for heavy font users. It also comes with four additional resident fonts (the Helvetica Condensed family). If you can live with the toner-spillage problem, this is a great buy.


GCC Technologies, Inc.
580 Winter St.
Waltham, MA 02154
(617) 890-0880
$4,199

IBM Personal Page Printer II

Uses the same engine as the Ricoh printer, with nearly identical performance, but the IBM version costs $500 more. It comes with 12 extra resident fonts — from the Garamond, Korinna, Helvetica Black, and Helvetica Light families — above and beyond the 35 standard Adobe faces (but it lacks Helvetica Narrow fonts). It emulates the IBM Proprinter XL and HP LaserJet Series II printers. Not a great buy unless you plan to share the printer with DOS machines — or just want to support Big Blue.


IBM Corp.
900 King Drive
Rye Brook, NY 10573
(800) 426-2468 or (914) 984-4488
$4,999
NEC Silentwriter LC 890

Nearly identical in price and performance to the NT, this LED-array machine was the slowest printer we tested, and it suffers from overall poor print quality. Everything comes out too dark, so type tends to plug up, yet blacks are not solid. Gray solids come out plaid. Not recommended. But NEC has announced the LC 890 XL, which has a 68020 controller and a SCSI hard-disk option. This $6,995 printer, which should be shipping by now, will address the performance problem. But unless NEC revs the engine, print quality will still be lacking.

Pros: Two paper trays standard. Good toner handling. Engine rated at 600,000 copies. One-year warranty.

Cons: Slow. Poor print quality.

NEC Information Systems, Inc.
1414 Massachusetts Ave.
Boxboro, MA 01719
(609) 264-6800
$4,595

QMS-PS 820

Based on Canon's TX engine, with a life expectancy of 600,000 pages (the Canon SX used in Apple's printers is rated at 300,000), the PS 820 outperforms the NT by about 20 percent. But the price/performance ratio on this $6,495 unit is less than that of the NT. QMS will soon ship the PS 820 Turbo ($6,995) with a 68020 processor and a hard-disk option. QMS claims that the new model will outperform the NTX. The current PS 820 is too expensive, but the Turbo could be a best buy.

Pros: Two paper trays standard, with DA for tray selection. 600,000-page engine life. Several printer emulations. Easy to set up and maintain. Excellent manual.

Cons: Pricey. Type too heavy. Uneven gray and black solids. 90-day warranty.

QMS, Inc.
One Magnum Pass
Mobile, AL 36618
(800) 858-1859 or (251) 633-4300
$6,495

Ricoh PC Laser 6000/PS

This printer performs 15 to 20 percent faster than the NT and costs $500 less. It has a very good price/performance ratio, but (along with the IBM and GCC printers) it has the messiest toner arrangement of all the printer tests. It's very easy to spill toner inside the printer.


Cons: Toner spills. Inconsistent gray solids.

Ricoh Corp.
3001 Orchard Parkway
San Jose, CA
95134
(408) 432-8800
$4,495

The standards (clockwise from top left): Ricoh PC Laser 6000/PS, NEC Silentwriter LC 890, GCC Business LaserPrinter, IBM Personal Page Printer II.

can be increased to 3 — or, in the case of the NTX, even 12 — megabytes. Adding RAM lets you download more fonts to your printer and increases the size of the font cache as well. But for a 300-dpi printer, it's a rare document that will benefit from more than 3 megabytes of memory, and RAM is expensive.

Another performance enhancement for type fanatics is a dedicated hard disk for fonts. A hard disk has three advantages: It can store hundreds of fonts; it eliminates the network traffic associated with downloadable fonts; and once a font is downloaded to disk, it stays there (downloading to RAM is temporary). A portion of the hard disk is also used as a font cache, which boosts performance even more (see Figure 4).

The high-resolution AGFA and Vari-type models offer a hard disk as part of their standard configurations. On the NTX, Dataproducts, and ATI printers — all 68020 machines — it's an option. The GCC Business LaserPrinter is the only 68000-based machine that has a hard-disk option. You can expect hard disks to be an option on many more printers in the future. If you use only a few downloadable fonts, a RAM upgrade to 3 megabytes is a good solution. But if you have a large library of type, invest your money in a hard disk instead.

Finally, printer-engine speed affects performance — although not as much as you might expect. Most of the printers we tested, including the NTX, are rated at 6 or 8 pages per minute (ppm). However, the Dataproducts and ATI printers, which are rated at 12 ppm, performed only about 15 percent faster than the 8-ppm NTX. This raises an important point: Ratings of engine speed are theoretical. They represent the maximum possible throughput available on a printer. In practice, throughput is almost always less. It's like the miles-per-gallon ratings given for cars. You never seem to do quite as well as the sticker promised.

Looking Good on Paper

Speed isn't everything. You want your pages to look good too. So how do you judge the quality of a printer's output? Print quality is a function of the printer's engine. Several printers may use the same
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Olympia, WA 98507 • 206.352.2097

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**Capsule Reviews**

**High-Resolution Printers**

These Postscript printers have 68020 microprocessors and a resolution greater than 300 dpi, which produces crisper type, a broader gray scale, and a higher price tag. Hard disks are standard.

**AGFA P3400PS**

The only 400-dpi Postscript printer currently available, the P3400PS produces crisp type that 300-dpi printers can't match, but its gray-scale images come up short. Shading subtlety gets lost in both the lightest and darkest shades. It has only 13 resident fonts, but the attached hard disk contains 60 more. Performance is roughly equal to that of an NTX, but it costs nearly twice as much. Our first two units gave us trouble and had to be replaced. Not good, considering it has only a 90-day warranty. Give this printer some time to mature.

**Pros:** Good print quality and performance. Two paper trays. Has a 20-megabyte hard disk with 60 Adobe fonts. Engine life rated at 600,000 copies. **Cons:** Questionable reliability. Poor gray scale. Doesn't do envelopes. Expensive.

**AGFA Compugraphic**

60 Industrial Way
Wilmington, MA 01887
(508) 658-6600
$12,500

**Varityper VT600P**

Pushing toner technology beyond its limits, the Varityper achieves an output resolution of 600 dpi. Overall print quality is the best of all the printers, but the Varityper is also the most expensive. Performance falls between that of an NT and that of an NTX - not bad considering it's handling four times as many dots per square inch. Not your basic desktop machine for everyday office use, but a good alternative to high-resolution imagesetters for some types of work.

**Pros:** Excellent type quality and gray scale. Comes with a 20-megabyte hard disk. **Cons:** Too expensive. Has a 90-day warranty. Big.

Varityper
11 Mount Pleasant Ave.
East Hanover, NJ 07936
(800) 631-8134 or (201) 887-8000
$17,000

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engine, so their output will look the same even though their overall designs, and even their performance, may differ.

All desktop PostScript printers initially used laser-based print engines. Today, two new technologies — light-emitting-diode (LED) array and liquid-crystal shutter (LCS) — are used as well (see Figure 5). We tested LED-array printers from NEC and Fujitsu. Each company designed its own engine, and the printers have vastly different output quality. Likewise, the output quality of the laser-based engines varies widely. Only one engine — the Casio LCS 130 of the Qume, Jasmine, and LaCie clones — uses LCS technology. Whether it's the basic technology or the particular engine design,

Most of the printers we examined are shipped without software of any note. However, a slew of utility programs that make spoolers reduce the time between initiation and shipment are available from third-party developers.

No matter how fast your printer is, a spooler makes it seem faster. That's because spoolers reduce the time between initiation of a print job and the instant you can resume work on the Macintosh. The printer doesn't print any faster, but you wait only a fraction of the time it typically needs for it to relinquish control of the computer.

Spooler are software programs (usually a DA paired with an INIT) that intercept documents to be printed, store them in temporary disk files, and then print them while you continue with your work. This background ability is how spoolers got their name. Simultaneous Peripheral Operations On-Line.

There's no shortage of commercial spoolers for PostScript and QuickDraw printers alike. SuperLaserSpool, TurboSpool, GrappleSpool, TangentSpool, and AppleShare Spooler are just a few that leap to mind. With prices typically less than $100, a spooler can be the least-expensive route to a "faster" printer.

Widgets and Whatnot

MockPackage Plus Utilities from CE Software is an eclectic collection of DAs and utility programs. Of interest to PostScript-printer owners is a handy DA called LaserStatus, which displays the status of the printer currently selected in the Chooser. If you share a laser printer, it lets you see whether it's busy or not before you send a long print job. You can also request detailed information about the printer, such as its PostScript version, page count, font memory, and resident fonts. Not happy with these fonts? LaserStatus lets you download fonts, PostScript files, or sets of both. Finally, if the printer isn't located next to your Mac, you'll save shoe leather whenever it acts up, because LaserStatus lets you reset the printer remotely. Also provided on the MockPack­age Plus Utilities disk is an application called Widgets, which does everything LaserStatus does and lets you disable the printer's self-test startup page. Both LaserStatus and Widgets are also available with CE Software's DiskTop.

PostScript Programming

When MacUser last evaluated PostScript utilities (see "PS I Love You," August '88), Emerald City Software's LaserTalk proved the indispensable environment for serious PostScript programming and debugging. Its interactive mode provides immediate feedback from the PostScript interpreter as commands are sent to the printer. Post-It, from PostCraft International, shines in its ability to manipulate EPS files and paste them commonly used code with its Glossary function. On the low end, PostHaste, from Micro Dynamics, is a bare-bones utility that lacks good debugging tools but might be worth a look if you don't want to spend a lot of money to get into the PostScript programming game.

"MiniCad+...is in our opinion, in power per dollar the best CAD program for the Mac...I think one of the best new features is the MiniPascal command language."...John S. Gates, AIA

"I have been using MiniCad+ for some weeks now and I must say it is a fantastic improvement on the last release of MiniCad. I particularly like the new 3D features which are easier to use"...Andrew Herron, Herron Associates

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For dealers only. MacUser magazine and Ingram Micro D have joined forces to offer resellers the Macintosh Pocket Selling Guide. It's a pocket-sized reference guide packed with everything a salesperson needs to better explain today's advanced Mac Products.

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If you would like more information about the MacUser/Ingram Micro D Pocket Selling Guide, contact Ingram Micro D.

we can’t say, but the overall output quality of this engine is excellent.

What should you look for when judging a printer’s output quality? Type is probably what most people are concerned about, because it dominates the majority of printed pages. To test type quality, we printed some 6-point text in Times Bold Italic and examined it under a magnifying glass.

You hope to see crisp, clean lines, with all the letters legibly formed. Some manufacturers, including Canon, which provides the engines for Apple’s LaserWriter IIIs, design their engines to produce strong, solid blacks. But this often makes type print too heavily, making everything appear slightly too bold. In extreme cases, type plugs up or letters jam together. The Camimion Turbo-Laser and NEC Silentwriter are particularly prone to this problem.

If you plan to print halftones or to create images that contain large, solid areas of gray, be sure to check a printer’s gray scale. By using default settings, you can get 300-dpi printers to produce 33 shades of gray, including white and black. We printed a gray-scale strip to see if each of the 33 shades was distinguishable from its neighbors. We also checked to make sure the strip showed an even distribution of grays, without being shifted toward the dark end, which sometimes occurs with printers that are designed for blacker blacks.

Finally, we performed a streak test. That is, we printed a solid page of each

---

\* Toner: No Deposit, No Return? \*

I used to be puzzled whenever I saw a diesel Mercedes-Benz sedan on the highway. Why would anyone who could afford a luxury car worry about the price of fuel? Similarly, I often wondered why some owners of expensive laser printers would go to the trouble of having their toner cartridges refilled. A little investigation reveals that the benefits can be substantial.

Lower cost is the main reason people turn to refilled toner cartridges. A new cartridge for the LaserWriter II retail for $129, yet a refurbished unit goes for only about $60. Throughout the life of the printer, buying second-hand cartridges can save you thousands of dollars.

The trick to reusing your toner cartridges is finding a reputable remanufacturer. Some of the low-price leaders in the field operate “drill and fill” houses, which, as the name implies, simply drill a hole in your old cartridge, empty out the spent toner (hopefully), and pour new toner in through a funnel. Patronsing these refill-only firms can be troublesome.

Despite the word “toner” in their names, the most popular cartridges (including the EP cartridges of the Canon CX engines and the EP-S cartridges of the SX engines) contain more than just the black “ink” that sticks to the paper. The primary components are the toner reservoir, transfer mechanism, photostatic drum, corona wires, and waste reservoir. A good cartridge remanufacturer — as opposed to a simple refiller — completely disassembles the cartridge, checks each part for wear, and lubricates the pieces.

In the long run, it’s wear and tear on the drum that determines the life span of a toner cartridge. Even under the best circumstances, the coating on the drum wears out after several refills. By insisting on getting back the same cartridge you sent, you’ll know exactly how many times your cartridge has been refilled. However, if your remanufacturer has good quality control, this shouldn’t be a concern. Also, a relatively new process allows drums to be recoated for about $10, essentially allowing infinite refills.

In any case, the firm should provide a test sheet printed with the refurbished cartridge and unconditionally guarantee its work against defects. The most common problems we’ve found with refilled cartridges are occasional black streaks on paper, overly light or dark printing, and toner leaks inside the printer. These symptoms indicate a poor job and should be your cue to switch remanufacturers.

Some proponents claim that, properly refurbished, used cartridges can actually be better than new ones. Because the drum has already been broken in, print quality is more consistent, and black prints better. Furthermore, Canon recently began using an abrasive in its toner that’s presumably designed to destroy the drum, making it impossible to reuse EP-S cartridges. All the more reason to buy refurbished, not new. Although some purists adamantly refuse to use refilled cartridges, the substantial cost savings involved seems to outweigh any charges leveled against them so far.

— Owen W. Linzmayer
Refilling toner cartridges can be easy on the pocketbook. Savings are based on a printer life expectancy of 300,000 copies, cartridges providing maximum copies, refilling the number of times expected, and prices of $119 to $129 each for new cartridges and $50 for refurbished ones.

Table 2: Toner Refills Save Money

<table>
<thead>
<tr>
<th>Engine</th>
<th>Cartridge</th>
<th>Maximum number of copies</th>
<th>Recommended number of refills</th>
<th>Lifetime savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>LaserWriter</td>
<td>CX EP</td>
<td>3,000</td>
<td>3 to 7</td>
<td>$5,160</td>
</tr>
<tr>
<td>LaserWriter II</td>
<td>SX EP-S</td>
<td>4,000</td>
<td>2 to 4</td>
<td>$4,140</td>
</tr>
</tbody>
</table>

Most printers do well on some of these tests but not on others. The NEC Silentwriter, sadly, does poorly on all of them. This printer is a prime example of the problems that can result from putting the desire for solid blacks above all else. Everything the Silentwriter prints is too dark, but it still produces less-than-optimal blacks.

Two engines performed with flying colors on all the output-quality tests: the Canon SX engine in the LaserWriter IIs, for example — display one or two large streaks. Some (notably the NEC Silentwriter) create something resembling a Scottish plaid. We also checked to see whether a full page of black printed solidly or contained gray splotches.

Most printers do well on some of these tests but not on others. The NEC Silentwriter, sadly, does poorly on all of them. This printer is a prime example of the problems that can result from putting the desire for solid blacks above all else. Everything the Silentwriter prints is too dark, but it still produces less-than-optimal blacks.

Ease of Use

All the printers we tested are fairly simple to set up and use, although they vary widely in their approach to toner replacement. All offer easy access to the paper path, making it easy to clear paper jams. The LaserWriter IIs — the NT and NTX are identical. Canon engine and all, except for the controller board — are the easiest of all to set up. No big surprise there, since Apple’s stock-in-trade is ease of use. The QMS-PS 820, which also uses a Canon engine, is also a snap.

The only printer that gave us any setup trouble worth mentioning was the Cammimn TurboLaser. To install or replace its toner and optical photoconductor (OPC), you have to pull on the front panel of the printer. The problem is, you really have to give it a jerk — pulling demurely doesn’t work. You get this sinking feeling that you’re about to snap the plastic just before the panel finally gives.

Setup is one thing. What about when there’s a problem? All the printers provide front-panel indicators or controls. The LaserWriter IIs have the simplest panels, with four LED indicator lights and associated icons. Some of them are clear enough to be proposed as international symbols; others defy interpretation. The Dataproducts and ATI printers offer the most elaborate setup, with extensive touch pads and LCD panels for status messages — it looks like you could fly a jet with them. (To be fair, they’re well marked and easy to understand.) The panels on the LaserWriter IIs only indicate status, but the Dataproducts and ATI printers, along with many of the other machines, let you control certain aspects of the printer’s behavior from the front panel. You can turn the startup page on or off, for example. If the printer has two trays, you can select which one to use.

There’s a lot of variation here, but don’t base your buying decision on the front-panel controls. If the printer is networked, you’re not likely to see the status lights anyway. And even if some of the controls are a bit cryptic, typically only a few people in a work group mess with a printer in distress. They’ll quickly learn their way around, and that will be that.

A more significant issue is the printer’s paper-handling capability. All of these machines can print on letter-sized paper,
Warning: You do not have a Seagate drive in your computer.

Don't take chances. Ask for Seagate.

Seagate
The first name in disc drives
and most can handle legal-sized paper, envelopes, and manually fed sheets. The clones don’t support manual feeding or envelopes, and the Camtronix Turbo-Laser is even worse — it can’t handle envelopes, manual feeding, or legal-sized paper.

Some printers have only one slot for a paper tray; others have two. Of those with one slot, some (Apple, Variety, and the clones) require you to change trays to switch from letter- to legal-sized paper, and you must buy the second tray. The IBM, Ricoh, and GCC printers each have one universal, adjustable tray. The Dataproducts and AT1 models come with a single tray, but you can add a dual-input cassette, which gives you a total of three trays, for a hefty $895. The AGFA, Fujitsu, QMS, and NEC printers come standard with two trays.

Then there are fonts. Most of the printers come with the same 35 Adobe fonts (11 typeface families) that the LaserWriter II/NTX has. The clones use Bitstream equivalents. The GCC and IBM printers throw in a few extra fonts, but the high-end AGFA offers 73 fonts (60 of them on its hard disk). The LaCie Panther PDX — already our cheapest printer — has an especially sweet deal: 84 Casady & Greene fonts worth $1,000.

In other words, there are nearly as many configurations as there are printers. If this is an important consideration, check the features listed in Table 1. If you have any doubts, grill the salesperson to make sure that the printer you buy meets your needs. Our recommendation for a two-tray printer: the QMS-PS 820.

Conspicuous Consumption
Printer engines have several parts that must periodically be replaced. These include the toner reservoir; the OPC; and,
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Please circle 178 for information
Please circle 179 for dealer inquiries
in some engines, the developer and fuser. (For an understanding of what these parts do, see Figure 5. To compare the cost of ownership, see Figure 7.)

Some of these parts need to be replaced sooner than others. Toner is usually the first to run out. It’s also the cheapest to replace. For this reason, many engine manufacturers let you replace the toner independently of the other consumables. This approach is cost-effective because you don’t throw away other parts that are still usable.

In most engines with separate toner replacement, however, you risk making a big mess. For example, when you replace toner on the Ricoh LP-1060 (used in the Ricoh, IBM, and GCC printers), you must lay the container in the printer and use a crank to remove a plastic strip from the bottom of the container. Nothing indicates when you’ve cranked the plastic all the way back, though. If you remove the container before the plastic’s all off —

### Capsule Reviews

#### High-Performance Printers

A Motorola 68020 microprocessor gives these Postscript printers their blazing speed, and they offer optional hard disks.

---

**Apple LaserWriter IIINTX**

An excellent printer. The optional SCSI hard disk for font downloading — the NTX was the first 300-dpi PostScript printer to offer this feature — makes it a great DTP workhorse. One of the highest-performance machines we tested, it’s an ideal choice for a network of users who generate a high volume of printed pages. Upgradable to 12 megabytes of RAM, but don’t waste your money. Stick with the standard 2 megabytes and invest in a hard disk instead. A market leader, the NTX will soon have competition that both undersells and outperforms it.

**Pros:** Reliable, high-quality printer with great performance. SCSI-drive option.

**Cons:** Streaky solids, splotchy blacks. 90-day warranty. For support, don’t call Apple, call your dealer — need we say more?

*Apple Computer, Inc.*

20525 Mariani Ave.

Cupertino, CA 95014

(408) 996-1010

$6,999

---

**Dataprodusts LZR 1260**

Identical to the Dataprodusts LZR 1260. All buys the machine from Dataprodusts and resells it with a new label; it even comes with a Dataprodusts manual. But ATI sells it for $600 more, and offers only a 90-day warranty. End of subject.

*Dataprodusts Corp.*

6200 Canoga Ave.

Woodland Hills, CA 91365

(818) 887-8000

$7,595

---

**ATI LaserPrint 1275**

Identical to the Dataprodusts LZR 1260.

ATI buys the machine from Dataprodusts and resells it with a new label; it even comes with a Dataprodusts manual. But ATI sells it for $600 more, and offers only a 90-day warranty. End of subject.

*Advanced Technologies International*

355 Sinclair-Frontage Road

Milpitas, CA 95035

(408) 942-1780

$8,195

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**Dataprodusts LZR 1260**

Like the NTX, a great machine. Unlike the NTX, an industrial-strength machine, with multibin options and an imposing footprint. Its Toshiba engine is rated at 12 ppm, 50 percent faster than the Canon engine in Apple’s NTX. In practice, it was only 15 percent faster — but that was enough to make it the fastest printer we tested. The LZR’s type is a little heavy, but it has good grays and blacks. A hard disk is available, which we recommend for anyone using lots of fonts. The extensive control panel includes an LCD status display and the ability to switch the startup page on and off. The engine life is rated at 600,000 copies (the NTX engine is rated at 300,000), and it has a one-year warranty (Apple gives you 90 days). Worth $1,000 more than an NTX? We’d call it a tie.


*Dataprodusts Corp.*

8200 Canoga Ave.

Woodland Hills, CA 91365

(818) 887-8000

$7,995

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**Dataprodusts LZR 1260**

Like the NTX, a great machine. Unlike the NTX, an industrial-strength machine, with multibin options and an imposing footprint. Its Toshiba engine is rated at 12 ppm, 50 percent faster than the Canon engine in Apple’s NTX. In practice, it was only 15 percent faster — but that was enough to make it the fastest printer we tested. The LZR’s type is a little heavy, but it has good grays and blacks. A hard disk is available, which we recommend for anyone using lots of fonts. The extensive control panel includes an LCD status display and the ability to switch the startup page on and off. The engine life is rated at 600,000 copies (the NTX engine is rated at 300,000), and it has a one-year warranty (Apple gives you 90 days). Worth $1,000 more than an NTX? We’d call it a tie.


*Dataprodusts Corp.*

8200 Canoga Ave.

Woodland Hills, CA 91365

(818) 887-8000

$7,995
disaster. Even when we cranked the plastic back all the way, some toner spilled inside the printer virtually every time.

Some engine manufacturers have put a great deal of thought into this problem, giving you the cost advantage of separate toner replacement but designing it to eliminate spills. The Toshiba engine in the ATI and Dataproducts printers is an example of good design, as are the Ricoh 4081 in the Camiin TurboLaser, and the engine in the NEC Silentwriter.

In engines that require separate replacement of the OPC, you must be careful because it's highly light-sensitive. You can destroy the OPC by exposing it to bright light or by touching it. Most printer manufacturers position the OPC out of sight inside the printer, so that unless you explicitly remove it, you don’t risk damaging it. With the Camiin TurboLaser, however, it’s in plain view every time you open the printer lid. Very poor design.

Some engine manufacturers seal all replacement parts inside a single cartridge, so you never risk a close encounter with the toner or OPC. The Canon engines (Apple and QMS printers) and the Fujitsu printer’s engine are designed this way. These are simple to replace — open lid, remove cartridge, insert new cartridge, close lid. While clean and easy, this approach significantly increases the cost per page. Every time you run out of toner, you must replace the not-yet-worn-out and more-expensive OPC as well. Some people save money by recycling their OPC/toner cartridges, trading in the empties for refill ones (see the “Toner: No Deposit, No Return?” sidebar). Others go even further and refill their own cartridges, which really reduces the cost.

The Clones

Life is full of hard choices — such as whether or not to buy a PostScript clone printer. Adobe, of course, would like the clones to go away. But they won’t. We’re not going to discuss the ethics, morality, or legality of clones, although they make interesting dinner conversation. Instead, we’ll investigate the issue from a user’s perspective.

The first thing to say about the clones we tested (Qume, Jasmine, LaCie — same printer, different labels) is that each one’s

![Image of PostScript-Printer Comparison]

Output quality falls into two broad categories: type and graphics. Shown here are three type samples (6-point Times Bold Italic) and three gray-scale strips. There’s one example each of the best and worst from the 300-dpi printers, plus 600-dpi samples for comparison. Keep in mind that our descriptions may not match what you see here, because it’s extremely difficult to reproduce the fine details on an offset press.

The Good: All the letters are highly legible in the type sample. There are small gaps in some of the characters, but they are not apparent to the naked eye and contribute to legibility. The gray-scale strip has a smooth gradation from white to black. Both samples were output on the Casio LC-130 engine of the Qume clones.

The Bad: The type appears too bold, and the small holes in letters such as the lowercase e are plugged up. This sample came from the NEC Silentwriter. In the gray-scale strip, printed on a LaserWriter UNIX, each shade of gray isn’t distinct from its neighbors. The Canon SX engine in the UNIX also has a bad streaking problem.

The Hi-Res: These samples were printed on Varityper’s 600-dpi printer. Not surprisingly, both type and gray scale look excellent. Distinct bands are not visible in the gray-scale strip because the higher resolution lets the printer generate too many shades of gray for the eye to pick up.
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performance is excellent, about 1.4 times that of a LaserWriter IINT. If this weren't true, they wouldn't pose such a threat to Adobe PostScript printers. We've heard rumors that other soon-to-be-released clones may run seven times faster than an NT. We'll see.

The second thing to say about the clones is that they're cheap—these are the least-expensive printers we tested. And the third thing is that they have excellent output quality.

But then comes the question of the clones' compatibility with PostScript. To test compatibility, you could devise PostScript code heavily laden with obscure PostScript operators to see if the interpreter in the printer does what the Red Book says it should. (The Red Book, officially entitled PostScript Language Reference Manual, describes the PostScript language and how its various operators, or commands, are supposed to behave.) Alternatively, you could try printing a bunch of files from commonly used Macintosh applications to see if any problems arise. We chose the latter approach, printing a variety of complex text and graphics files.

Although we had generally excellent results, there were two files that the clones couldn't print. One was a gray-scale image printed from DataCopy's MacImage scanner software. We got different results on different test runs; sometimes we got a single band of the image across the page, sometimes several bands, sometimes nothing. The image printed perfectly when it was opened with Digital Darkroom or imported into PageMaker instead. The second unprintable file was our MacDraw test file, which contained hundreds of ovals. This file simply overloaded the clones' memory.

After some work in the back room, Qume confirmed that we had, indeed, located a bug in its printer's ROM. An upgrade (version 3.0) should be available by now; take the printer to your dealer or send it to a service depot. The upgrade also fixes a problem previously discovered with some fonts at sizes smaller than 12 points, and it adds the Helvetica Light, Light Italic, Black, and Black Italic families to the printer's ROM. In addition, you get a coupon for the Bitstream MacFontware package of your choice. Not a bad deal.

In all fairness, we should point out that the Camintonn TurboLaser didn't successfully print all the text files either. In particular, it choked on the Adobe Separator files. Camintonn said that Adobe was supplying new ROMs with this bug fixed. Owners of Camintonn printers with buggy ROMs can request the new, user-installable ROMs, which are free.

As we went to press, we discovered, much to our chagrin, that the clones wouldn't print at all with Apple's new LaserWriter driver. Qume was unaware of this (!), and while the company assured us the problem would be corrected, it couldn't say when.

Based on our experience, PostScript compatibility doesn't appear to be a serious problem with any of the clones, if—and you'll have to decide for yourself how big an if this is—you stick to the 35 resident fonts.

Font Frenzy

Based on their price, performance, and output quality, the clone printers sound dressed for success. But there is a caveat, and it's a significant one. Most PostScript printers—and the clones are no exception—have the same 35 typefaces stored in ROM. They're always there, and you can always use them. In Adobe PostScript printers, these typefaces come from Adobe; in the clones, they come from

---

**Figure 7: Cost of Ownership**

<table>
<thead>
<tr>
<th>High performance</th>
<th>The clones</th>
<th>The standards</th>
<th>High resolution</th>
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<tbody>
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<td>Apple LaserWriter INTX</td>
<td>Qume CrystalPrint Publisher</td>
<td>Apple LaserWriter INT</td>
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<td>Dataproducts LZR 1280</td>
<td>Jasmine DirectPrint</td>
<td>Camintonn TurboLaser/PS-PLUS 3</td>
<td>Varityper VT600P</td>
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<td>ATI LaserPrint 1275</td>
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**Table: Cost of Ownership**

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PostScript printers can be pricey propositions, and purchase price alone doesn't tell the whole story. The cost of replacement parts—in the OPC, developer, cleaning devices—adds up to thousands of dollars over the lifetime of a printer. This graph shows the maintenance costs for the first 100,000 copies; life expectancies of the engines vary from 250,000 to 600,000 pages.
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Bitstream. Most of our tests used only these 35 fonts, as do more than 90 percent of all documents printed on PostScript printers. If you're planning to do likewise—if you never intend to use any fonts other than the 35 resident ones—compatibility should not pose a problem with the Qume/Jasmine/LaCie clones.

But both Adobe and Bitstream have type libraries containing hundreds of other downloadable typefaces. Many other companies also produce fonts that work on both PostScript and clone printers. Although fonts from Bitstream and other companies also produce fonts that work on Adobe PostScript printers, the Adobe fonts don't work on Adobe type library. They don't have Bitstream fonts. That may change, but it remains to be seen whether service bureaus will add the Bitstream library as a welcome opportunity or as an unwarranted expense. (For more comprehensive discussion of fonts, see "Fonts from A to Z" elsewhere in this issue.)

What does this mean to you? If you're going to use your clone as a proofing device for Lino output and you plan to use downloadable fonts, you should be extremely careful. The chances are good that you will run into compatibility problems. For this reason, unless you know for certain that the fonts you use will be available on the printer on which you print the final output — and you can always provide them yourself, if the folks who run the Lino are willing — we don't recommend the clones for font-intensive DTP work with high-resolution output.

And, because of performance problems, we don't recommend using them with downloadable fonts at all.

Decisions, Decisions

As you can see, many, many factors affect your choice of PostScript printers. Remember, start by figuring out what you plan to do with the printer, both now and in the future. If you're not going to do halftones or use gray type or large, solid-gray areas in drawings, don't worry about how the gray-scale tests came out. If all you plan to do is print spreadsheets, look at the performance chart (Figure 3) to see which printer did best on the Excel test.

Although we found the LaserWriter IINXT, the clones, and the QMS and GCC printers to be the best of the lot, your needs may point you in a different direction. If high resolution is what you need, for example, check out the Variotyper VT600P. And keep your eyes open. By the time you read this, NEC and QMS will have new models on the market, and these are just the ones we know about.

Finally, one more thing that bears repeating. In May, Apple announced its own outline-font technology, which will enable Macs to display high-quality type and print it to both PostScript and non-PostScript printers. (Apple will provide a core set of fonts; it hasn't said which ones, but the basic 35 seems like a good guess. The rest will come from third parties.) Meanwhile, Adobe has announced the Adobe Type Manager, which will let you use PostScript printer fonts to display high-quality type on the Macintosh screen.

When Apple's and Adobe's products ship sometime in 1990, they will completely change the terms of the QuickDraw versus PostScript debate. How they'll change, we can't tell you, and what it will mean for the clones is anybody's guess. Does that mean you should be wary of buying a PostScript printer? Not until Apple stops selling them — and that day, if it ever comes, is a long way down the road.

Henry Bertman wrote MacUser's first comparison of PostScript printers (October '87) and its evaluation of the LaserWriter II family (May '88). He appears unable to leave the genre, a fact of life that he likes to pretend disturbs him. Senior Editor Aileen Abernathy is completing her grand slam of major Mac peripherals, which began with color monitors (October '88) and gray-scale scanners (June '89).

Acknowledgments

MacUser Labs would like to thank the members of our advisory panel: Jim Gable and Steve Rea of Apple Computer; Ted White of Campton Corp.; Arnie Peters of Canon Corp.; Robert Ross, Jr., of QMS; Mike Harris of Qume; and Bill Woodruff of Dot Science.
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<th>ERASABLE OPTICAL DRIVES</th>
<th>Drive</th>
<th>Cartridge</th>
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<td>Jasmine DirectOptical™</td>
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<td>$298</td>
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<td>Pinnacle Micro REO-650™</td>
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<th>SYQUEST CARTRIDGE DRIVES</th>
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<td>LaCie Cirrus 45R</td>
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<tr>
<td>Mass Microsystems DataPak™</td>
<td>$1795</td>
<td>$149</td>
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<tr>
<td>Peripheral Land Infinity 40 Turbo™</td>
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<td>$149</td>
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All Syquest Drives use the same drive mechanism.

*Prices shown are cash prices and do not include shipping. Add 3% for Visa, Mastercard, 5% for American Express. Add 10% for rush handling. LaCie, Cirrus, Silverlining and Silverserver are trademarks of LaCie, Ltd. Other product and company names shown are registered trademarks of their respective companies. Prices and specifications shown are subject to change without notice. Price comparison table taken from MacWorld, July 1989. *Call for complete details, some restrictions may apply.

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PostScript-Printer Comparison

The Bottom Line

In a rapidly changing market, "what's hip today just might become passe." So it is with PostScript printers. New products come out so rapidly that today's front-runner might fall back into the pack before you can reach the store to buy it. As with cars, you may find yourself relying on a company's reputation rather than going with the recommendation of a specific year's model.

Apple LaserWriter II NTX

Nevertheless, we do have some favorites. Topping the list is the Apple LaserWriter II NTX, a true high-performance machine. It has a 68020 processor and an optional SCSI hard disk for downloadable fonts, and it packs all that power into an easy-to-use, sleek desktop package. At $6,999, however, it's not cheap.

The Dataproducts LZR 1260 is also an excellent performer. It's the fastest printer we tested, and a hard disk is available. Although it costs $1,000 more than the NTX, we rate it nearly as high. This is not one for the desktop, though. Its bulkiness and multibin options make it more of an industrial-strength machine.

GCC Business LaserPrinter

You may not need that much power or want to spend that much money. Among the standard 300-dpi models, the GCC Business LaserPrinter ($4,199) is a solid performer, with excellent type quality and a hard-disk option. This is one of the low-cost printers, although its toner-replacement technique is poorly designed, making it easy to spill toner inside the printer.

If you need a two-tray machine, check out the QMS-PS 820. Although priced too high ($6,495), it has excellent performance and an engine life rated at 600,000 pages, which is twice that of the NTX. QMS has an excellent reputation. The printers it will release later this year — 68020-based "Turbo" models of the current PS 810 and PS 820 — are the ones to watch, and maybe even wait, for. The PS 820 Turbo will certainly give the NTX a run for the money.

As with the recommendation of a specific year's model, the Oume is poorly designed, making it easy to spill the toner inside the printer.

The Camintonn TurboLaser, also too expensive in our opinion ($6,495), has one feature that none of the other printers offer. It can simultaneously support multiple connections — LocalTalk, serial, and parallel. The printer polls the various data ports to see which one wants to talk to it. It's worth considering if you have a mixed Mac/PC environment.

Varityper VT600P

If you're looking for ultra-high resolution, and you can afford the $17,000 price, check out the Varityper VT600P. This 600-dpi printer has excellent print quality and a fair amount of zip to boot. It could be an attractive alternative to Linotronic output for some types of work.

Finally, there are the clones: the Qume CrystalPrint Publisher and its identical triplets, the Jasmine DirectPrint and LaCie Panther PDX. These non-Adobe PostScript printers can perform 1.4 times as well as the NT but cost less. The Qume is $4,499, and the Jasmine and LaCie are $3,495, giving them the best price/performance ratio of all the printers.

The clones are the clear winners in bang for the buck, as far as performance is concerned. The GCC and Ricoh printers, among the standards, and the Dataproducts LZR 1260 and Apple LaserWriter II NTX, among the high performers, have a slight edge over the competition in their respective categories. But before making a buying decision, consider factors such as output quality, paper handling, and compatibility. The Varityper and AGFA printers, for example, are good performers but do poorly on the price/performance comparison because you pay the price for higher resolution. And the clones, despite their impressive standing, are probably a poor choice for use with a large type library.

Figure B2 Price versus Performance

<table>
<thead>
<tr>
<th>High performance</th>
<th>Apple LaserWriter II NTX</th>
<th>Dataproducts LZR 1260</th>
<th>ATi LaserPrinter 1275</th>
</tr>
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<tr>
<td>The clones</td>
<td>Qume CrystalPrint Publisher</td>
<td>Jasmine DirectPrint</td>
<td>LaCie Panther PDX</td>
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</table>

<table>
<thead>
<tr>
<th>The standards</th>
<th>Apple LaserWriter II NTX</th>
<th>Camintonn TurboLaser/PS PLUS 3</th>
<th>Fujitsu RX7100PS</th>
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<tbody>
<tr>
<td>GCC Business LaserPrinter</td>
<td>BM Personal Page Printer II</td>
<td>NEC Silentwriter LC-990</td>
<td>QMS-PS 820</td>
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<tr>
<td>Ricoh PC Laser 6800PS</td>
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<td>High resolution</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>AGFA P2400PS</th>
<th>Varityper VT600P</th>
</tr>
</thead>
</table>

Except for the 600-dpi Varityper, these printers had the best overall output quality as well. Compatibility with Adobe PostScript models is very high if you stick to the 35 fonts resident in the printer. But all bets are off — for both performance and compatibility — if you use downloadable fonts. And their failure to work with the new LaserWriter driver (version 6.0) raises questions about future compatibility.

A final note: Our price/performance data is based on manufacturers' list prices. For many of these printers, you can find significantly lower street prices. So you may want to recalculate the price/performance ratio of a particular printer, based on the best price you can find.

MAC USER September 1989
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POWER TOOLS

Edited by
James Finn and
Kristi Coale

Want to get the most out of your Mac? Welcome to our new Power Tools section, devoted entirely to productivity. We'll help you get more from your software and hardware with practical how-to articles, and we'll demystify technology and its jargon with informative reports. Help Folder and Tip Sheet will now be found here, and there's a lot more. This month we'll tell you about utilities that work better than the Mac's Finder, show you how to diagnose keyboard problems, and introduce a new department called Beating the System, by Michael Swaine.

Is the Finder keeping you in chains? Here's how to break free and increase your productivity.

Losing Your Finder

By James Finn

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MacUser welcomes your input. Please specify on the envelope and in your letter whether you're writing to Chris Espinosa (Help Folder), Michael Swaine (Beating the System), Greg Wasson (Tip Sheet), or James Finn and Kristi Coale (for all other ideas for the section). We pay $25 for every idea or tip we use, and the Tip of the Month gets $100.

By James Finn

shell: the Finder is a shell program for the Mac, one that's cracking with age.

The main problem is that the Finder is tied to the hierarchical structure of the Mac's file system. Want to launch MacWrite? You first have to open folders until you reach the one containing it. Ditto for launching a document. Besides being time-consuming, this process leaves your desktop cluttered with open folders, which is doubly annoying when you use Multifinder.

The Finder's file management also suffers from this approach. Want to move some files from one folder to another? Double the clutter: You have to open the source folder, expose the destination folder, and make sure that one doesn't cover the other.

You learn to work around it. You start organizing your hard disk to serve the Finder, keeping frequently used documents and applications on or close to the desktop so you won't have to open so many folders. This compromise defeats the purpose of the Mac's Hierarchical File System (HFS). You should be able to create a folder structure to organize files the way you want, not the way the Finder wants. Working within a hierarchical structure is a great way to organize your disk, but it's a slow way to perform most of the functions you associate with a shell.

Figure 1: PowerStation is the ultimate launching pad. Applications and DAs are installed in buttons and can be opened with a mouse click or from the keyboard. The Expense Report Form button appears in a different font because it has been dedicated to a single document.

By James Finn
There is a better way. Inexpensive commercial programs offer power lacking in the Finder. By using several of them, you can bypass the Finder altogether. I’ll look at my two favorite application launchers, Software Supply’s PowerStation and ICOM Simulations’ OnCue, and at my preferred file-management utility, CE Software’s DiskTop.

**Let’s Do Launch**

PowerStation is a program that you place in the System Folder. Set it to be your startup application (using either the Finder’s or PowerStation’s Set Startup command) and you can say goodbye to the Finder.

PowerStation is the ultimate launching pad (see Figure 1). It gives you a screenful (actually up to 16 screenfuls, or “pages”) of buttons, into which you can install all of your favorite applications and even DAs. Click on a button, and the application launches. Click on the little menu icon to the button’s left, and — surprise! — a pop-up menu lets you rename, cut, or paste buttons (entire pages of buttons can also be cut and pasted).

Click on the little document icon at the right of the button, and you enter power-user’s heaven, a dialog box for attaching documents to the application (see Figure 2). You can select multiple documents at once, even if they’re not in the same folder, and open them all by clicking on the Open button. Put a check mark by any documents you use frequently, and they’ll be preselected automatically whenever the dialog box appears. As the figure shows, the program has many more options for customizing button behavior.

Even with all its features, PowerStation is simple to use. A command quickly sorts the buttons on screen, and you can anchor buttons that you don’t want moved during sorts. If you reorganize your hard disk, PowerStation can relocate all installed applications and documents with a single command. You can even designate a page of buttons as the “startup page,” and all the programs on it will launch each time you boot your Mac.

On Cue, another commercial launching pad (see Figure 3), is an INIT (startup document) that creates a menu in the upper right corner of your screen (you can also assign a key combination that causes the menu to pop up under the cursor wherever you click — great for large screens). Install your favorite applications and documents into the menu and launch them thereafter by selecting them.

Since On Cue isn’t an application, it can’t replace the Finder, but it makes a good supplement. On Cue isn’t as powerful as PowerStation; there’s no way, for example, to open more than one document at a time. But, unlike PowerStation, On Cue lets you launch a new application without first quitting the current one.

**Access to Files**

So much for program launchers. Moving on to file managers, my favorite is DiskTop, a DA that I use constantly. DiskTop can copy, move, delete, and rename files and folders, all from within any application — and that’s only the beginning.

A flexible Find command quickly searches for files on your disks by name, type, creator, size, or date created or modified. Power users
POWER TOOLS

can switch the Files display from "Normal" to "Technical"; listings then show the type and creator of each file (see Figure 4), and you can access the file's Finder bits (such as Locked and Invisible).

DiskTop lets you launch an application or document by locating it and double-clicking on it in the Files window. In addition, you can install up to 20 files onto DiskTop's menu for faster access to launching. Somehow, though, I find that using DiskTop for launching is less convenient than using either PowerStation or On Cue.

An alternative to DiskTop is DiskTools II, a DA that ships with Electronic Arts' DiskTools Plus package. Similar in function to DiskTop, it uses a different interface. You might try both to see which you prefer.

Multilander Mania
Life becomes even more fun when you're using MultiFinder. PowerStation lets you run MultiFinder without (or, if you must, with) the Finder. I love this feature. Without the Finder, you see only the windows for your open applications — no icons for mounted disks, trash, and files on the desktop; no windows for open folders; in short, no clutter. Inserting a floppy disk is faster, since the Finder isn't scanning the Desktop file to draw a disk icon or open windows. And with MultiFinder, PowerStation is always there, so, memory permitting, you no longer have to quit one application before launching another.

On Cue can place a list of open applications at the top of its menu, making it easy to switch among them. Using such a list is more convenient than using the Apple menu, which places the application list below all the DAs. On Cue's list includes an entry for the DA layer, something that Apple omitted.

Future Perfect?
SADE, Apple's new debugging environment, currently ships with a beta version of a new MultiFinder. Among other new features, the list of open applications now appears at the top of the Apple menu instead of at the bottom. Apple also recently announced many features of System 7.0, to be released sometime before the world ends (see News Line, August '89). Finder 7.0 is a much improved shell. I don't have the space to discuss all its features, but you will be able to install applications and documents directly into the Apple menu, and an integrated Find command can locate a file and then immediately open its folder on the desktop. System 7.0 will, however, require at least 2 megabytes of RAM.

So it looks as though most of On Cue's functionality is being incorporated into the Finder, although probably not as elegantly. I expect that PowerStation and DiskTop will remain as indispensable with the new System as they are today.

The Finder is cute, but when you're ready to move on from cute to productive, take a look at what these tools can do for you.

Live with the Finder
If you use the Finder, here are some reminders and advanced tips to make it a more-effective shell.

1. If you hold down the Option key while opening a folder or disk, the window opens only temporarily. When you launch an application and then return to the Finder, the window will be closed.
2. By holding down the Option key while closing a window, you can make all the windows on the desktop close.
3. When you hold down the Command key and click in the title bar of an inactive window, you can move that window on the desktop without activating it and bringing it to the front.
4. The new MultiFinder (currently distributed with the Standard Apple Debugging Environment, or SADE) adds a Set Aside [application name] item to the Apple menu. Selecting this removes all the windows of the current application. If you hold down the Option key, Set Aside [application name] changes to Set Aside Others, removing all windows except for those of the current application.
5. In this new MultiFinder, hold down the Option key when clicking on an application's window or on the small icon at the right edge of the menu bar and the current application will be set aside as you switch to the next.

— James Finn
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Getting Involved with Your System

You can’t fight City Hall, but you can beat the system — that’s System as in file or folder. We’ll even help you in Beating the System.

Each month we’ll take a user’s-eye view of the Finder, the System file, cdevs, INITs, and the other pieces that make up the operating system of the Macintosh. The Macintosh System has a lot of power and flexibility, but trying to find that power and flexibility can be like straying from the tour in a country where you don’t speak the language. Our purpose here is to equip you to get along on your own in System territory. We will leave the guided tours and tourist traps to others because ours will be a business trip; we are here to get something done.

The “we” is not an editorial affectation. I hope you will be inspired to share your own insights and discoveries with other Mac users through Beating the System. In “Beating the Puzzle” (see sidebar), you will find several addresses at which I can be reached. I can’t promise a personal response, but I do promise to publish useful tips on using, extending, and customizing the System and to investigate any broadly interesting problems in the way the System operates.

In the middle of this article is a little puzzle dealing with the way the System operates. If you solve it, you’ll beat the System and discover another way to make your Macintosh just a bit more your Macintosh. And if yours is the first correct solution I receive, you’ll win a T-shirt. Beating the System pays off in increased productivity and profits, and beating the other System beaters can increase your wardrobe.

This month, we’ll go through all the preparations for the journey and look at the territory we will be exploring in the coming months.

Beyond the Guidebooks

The first prerequisite to making the System do your bidding is knowing its capabilities, what it can and cannot do. The fluid ease of use of the Macintosh System discourages looking beyond its most obvious features; therefore, many Mac users rely on the most obvious methods, missing a lot of “power techniques.” If you know that holding down the Option key as you quit from an application program also closes all open windows on the desktop, you probably learned it from MacUser’s Tip Sheet or The Macintosh Bible and not from Apple’s documentation. System features that have been around for several releases are sometimes little known and less understood. We will look at some of the most interesting of the least known, concentrating on solving practical problems.

The System is a moving target, and we will study its maneuvers carefully. New System releases from Apple often contain surprising features, some documented, some not. Sometimes they are pleasant, sometimes not. We’ll look at the additional features of new releases and also examine some practical implications of the general direction of Apple’s future System releases.

Getting Your Documents Together

In addition to scrutinizing the System itself, we’ll examine some extensions, mostly from third-party vendors. These extensions effectively become part of the System when placed in the System folder. You’re probably familiar
MacPrint has several advantages you can easily point to.

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with some of these already: Mouse, Keyboard, Easy Access, CloseView, LaserWriter, and AppleShare.

Most System extensions are Startup documents, Control Panel documents, or Chooser documents. Startup documents, commonly referred to as INITs, are files that perform a one-time function when you start the machine. Control Panel devices (ccdevs) are documents that configure the System or perform a startup function; they are controlled through the Control Panel desk accessory (DA). Chooser documents (PRERs and RDEVs) manage the Macintosh’s interaction with the outside world of printers, networks, and the like.

The aforementioned extensions are all Apple’s: Mouse and Keyboard are Control Panel documents, Easy Access and CloseView are Startup documents, and LaserWriter and AppleShare are Chooser documents. Third-party vendors have added tools that extend the System in various ways. For example, Nine to Five’s Preview is a Chooser document that “prints” to the screen, allowing you to preview printed documents even from applications that lack a built-in Preview option. Other third-party extensions remap keystrokes to enable you to create keyboard macros or to automatically substitute “smart” quotes (true left and right quotes) for the ambidextrous computer-keyboard ones. They can alter the way generic dialogs work — adding a New Folder option to the standard file dialog, for example, so that when you create a new file within any application, you can simultaneously create a folder to hold it. One Control Panel document lets Macintosh II users toggle to a Plus/SE display, useful if you are designing forms on one machine for use on another.

Some extensions work invisibly, such as those that turn the memory cache on or off, or check the System for viruses. Another example is the Radius SANE Startup document, which does nothing but speed up your operations a bit by providing a different path for math operations.

Because Apple allowed for such extensions, making the System work more like you do can be as simple as putting the right documents into your System folder. We’ll look at what should be in the System folder for handling a variety of situations.

Beating the Puzzle

Here’s a puzzle whose solution involves a little-known feature of the Macintosh System.

Here’s a screen shot from a Macintosh SE. This is the entire screen. MultiFinder is not active, as can be seen by the lack of any icon at the right end of the menu bar. Two windows are visible: the System-folder window and the hard disk window named Studio. Note that the System-folder window fills the screen entirely and that the Studio window is in front of it, with the icon for the System-folder window highlighted. We can account for all 23 of the System-folder window’s files and folders, and we can see that the System folder resides in the Studio folder.

What is the System-folder window doing behind the Studio window? Opening or selecting the System-folder window should have brought it to the front. The Studio window could then have been dragged to its present position, but if so, where was it dragged from? If bringing it forward involved clicking on the icon for the Studio folder, where is that icon? Nowhere within the clicking range, since icons never appear in front of windows on the desktop and the System-folder window fills the desktop.

There is a solution, and it requires beating the System in one of the ways discussed here — there may be other solutions, but I’ve tried to eliminate the more obvious ones.

If you solve the puzzle, send your solution to Michael Swaine, c/o MacUser, 950 Tower Lane, 18th Floor, Foster City, CA 94404. The first correct solver will receive an “I beat the System and all I got was this lousy T-shirt” T-shirt.

But don’t wait until you have solved the puzzle to write. Send me your System insights, discoveries, and problems at the above address or at any of these: MCI Mail: MSWAINE: Compuserve: 72617,1256; MacNet: MSWAINE.

Customizing the System by actually modifying System files seems difficult and dangerous. It turns out to be neither, once you know what you’re doing.

The System
And then... Maxell created the RD Series.

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One of the best introductions to System extension is Ted Landau's "What's INIT for You" (August '89). Landau's article also discusses some tools for managing Startup documents and creating "startup sets," logical groupings of Startup documents that effectively customize your machine for different uses. The focus here will be on using such tools to make your System better serve your purposes.

Getting through Customs

The third broad topic we will cover is the most ambitious — System customization.

Any of the extensions just discussed can be modified by use of a resource utility such as ResEdit to get inside the tool and alter its behavior. For example, by altering their resources, you can prevent Startup documents from splattering their icons all over your opening screen.

More importantly, you can modify the System itself. Customizing the operation of the System by modifying System files seems difficult and dangerous, but it turns out to be neither, once you know what you're doing. Resources are the key.

Resources are the foundation of every Macintosh program. Items such as icons, fonts, menus, dialog boxes, and alert boxes — all of which would otherwise be at least partially hidden in the code and data structures of programs — are stored as separate objects that can be manipulated and edited without any programming knowledge. A four-character designation identifies each type of resource; for instance, cdev and INIT are the resource types for the operational parts of Control Panel and Startup documents, respectively. Because Macintosh programs are constructed out of resources, users can modify compiled programs, including those that make up the System, without destroying the System in the process.

Getting It Out of Your System

Assuming that you have some reason to fiddle with the System, how do you go about it? One resource is the special edition of Tip Sheet by Darryl Lewis on customizing the Finder with ResEdit (June '89), which provides a good how-to on twiddling the bits in the Macintosh operating system. ResEdit is the most powerful general-user tool for manipulating System resources, but there are other such tools. REdit, Layout, Installer, and the familiar Font/DA Mover are all resource utilities.

So much for the how-to. What about the why-to? Are there practical reasons for modifying the System's resources? There are — I count three.

First, you can add capabilities to the System by adding instances of an existing resource type. Fonts are the most obvious example. Adding fonts to your System file makes them available to all your applications; removing them reduces the memory demands of the System. For fonts, you don't need ResEdit; Font/DA Mover works fine.

Second, you can edit System resources to make your System work the way you need it to. As shipped, the Finder lets you open only 13 windows at a time. If that's not enough, you can change this limit, which is an attribute of the layout resource (called LAYO in ResEdit) of the Finder, which also defines the layout of the desktop. By setting an attribute of the LAYO resource, you can raise or lower the limit. (If you know you'll never want 13 windows open simultaneously, you'll gain some extra memory by lowering it.)

Third, you can edit System resources to enable "hidden" features of the System. One such feature is New Folder Inherit, another feature of the Finder's LAYO resource, one that is disabled in the Finder as shipped. Turning on New Folder Inherit causes a new folder to "inherit" properties of the folder it came from. For example, with New Folder Inherit turned on, if you set a folder to View by Name, all folders created within it will also be View by Name folders. Similarly, future installments of this department will inherit the qualities of this one: They will cover Apple's System software and how you can extend or customize it to your needs.
Keyboard Diagnostics

The problem:
You're typing along contentedly, when the cursor suddenly stops reacting to your keystrokes. You jiggle the connections, which lets you get back to work, but only temporarily — your keyboard eventually quits again.

The solution:
Run a battery of diagnostic tests. Is the problem something as simple as dirty outlets, a bad cable, or a bad keyboard, or is the problem inside the Mac? In some cases, you can take care of it yourself.

The tools:
You may need small needle-nose pliers, a telephone crimper, scissors, a razor blade, a sharp knife, telephone-handset connectors, a spare keyboard cable, a spare keyboard, and a spare Mac.

Warning
The hazards: Make sure the Mac is turned off while you're working on any internal parts. You'll also want it turned off if your keyboard is ADB (Apple Desktop Bus, common to all Macs in the SE and II families). Unplugging and then reconnecting an ADB device while the Mac is on can destroy the ADB chip in the Mac.

Hypochondriacs tend to run to the doctor at the smallest sign of illness — a mighty expensive practice these days. HypochondriMacs face similar financial woes when dealing with the slightest malfunction of their computers. In both cases, self-diagnosis is a key not only to saving money but also to learning more about the mechanisms involved.

Take your Mac's keyboard, for instance. If your keyboard isn't working, it might be because of something that's easy to fix, such as dirty connection points. You can pinpoint the problem (and, hopefully, remedy it), using this diagnosis map.

By Kristi Coale
If all else fails:

Maybe your Mac is sick. To find out if this is the case, plug your keyboard and cable into a spare Mac. (You might be able to play with one at your local service bureau, or you might want to arrange a short-term Mac rental; you may need a spare Mac in this phase anyway.) If your keyboard still doesn’t respond correctly, try it with the spare cable or try your cable with the spare keyboard. There may be some problem with the connections or, in the case of ADB equipment, in the daisy-chaining of the components.

If your keyboard works with the spare Mac, then the problem is inside your Mac. The complication may stem from a bad ADB chip or, in the case of the Plus or earlier model, a bad VIA (Versatile Interface Adapter) chip. Once you’ve confirmed this conclusion, you’ll have to take your Mac to an authorized Apple dealer.

Although self-diagnosis may eventually send you to the dealer, at least you’ll have a better idea of what can go wrong with your Mac. In the best case, you’ll gain more confidence in your ability to find and fix the complication, and you’ll save some money along the way.
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With its Print Background Picture function, FullWrite Professional lets you print a graphic in Paint, PICT, or (on a PostScript printer) EPSF format on the same page as a FullWrite document. This means that you can create a fancy border in a graphics program and print a FullWrite document with the border surrounding it. Users who try this with EPSF files created in Illustrator 88 find, frustratingly enough, that it doesn't work. Apparently the problem is that Illustrator 88 includes color-PostScript information in its EPSF files that FullWrite doesn't understand.

Here's a workaround: In Illustrator's Save As dialog box, check the "Save Adobe Illustrator 1.1 compatible file" and "Include copies of placed Encapsulated PostScript files" boxes. Now the background picture will be fine (but it will be in black and white), although you may have to adjust the placement of the Illustrator graphics.

Glenn Davis
Santa Cruz, CA

Smart Art 1.0.1

Browsing EPSF files can be a real pain. Even with utilities such as Art Browser, you have to continually set and reset in order to find the next file. Although it's not intended for this purpose, Smart Art makes the job of browsing a snap through its ability to preview unopened documents.

Simply open the folder of EPSF files from Smart Art's Open dialog box and select the file you want to view. The preview window lets you zip through numerous files that are displayed in a reduced-but-still-recognizable size (see Figure 1).

Remember, you're only previewing the art — don't try opening these files in Smart Art.

Robert B. Woodward
Atlanta

SimCity 1.0

The SimCity manual and Print dialog box warn that LaserWriter printing is not supported, but that's not entirely true — the LaserWriter can handle part of the job.

When you choose Print City from the File menu, you are offered two choices: to print all on one page, which produces a reduced city map without fine detail, or to print a tiled map two-by-three pages in size that displays buildings, roads, and tracks in all their delightful SimCity complexity (see Figures 2a and b).

If you print to a LaserWriter, the one-page map prints out fine. The tiled-map Print option produces the first section or page of the map, but you have to print the remaining five pages on an ImageWriter.

Ed Houseman
Burlingame, CA

Figures 2a and b: SimCity lets Laser-Writers print two views of urban sprawl (although the manual claims that it supports only ImageWriter output). You can print either a one-page comprehensive view (2a) or the first page (2b) of the detailed six-page tiled map (which requires an ImageWriter for the remaining five pages).

Compiled by Gregory Wasson
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**MacWrite II**

The new MacWrite II has a nifty smart-quote feature that automatically converts the typewriter-style single- and double-quote marks (like "this") to the more-professional-looking curly quotes (like “this”). What do you do if you customarily use special foreign quote marks (such as guillemets—like «this»—in French, Italian, and German)?

You can change MacWrite II to be smart in any language by changing the SMQT resource with ResEdit. Open the resource and substitute the guillemets (both single and double) for the curly quotes. The keystrokes for « and » are Option-backslash and Shift-Option-backslash, respectively. The keystrokes for < and > are Shift-Option-3 and Shift-Option-4, respectively. Close ResEdit and save the changes you’ve made. Now the program will smartly insert the new types of quote marks as you type.

Dave Valulis
Scotts Valley, CA

**Ready, Set, Go! 4.5**

An undocumented feature of Ready,Set,Go! is its ability to produce gray-scale characters. Users who cannot afford to produce multicolor newsletters or brochures can use the program’s color features to their advantage. By making text different colors and printing without the Color Separation option checked, you can have the program output gray-scale characters on a PostScript printer.

Figures 3a and b show what some of the basic colors look like when displayed on a color screen and when printed in gray scale.

Dave Friedman
Madison, WI

**Finder**

You can save a considerable amount of horizontal space by resetting the generous tab stops Apple assigns in the Finder.

To do so, run ResEdit and open the Finder on the disk you want to change (make sure you’re not running under MultiFinder—you won’t be able to do this if you are), open LAYO, open LAYO=1D128, scroll down to the Tab-stop labels, and substitute the following values:

<table>
<thead>
<tr>
<th>Tab stop</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tab stop 1</td>
<td>20</td>
</tr>
<tr>
<td>Tab stop 2</td>
<td>114</td>
</tr>
<tr>
<td>Tab stop 3</td>
<td>154</td>
</tr>
<tr>
<td>Tab stop 4</td>
<td>208</td>
</tr>
<tr>
<td>Tab stop 5</td>
<td>304</td>
</tr>
<tr>
<td>Tab stop 6</td>
<td>352</td>
</tr>
<tr>
<td>Tab stop 7</td>
<td>384</td>
</tr>
</tbody>
</table>

You can change these values to suit your preferences. I find that these values save the most space without obscuring too much of the column’s contents.

Charles A. Frean
Groton, MA

**Hard Disks**

The performance of your hard disk relates to its interleave factor. If you change machines or add an accelerator card, you may need to change the interleave. As a rule, drives attached to a Mac Plus work best with a 3:1 interleave; those attached to an SE require 2:1; and Mac IIs, Ix’s, SE/30s, and all accelerated Pluses and SEs work best if the disk has a 1:1 interleave.

To see what that interleave is and to change it, use the latest version of Apple’s HDSC Setup (which is part of the System Tools 5.0 or 6.0 package). Hold down Command-I after you arrive at the application’s window to access the interleave areas of the program. Remember to back up your entire disk before changing the interleave. Changing the interleave requires reformating the disk—an operation that destroys all the data on the disk.

Steven Bobker
Palo Alto, CA

Figures 3a and b: If you’re a desktop publisher with a Mac II and color monitor but have little interest in or means of producing color publications, you can use the color-text capabilities of Ready, Set, Go! 4.5 (as shown in 3a) to create gray-scale characters (as printed out in 3b).
Trade secrets revealed...

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**Keyboard**

There comes a time in the life of every Mac keyboard when one of the keys fails to work. How-to articles describe how to repair the keyboard by breaking out the trusty old soldering pencil, tearing the keyboard apart, and replacing the individual key with one purchased from the local Apple dealer. Although this method does an admirable job, you may be uncomfortable doing this kind of minor keyboard surgery.

I have an easier method that requires no soldering. The method is based on the assumption that the key is probably suffering from a dirty contact and that the contact can be cleaned with a judicious application of a solvent.

Disconnect the keyboard from the Mac and carefully pry the key cap off the offending key (see Figure 4a). Now take a can of WD-40 (available at most hardware stores), insert the small straw that comes with the lubricant into the nozzle, and direct as short a spritz of WD-40 as possible at the point where the white key plunger enters the black body of the key (see Figure 4b). Work the key plunger several times and then reconnect the keyboard to see if the key works. The first application of WD-40 may not do the trick, but the key should be resurrected by the second or third try. This method has worked for me on three occasions when I've lost a key on my four-year-old keyboard.

Michael J. Blotzer
Augusta, ME

---

**Tip of the Month**

**Word 4.0**

Inserting graphics in a word-processing document can significantly increase printing time. Here's a trick for trimming your printing time on working drafts and proofs.

Measure the illustration's height (many object-oriented draw programs have a Show Size option). Insert the graphic into a Word document. With the graphic selected, choose Paragraph from the Format menu. Type a minus sign in the Line Spacing box and then enter the graphic's measurement. The minus sign adjusts the paragraph's height to match the size of the graphic.

Select the graphic again, choose Character from the Format menu, and format the graphic as hidden text. When you print draft documents, be sure Print Hidden Text in the Print dialog box is not selected. The illustrations will be replaced by an appropriate amount of white space, and you'll know where your page breaks are (see Figure 5a). When you're ready for the final version, recheck Print Hidden Text, and the graphics will print properly (see Figure 5b).

You'll also find the zebra fish, not to be confused with the zebra finch. Then there's the zebra crossing, the standard crosswalk.

Peter Ansln
Santa Monica, CA

---

**Figures 4a and b** Sticky keyboard slowing you down? A quick and easy remedy is to carefully pry the offending key off your disconnected Mac keyboard (4a), apply the lubricant WD-40 to the key plunger (4b), and work the key plunger several times. Although the first application of WD-40 may not work, the second or third try usually unsticks your problem key.

---

**Figures 5a and b** Printing graphics in draft Word documents can be slow. One solution is to use hidden text. In the Paragraph dialog box, enter the height of the graphic as a negative number for Line Spacing, which adjusts the paragraph height to the size of the graphic. In the Character dialog box, set the graphic to be a hidden character. When you print, make sure to uncheck the Print Hidden Text box. Drafts will print much faster, and you'll also have an idea of the space the graphics occupy.
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Help Folder

Answers to Readers' Questions

Slow LaserWriter SC

Q. I have a Mac II with 5 megabytes of RAM and a Rodime 45-megabyte hard-disk drive. My printer is a LaserWriter IISC, and I'm using System 6.0.2. I use this computer extensively at work. Overall, I am very happy with it; much of the negativity surrounding the Laser Writer IISC is, I think, unwarranted. It's fast, and the quality is good.

I do have a couple of problems, or really annoyances, though, that you might be able to help me solve. One is background printing: Whenever I print a document, other operations (such as editing another document) slow down to a snail's pace. This slowdown doesn't make sense to me. I realize the CPU has to handle background printing, but why can't it operate as a spooler?

Also, during printing from Cricket Graph, the vertical legends are in ImageWriter quality. Would these difficulties be corrected if I printed graphs on a PostScript printer?

Phillip Berger
Moscow, ID

A. Unlike the other Laser Writers, the LaserWriter IISC doesn't have an on-board computer running PostScript to help it print the massive number of dots on a laser-printed page. Essentially, the SC is a 300-dot-per-inch (dpi) ImageWriter that communicates through SCSI rather than a serial port. The volume of data is one reason your machine slows down during background printing. The Macintosh fs spooling: The application is saving its pages into a "spool file" on the hard disk, and later the PrintMonitor takes the pages out of the spool files and sends them to the printer, which naturally slows performance of other operations. With the SC, it's worse, both because more data is being moved around and because the SCSI bus is being used twice (once to get the information from the disk and again to send it to the printer).

The LaserWriter NT and

Are All Modems Created Equal?

Q. I need a modem for very basic communications between home and a small law firm. The software and information require only a 1,200- or 2,400-baud Hayes-compatible modem. I was looking at a few modems, including the Hayes Smartmodem, an Everex modem, and a U.S. Robotics Courier modem. Voice/data switching would be nice, but it is not necessary. Should I buy a modem on price, or does quality make a big difference?

Brady Ryall
Winnipeg, Manitoba
Canada

A. Thanks to the standardization of the Hayes Smartmodem command set, you're pretty much free to choose a Smartmodem-compatible modem on its price, warranty, and manufacturer's reputation. As with most products, quality of manufacture makes a difference, and the little design features (such as the swiveling power connector on the Prentice Popcorn modem I use) count for something.

But beware: "Hayes-compatible" is a pretty loosely used phrase. Not all applications use the Hayes command set correctly, and not all modems implement it consistently. My modem requires uppercase characters in commands and has a 40-character command-line limit (which makes it difficult, for example, to place a long-distance modem call charged to an MCI or Sprint card).

Before you buy a modem, it's a good idea to check it out with your telecommunications software.
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Where No Courier Has Boldly Gone

Q. While preparing transparencies for my statistics course, I ran into the following problem. I was working with histograms, output from a program called Minitab, captured during an interactive run. Minitab uses spaces and asterisks to create graphics, so I converted the output to Courier. When the histogram output is bold, the columns do not align correctly; in plain text, they're OK. This happens consistently in both Word and WriteNow, even though what's on the screen looks fine, whether it's plain or bold.

S. David Farr
Buffalo, NY

A. QuickDraw creates bold characters by “smearing” each letter one pixel to the right, which makes each bold character wider. That looks fine on the screen and on a low-resolution printer, but a pixel width's worth of bold-facing looks grotesque on documents produced on a laser printer or other typographical device. A bold character on the LaserWriter is only slightly wider than its plain equivalent, not nearly a whole point wider.

Here's where you run into a discrepancy: A bold word printed on a LaserWriter is not as wide as it is on-screen. The LaserWriter driver could add space between the printed letters to match the screen, but that would look really ugly. So instead, the driver adds space between each word and its neighbors to compensate for the difference between the screen and printer widths. The amount of extra space it adds is proportional to the number of characters on the line.

So, in your histogram example, because each line has a different number of asterisks, each gets a different amount of space between words, which is why your columns don't align.

There are two workarounds. Both Word and WriteNow support fractional width spacing with high-resolution printers, which optimizes character spacing for printing and should fix the alignment problem (see Figure 1). Word calls this approach Fractional Widths; in Word 3 the option is in the Print dialog box, and in Word 4 it's part of the Page Setup dialog box. In WriteNow you select it in Page Setup by checking "Use printer spacing." The other workaround is to replace the space runs with a single tab and set tab stops.
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POWER TOOLS

Glue is that you can save an Image File (a picture of a printed page), open that file with the Viewer DA, and select a rectangle of text to paste into another application. So if you have columns of data in a word processor and you want to extract just one column, use SuperGlue, open the Image File, select the column, and copy the text. Then you have only the column you want.

Another option is to upgrade your version of Filevision to Filevision IV, which does import and export data. For more information, contact Filevision’s publisher, Marvelin Corp., at 3420 Ocean Park Blvd., Suite 3020, Santa Monica, CA 90405; (213) 450-6813.

Layering Disk Labels
Q. I have about a dozen 3.5-inch disks with outdated labels. After I peel and scrape all of the paper label off, the adhesive remains. I have unsuccessfully tried to clean away the sticky surface with a few household cleaners, rubbing alcohol, and nail-polish remover.

Any recommendations for something to remove the adhesive? It seems like a shame to just trash the disks. What about placing a new label over the old one?

Troy Biles Coralville, IA

A. By all means, pile up the labels! As long as the new label completely covers and adheres to the old one (and doesn’t leave a sticky flap), you can.

Desperately Seeking Specs
Q. I can’t locate anyone who has sound knowledge of the Mac hardware architecture or find any sources of information about it. I have dealt with several brands of computers throughout my career, but I am unfamiliar with the Mac’s internal structure. Therefore, I hesitate to make any modifications to existing systems. Is there a brochure, book, or reference in which I can see labels of what goes where or how to replace memory chips, devices, and so forth?

Karl A. Shump
Durham, NH

A. The Macintosh Family Hardware Reference outlines the internal architecture of the Macintosh 128K, 512K, 512KE, Plus, SE, and II computers. It describes the basic workings of the processor, memory, I/O, and bus circuitry and includes pinouts of all internal and external connectors.

Written by Apple and published by Addison-Wesley, it’s available in most technical bookstores (ask for the Apple Technical Library from Addison-Wesley) and from APDA; (800) 282-2732.

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Elefontitis

You have large type in your page-layout document and need a decent screen image. Instead, you see jagged, off-size headlines. Cheer up. There are new cures available with Apple's System 7.

The Mac is a WYSIWYG machine in most respects, except with fonts used at the "wrong size." You've seen text that prints well on a PostScript printer but looks jagged on-screen and when printed on an ImageWriter. It happens because the good-looking, PostScript-printed stuff comes from mathematically defined outlines of each character. These shapes increase or reduce size flawlessly, but screen text comes from paintings or bit maps of each letter, called a screen font.

Screen fonts don't resize well, so ideally you should have a screen font for each point size you use. You probably have point sizes such as 9, 10, 12, 14, 18, 24, and maybe 48 on hand. But if you want to use, say, 107 points, for which no screen font exists, you get a resized version of an existing screen font that's been hammered to fit.

Apple has announced a new outline-font technology that should solve that problem sometime in early 1990. Adobe is also developing a solution that should be available this fall. (Both Apple's and Adobe's approaches will require 2 megabytes of RAM.) QuarkXPress 2.1 offers relief right now, and FontSizer has been serving as an interim plane toward screen-font Nirvana. If you want to WYSIWYG wisely, here's the scoop.

The Solution Outlined

Since font outlines are so versatile, we should abandon bit maps and use outline fonts for both screen and print. Outlines can be resized and displayed with great fidelity to the original typeface. Screen fonts of any size (12, 22, 99, 116) are available in any application. With better visualization and size flexibility, you may be inspired to use large display type more frequently, in odd sizes and in more creative ways. Low-resolution devices earn new respect because their text output comes from smooth outlines.

U.S. MicroLabs markets FontSizer, a utility that produces precisely sized bit-mapped screen versions of any PostScript outline font in sizes from 12 to 127 points. (Actually, the utility orders an Adobe PostScript printer to do it for you.) Provided you have access to the printer, this scheme is inexpensive. These custom screen fonts are usable by all programs. You must, however, create all the screen fonts you need while keeping an eye on disk space—a single font in a large point size can exceed 100K.

If you need typographic WYSIWYG for page layout and haven't bought a page-layout program, consider QuarkXPress. Version 2.1 offers outline-based screen fonts. Although you can use fonts from any vendor in QuarkXPress, the screen-font WYSIWYG feature works only with Type 3 (unencrypted) fonts, which excludes Adobe's type library.

Making Your Own Screen Fonts

FontSizer is a utility program that creates bit-mapped screen fonts from your PostScript font outlines. It needs the help of an Adobe PostScript printer to do the imaging.

If you have a few tricks of the trade to share, send 'em to DTP, c/o MacUser 950 Tower Lane 18th Floor Foster City, CA 94404
Apple's Outline Fonts

Apple's System 7, scheduled to ship in early 1990, will offer outline-font capabilities for both printing and screen display. The new font format is optimized for rendering accuracy and display speed. Apple claims that access to outline fonts will be automatic and totally transparent to existing programs. With System 7's Layout Manager, you'll see sophisticated typographic effects such as kerning and ligatures. However, applications will need to be upgraded to take advantage of these effects.

Apple's fonts will print well on a wide variety of non-PostScript devices—from the ImageWriter to the LaserWriter IIISC—at any resolution. On the other hand, they'll require translation (by a conversion utility Adobe plans to develop) before printing to a PostScript device such as your friendly LaserWriter.

Apple will supply a basic set of fonts for the Graphics Professional. Paint and drawing programs store graphics in a number of ways. And unless your program speaks that file's particular language, it can't read it. EPS, PICT, TIFF—we shouldn't have to memorize this alphabet soup. The Curator simplifies life for you by acting as a multi-lingual interpreter.

Fortunately, several type vendors are now licensed to produce them. Adobe is also investigating ways for ATM to support Type 3 fonts supplied by such companies as Bitstream and Kingsley/ATF.

ATM will work with both System 6 and System 7. Moreover, ATM will let upgraded applications access Apple's System 7 Layout Manager. For ATM to work, your System Folder must contain the PostScript outlines of any fonts you're likely to use, even fonts that are resident on your printer. PostScript effects such as fill and stroke will be printed but may not appear on-screen.

What about printing to non-Adobe PostScript devices? ATM will use outline fonts for output to low-resolution printers such as the ImageWriter family but not to high-resolution devices. Adobe doesn't want to muscle in on its own market by supplying non-PostScript printers with clean Adobe outlines.

Banking on Adobe's ATM

Adobe Systems will dispense some systemwide relief this fall with its Adobe Type Manager (ATM). Much like Apple's System 7, this transparent utility will provide the benefits of outline fonts to all applications. ATM is designed to work primarily with Adobe-compatible (Type 1 or encrypted) fonts. Fortunately several type vendors are now licensed to produce them. Adobe is also investigating ways for ATM to support Type 3 fonts supplied by such companies as Bitstream and Kingsley/ATF.

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SuperGlue II™ with GlueNotes™ creates an electronic printout
What About Service Bureaus?

If you depend on a service bureau for output, you should do as your bureau dictates, at least for out-of-house printing. Regarding Apple fonts, some service bureaus are spooked by visions of new font discrepancies. Others welcome the birth of the WYSIWYG screen font, because it increases their customers’ appreciation for typography and may encourage greater use of bureau services. Bureaus already have PostScript-based systems that work. Unless they see profitable demand, there’s little motivation to support Apple fonts and make major system changes.

By the time System 7 is released, more factors — prices, upgrade policies, and compatibility and performance data — will be known. Any font setup you have should work when you move to System 7, so you’ll have the opportunity to adjust your font strategy.

— Salvatore Parascandolo

Options for WYSIWYG Screen Fonts

<table>
<thead>
<tr>
<th>Type of outline font</th>
<th>System 6</th>
<th>WYSIWYG capabilities</th>
</tr>
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<tbody>
<tr>
<td>PS Type 1</td>
<td>Adobe Type Manager 9/90</td>
<td>AA</td>
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<tr>
<td>PostScript Type 3</td>
<td>QuarkXPress</td>
<td>AA</td>
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<tr>
<td>PostScript Type 3</td>
<td>Other Applications</td>
<td>A</td>
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</table>

<table>
<thead>
<tr>
<th>Type of outline font</th>
<th>System 7</th>
<th>WYSIWYG capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple Format</td>
<td>Apple Scalable Font Manager 1/90</td>
<td>AA</td>
</tr>
</tbody>
</table>

Under System 6 you can use Adobe’s Type Manager to have freely resizable screen fonts on the fly from PostScript Type 1 outlines. QuarkXPress now offers resizable screen fonts on demand, but only from PostScript Type 3 (unencrypted) outlines. System 7 will support all of the above and add built-in font scaling of Apple’s new outline fonts.

like Solutions, have them.

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Have you ever lost an Adobe Illustrator file but still have a PageMaker document that contains the missing graphic? Or maybe you need to change some placed art, but the layout was done elsewhere and the original artwork is unavailable. In either case, you can convert the graphic back into an Illustrator document by following the steps below. (Although we are using PageMaker as our example, this technique lets you pull Illustrator drawings out of most programs if you hold down Command-F while clicking on OK in the Print dialog box.)

**Step 1**

**Make a PostScript file containing the graphic you want to convert back into Illustrator.**

To do this, open the PageMaker document and move the graphic to a blank page. Choose Print and set the page range to just the page that has your graphic on it. Hold down the Option key (or Command-F) and click on OK. The PostScript Print Options dialog box will appear. Select only “Print PostScript to disk” and “Normal.” Click on “Set file name” and save the file. The result is a text-only file containing the PostScript code that describes that page.

**Step 2**

**Open the PostScript file and find the code used for the Illustrator drawing.**

Use any word processor — Word, MacWrite, or MindWrite, for instance — that can handle large files (larger than about 32K). Search for the text string

```plaintext
Creator:Adobe Illustrator
```

and is the first line of the description of your graphic.

The end of the code sequence depends on which version of Illustrator was used to create the image. For Illustrator 1.1, the end of the text block contains the two lines

```plaintext
%%Start of text block
```

For Illustrator 88, the end of the text block contains these two lines:

```plaintext
Adobe_cmykcolor /terminate get exec
Adobe_cmykcolor /terminate get exec
```

After you locate this section of code, delete all the text before and after it. Be sure to delete any extra lines or spaces before and after the block of code. Remember: The first line of text should read

```plaintext
%!PS-Adobe-2.0 EPSF-1.2
```

**Step 3**

**Save the code in a form that Illustrator can read.**

After you have reduced the document to just the Illustrator code, save it as plain (ASCII) text. When naming the file, add the suffix “-ill” for an Illustrator file or “-ill88” for an Illustrator 88 file and then click on OK. (The suffix will help you remember what type of file you recovered.)

**Step 4**

**Open the file in Illustrator.**

Launch the correct Illustrator version for the graphic you have recovered. (Illustrator 1.1 cannot read Illustrator 88 files.) Open the text file. If you’ve done everything correctly, you should have the drawing back in an editable form. Resave the file, and it will appear as an Illustrator document, not a generic text file.

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Word 4.0 and PostScript

Word 4.0’s powerful new features — table generation, WYSIWYG display of columns, text wrap around graphics — really position it as a low-end DTP product. But it still can’t do some simple, but vital, desktop-publishing chores. Crop marks, for example.

Fortunately, Microsoft has provided a workaround. You could access some of PostScript’s amazing capabilities in Word 3.02. The latest incarnation, version 4.0, extends this ability with predefined PostScript variables, group commands, and a glossary containing several common PostScript procedures (crop marks, gutter rules, column screens, and so on). This largess beckons users to experiment, yet most features remain tantalizingly obscured by paltry documentation. The commands work only for LaserWriters, but if you use one, grab a pencil. What Word has left unsaid shall now be spoken.

Group Commands

Placing bits of PostScript code (even lengthy routines) into a Word document is simple. But Word requires that you first clearly define what part of the page will be affected by the PostScript code. Is it going to affect the entire page (for example, a box enclosing the page) or just a paragraph or inserted graphic?

You define the boundaries by inserting a group command immediately before the page element it will affect. In Word 3.02, you could use two such commands: .page., .para., or .pic. (referring to the entire page, the next paragraph, or the next graphic insertion). Version 4.0 has added .cell. and .row. to facilitate PostScript manipulation of tabular material, and .dict., which we’ll discuss later.

Group commands create a drawing rectangle that specifies the overall size of the PostScript graphic. The actual dimensions of the graphic never have to be entered, because the command gathers this information from Word itself. The drawing rectangle created by .page., for example, is determined by the page size you’ve specified with the Page Setup command. If your page is 5 x 7 inches, the drawing rectangle mirrors those measurements exactly. Most other group commands, such as .para. and .pic., let you focus on increasingly smaller or more precise areas of the page — a paragraph, or a graphic frame within a paragraph.

After the group command is entered, you can enter PostScript code you’ve written or copied from another source. Here’s a simple example that places a 5 x 7-inch box on a page. At the top of the page, type the following:

```
:page.
newpath
.25 setlinewidth
126 144 moveto
360 0 rlineto
0 504 rlineto
-360 0 rlineto
closepath
stroke
```

Anyone with PostScript savvy will notice some peculiarities here. The primary one is that the PostScript inclusion hasn’t been bracketed by a `save/restore or gsave/grestore pair, which prevents certain PostScript operators (rotate, for example) from changing the graphics environment of the entire page. Why this apparent breach of PostScript etiquette? Because the group commands automatically bracket each grouping of PostScript code with a `save/restore coupel.

You might also notice that the origin point (0 0) in Word’s version of the PostScript coordinate system corresponds exactly to that found in PostScript itself. This means that the origin point (0 0) is found at the lower left corner of the current drawing rectangle, whether it is a page, paragraph, or graphic frame.

Word’s built-in PostScript routines and variables can go a long way to increasing the program’s value as a tool for desktop publishing. The ability to create crop marks, for example, or to screen alternating rows in a form or table can greatly enhance the usefulness or appearance of your work.

```
% puts crop marks at page’s four corners:
mark 9 def % length of crop mark
white 4 def % white space inside crop mark
.5 setlinewidth .1 % thin lines
%horizontals
wpleft mark sub white sub wp sub wp top sub moveto mark 0 rlineto
wp top sub wp right sub wp left sub white 2 mul add 0 moveto mark 0 rlineto
wpleft mark sub white sub wp sub wp bottom moveto mark 0 rlineto
wp bottom sub wp right sub wp left sub white 2 mul add 0 moveto mark 0 rlineto
%verticals
wplbottom mark sub white sub wp sub wp left sub white sub wp bottom 2 mul add 0 moveto mark 0 rlineto
wp left sub wp right sub wp bottom mark sub white sub wp bottom moveto mark 0 rlineto
wp bottom sub wp right sub wp left sub white sub wp bottom 2 mul add 0 moveto mark 0 rlineto

para 9 setgray wpsbox fill
```

A simple gray screen placed behind a paragraph can make it stand out and catch the reader’s attention. And for the PostScript effects included with Word, you don’t have to know even one PostScript command. You only need to know how to insert PostScript into Word.

Figure 1: Word contains predefined PostScript commands that enhance its use as a DTP tool. Here, the commands for crop marks (from the supplied PostScript Glossary) and a gray screen are interspersed with plain text. The effects of this code never appear on-screen — only on paper.
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Printing PostScript

If you print the document now, you won’t magically have a PostScript-generated box on the page. The code prints as ordinary text. To have it executed, you must do several things. First, select the PostScript code (including any group command). Then hold down the Shift key and pull down the Format menu. You’ll see that Styles has been replaced by the All Styles command. All Styles has several predefined styles, including one called PostScript. Select it and click on OK. The PostScript code has now been changed into a form that will be interpreted rather than printed (see Figure 1). To see the code after this point, make sure that Show Hidden Text is selected in the Preferences dialog box (Edit menu).

You can’t see the results of your tinkering by using the Print Preview command; you must print the document on a LaserWriter (see Figure 2). When you print, make sure that Print Hidden Text isn’t selected in the Print dialog box and check the Chooser to make certain that Background Printing is turned off. If Background Printing is left on, the PostScript effects will be shifted down and to the right from where you want them on the first page of the document. Subsequent pages will print correctly.

The on-screen appearance of Word’s native PostScript style leaves something to be desired. Fortunately, you can easily modify most of the attributes. While holding down the Shift key, select Define All Styles from the Format menu. Select PostScript. The description box defines the style as “Normal + Font: 10 point, Bold, Hidden.” The main culprit here is Bold, which makes the type hard to read. So just pull down the Format menu while the dialog box is showing and turn off Bold. You can safely change anything in the PostScript style other than the Hidden attribute.

Screens and Crop Marks

So far, the process is simple enough. But what if you want to place, say, a gray screen behind a single paragraph. Do you need to know the precise location and size of the paragraph? Not at all. First, remember that the group command .para. creates a drawing rectangle that corresponds to the size and position of the paragraph it precedes. And Word has another card up its sleeve — built-in PostScript variables. There are 22 variables, which will aid you as you develop code. For a list of the variables and their descriptions, see pages 285 and 286 of the User’s Guide.

To make a screened paragraph, we need the variable called wpSbox. Here’s what you need to type in front of the paragraph (and then format in Word’s PostScript style as described before):

```
para.
.9 setgray wspSbox fill
```

By the way, you don’t have to use carriage returns, although they make the code more legible. You could simply type:

```
para. .9 setgray wspSbox fill
```

In any case, the variable wpSbox is equivalent to defining a drawing rectangle the same size as the paragraph. Without it, you’d have to determine the coordinates of the paragraph (with a ruler on a printout) and type something like:

```
126 144 moveto
360 0 rlineto
0 504 rlineto
360 0 rlineto
fill
```

These are hypothetical coordinates, but you can see the advantages of having the variables. You save a lot of typing, and you don’t need to figure out specific positions or dimensions.

An even clearer example is crop marks, one of six routines included in the PostScript Glossary that accompanies Word 4.0. After the actual crop marks are defined, the routine places them at the corners of the page. Ordinarily, you would have to know or calculate exact positions for the marks, a painstakingly bothersome task. But with judicious use of some of Word’s variables, you can avoid the hassle:

```
wpsleft markl sub whiten sub wpsy wpstop sub moveto markl 0 rlineto stroke
```

The variables wpSleft, wpsy, and wpStop refer to the left margin, the drawing rectangle’s height, and the top margin respectively. You don’t need to
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get the dimensions from the Page Setup dialog box. Word fills in the appropriate numbers when the file is interpreted and sent to the printer. And if you change the page size, you don't have to go back to the code and insert new dimensions.

Creating Global Commands

When PostScript requires specific measures or positions that can't be referred to through the built-in variables, the dimensions are expressed in points. If you feel more comfortable working in inches, simply place the following code after a group command such as .para or .page (and, of course, format it in Word's PostScript Style):

```
/inch (72 mul) def
```

Then you can use code such as 1 inch moveto instead of 72 72 moveto. The routine you've inserted automatically multiplies the inch units by 72, converting them into PostScript's point system.

Ordinarily, such a routine applies only to the drawing rectangle indicated by the group command. So if you had a .page and several .para PostScript groups on the same page, you would have to insert /inch (72 mul) def in each group. When Word scans the page for PostScript, it does each group in turn and discards the variables or routines of that group as soon as it has been processed. Even routines or variables placed after the .page command can't be used by other groups on the same page.

In Word 3.02, this made it difficult to create routines that would remain in effect throughout a document. You could add PostScript operators such as the inch conversion to Word 3.02 by using ResEdit to modify the Serial Printer driver (available from Microsoft). This process is fully described beginning on page 554 of Working with Word by Chris Kinata and Gordon McComb (Microsoft Press, 1988). Version 4.0's new .dict. group command — along with a sly trick — makes this somewhat delicate procedure unnecessary.

A .dict. group contains procedures, user-defined variables, and other definitions that you want to use in more than one group on a single page (such as the inches-to-points conversion). Note that these procedures are still valid only for one page. Does that mean you have to insert the .dict. group at the start of every page? Absolutely not. Make Word do it for you by placing the .dict. group into the header of the document. Happily, Word always scans the header before any other part of the page for PostScript codes. A .dict. group placed there is, in effect, operative until the end of the document.

This same trick can be used to perform actual drawing routines. You can, for instance, write a program that prints the word DRAFT across the page in gray type (see Tip Sheet, July '89) or that causes the page to be boxed (as in our first example). By placing this routine in the header, you can ensure that the graphic will be drawn on every page.

Even if you plan never to write your own PostScript code for use with Word, you'll find working strictly with the six PostScript Glossary items can be rewarding. And if you do generate PostScript code, take a hint from Microsoft and use the Glossary to store commonly used bits of code, entire procedures, and .dict. collections.

— Gregory Wasson

Figure 3: Politicians might find this special PostScript effect useful. It's called "smear word" and is included in Word's PostScript Glossary.
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BRIDGES

"Divide and conquer" works in battle, and it also applies to networks. One of the easiest ways to unclog network bottlenecks is to divide your network into subnetworks with a router. Kee Nethery's review of five LocalTalk-to-LocalTalk routers tells you when routing helps and when it hurts.

If you've been reading the hints and tips in Kurt VanderSluis' Trouble Shots, you know that he's no fan of passive-star networks; active stars are the first step toward a truly cosmic network experience.

WRITE TO
Bridges, c/o MacUser
950 Tower Lane
18th Floor
Foster City, CA 94404

Edited by Henry Hortman

LocalTalk on the Ceiling

Do you, like many of us, have a dynamic office environment—lots of cubicles constantly being rearranged and people moving from one cube to another? Does your network wiring give you headaches every time you reorganize? You might want to consider putting it on the ceiling. With light beams.

Photolink, from Photronics, uses infrared light bounced off a wall or ceiling in the FDHD, which is standard on the Macintosh IIX, IICX, and SE/30, can read DOS-formatted 3.5-inch disks, but it cannot display their contents in iconic form on the screen. The only tool Apple provides for seeing the contents of a DOS disk or for transferring files between DOS and Macintosh disks is the Apple File Exchange utility—not my favorite piece of software.

Dayna has now made the technology behind the DaynaFile available to those of us who can't justify the $600 expense of a DaynaFile. DOS Mounter, an $89.95 place of wires to make LocalTalk (230.4 kilobit/second) connections among Macs. Users won't notice any difference; no INIT other special software is required. Each Photolink transceiver, which mounts on a bookcase or on top of a partition, has four ports. You can attach a single Mac or a daisy chain of several devices to each port. When two or more transceivers aim their infrared beams at the same point on the ceiling, they effectively create a passive-star network (don't tell Kurt VanderSluis). Each transceiver costs $995.

Photronics Corp.
200 E. Hacienda Ave.
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(408) 370-3033

DOS on the Desktop

Until recently, if you wanted your DOS disks to appear on the Mac desktop, you needed an external drive such as the DaynaFile. Apple's SuperDrive (a.k.a. INIT, goes into your System file. When you place a DOS-formatted 3.5-inch disk in your SuperDrive—sorry, it doesn't work with 800K drives—it appears on your desktop as a disk icon. You can copy files between the DOS disk and Mac floppies or hard disks, create folders—the works—by clicking and dragging. It's the way a Mac should work with DOS disks, and it's very nice of Dayna to have made the technology available.

DOS Mounter supports extension mapping. DOS filenames have two parts, the name and the extension, separated by a dot. With extension mapping, you can tell the Mac to use, say, a WordPerfect icon to display any DOS file that has a .doc extension—myfile.doc, for example. You can use the Control Panel to store extension maps.

There are a couple of drawbacks, however. The first is that DOS Mounter is slow. If you're used to hard-disk response times and find working with Mac floppies tedious, wait till you try a DOS
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VMS: Phase 2 On Hold

There’s a big hole in AppleTalk Phase 2. AppleTalk for VMS 3.0, required for Phase 2 compliance, was not announced along with the other pieces of Phase 2. Apple will say only that this announcement “will be made jointly with Digital” — but it won’t say when. The result: delays and headaches for network managers who want to migrate large VMS-based EtherTalk networks from Phase 1 to Phase 2.

Stay tuned.

LAT on the Mac

At the Spring Developers’ Conference, Apple announced the details of the Communications Toolbox, which will be part of System 7.0 software. This Toolbox will provide underlying technology for data-communications connections, terminal emulation, and file transfer between Macintoshes and other operating systems. By providing this core technology — which has long been missing from Macintosh system software — Apple will allow application vendors to concentrate on the more-interesting aspects of communications software and will help standardize the user interface for communications tasks.

A particularly exciting part of the Toolbox announcement was the revelation that, as part of the Apple/Digital Equipment (DEC) agreement, Apple has licensed LAT technology from DEC. LAT is a very efficient high-performance transport mechanism for DEC terminals. Non-LAT terminal sessions to a VAX host interrupt the host processor every time a key is pressed at the terminal. LAT buffers the data going to the host, reducing the strain on its CPU. In addition, LAT will enable Macintoshes to run multiple terminal sessions to multiple VAX hosts simultaneously.
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A Guide to LocalTalk Routers

Reliability is the key to picking the right router. We tested the five LocalTalk-to-LocalTalk routers on the market; here are our picks.

By Kee Nethery

Imagine that you are one of 50 callers on a conference call. According to protocol, only one person talks at a time, no one monopolizes the call, and everyone waits until a pause in the conversation before saying anything. Now imagine a second conference call, not directly connected to the first. To speak with someone on the other conference call, you have to go through some kind of switching device that can bridge the gap between the two conference calls and forward messages between them.

AppleTalk works in much the same way. Each “conference call” is a network. Each person on the call is a node—a computer, a printer, or another network device. The AppleTalk protocols define the rules by which nodes communicate with each other. Data packets are the “conversation” on the line. And a bridge, or router, acts like a switch that connects two networks.

Strictly speaking, bridges and routers serve different functions. The distinction between the two, however, is a rather subtle one and is beyond the scope of this article. More important is the fact that, in AppleTalk networks, there are no “true” bridges. All the switching devices that are commonly called bridges are really routers.

An AppleTalk router straddles two networks; listens to both of them; and, if appropriate, forwards messages between them. A router does not forward messages if the conversation is just among nodes on the same network. Not forwarding messages unnecessarily is called traffic isolation, and it is the main function of an AppleTalk router. It reduces overall network traffic by restricting certain data packets to only part of the internet. (An internet is a meganetwork comprising two or more smaller subnetworks.)

A router cannot speed up your total network throughput—a LocalTalk-to-LocalTalk router, for example, cannot make a LocalTalk network transfer data faster than its specified rate of 230.4 kilobits per second—but by isolating traffic within small subnetworks, routers can reduce the traffic in each subnet. That speeds up the effective performance of...
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the network by dividing it into parts. Each work group has less traffic and therefore fewer collisions — as long as users don’t cross the bridge too often.

To Route or Not to Route

The most common mistake involving AppleTalk routers is installing them where they are unnecessary. Suppose you have a single network with 20 users and one file server (see Figure 1a). Let’s say everyone is constantly trying to use the file server, so each node theoretically gets three minutes of access to the file server per hour.

You see an advertisement that says, “Speed up your network with an Acme SuperBridge!” You buy one and install the Acme router, which splits your network into two smaller subnets. You and half of the other users are now on a new network, on one side of the router. Everyone else and the server remain on the old network, on the other side of the router. Things should speed up significantly, you think to yourself, since each

network is now handling only half the traffic.

Wrong. For those on the old network with the server, things do improve. Since there are now only ten nodes on that network, each node (one of which is the router) gets an average of six minutes of server access per hour, instead of the previous three minutes. They’re the lucky ones. But as far as the server is concerned, the router is just another network node, one out of ten. The server doesn’t know that there are ten more users sitting on the other side of the router. Everyone

on the new network, on your side of the router, must now share the router’s six minutes per hour of server access time. Since you are one of the unfortunate ones who has to go through the router to get at the server, you now get access for only about 30 seconds — 1/10 of six minutes — per hour. For you and for all the other users, your access to the file server has now been drastically reduced (see Figure 1b).

So when should you install a router? Install a router only if you have distinct work groups that do not regularly share network resources with users in another work group. Network resources include such things as file servers, mail servers, and printers. If slow printing is your main problem, the most cost-effective solution may be simply to add a print spooler to your network. If that doesn’t do the trick, consider whether you can subdivide the users on your network into work groups — each work group will become its own subnet — and give each group its own file server, mail server, and printer. Then use routers to interconnect the work groups so that users on one network can send mail to, share files with, and print to a printer on another network.

But make sure not to put people on the “other side” of a router from a printer or server that they regularly access.

Never put

users on the

“other side” of

a printer or

server that

they regularly

access.

Hardware and Software Options

Routers can connect many kinds of AppleTalk networks, including LocalTalk, Ethernet, Arcnet, broadband/video, and (probably by the time you read this) Token Ring. The kinds of networks you are connecting will determine what type of router you should use. For example, if your company has an existing Token Ring network and you want to connect a LocalTalk work group of Macs to it, you will need a LocalTalk-to-Token Ring router. This article covers only LocalTalk-to-LocalTalk routers.

A LocalTalk router can be implemented in either hardware or software. A hardware router is a specialized hardware box with the LocalTalk-router software built into its ROM. Updating a hardware router usually requires replacing the ROM chips, which your dealer or vendor may have to do for you. Software routers run on a Macintosh. In a way they are an extension of system software. This software
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can be quickly, easily, and inexpensively updated by use of a floppy disk. Although a software product can be quickly updated, hardware routers certainly have their advantages. The chances are slim, for instance, that someone will accidentally crash a hardware router—or take it home for the weekend.

For this article, we tested the five LocalTalk routers currently on the market: Hayes’ InterBridge, Nuvotech’s TurboBridge, Shiva’s NetBridge, Solana’s I-Server (all hardware), and version 2.0 of Infosphere’s Liaison (a software router; version 1.0 was reviewed in the April ’89 Bridges section).

Reliability

You wouldn’t drive your car over a bridge that failed “only” once a week, and you shouldn’t trust your company network to a router that fails only once a week either. Total reliability is more important than speed or cost. Failure or bad behavior from the device that controls user access to precious network resources is simply not acceptable.

To test reliability, we configured all five LocalTalk routers and attached them to the MacUser network for several days. Of the five routers tested, the Solana I-Server (ROM version 1.050) and Nuvotech’s TurboBridge (ROM version 33.15A) had obvious routing-table problems (see Figure 2). When we were using the TurboBridge, the Chooser showed each zone name three times. (Nuvotech is aware of this problem but couldn’t say when it would be fixed.) The I-Server worked fine for a while but then added some garbage zone names to the zone list. Solana said that the I-Server likes to control zone names on a network and that when a Liaison user on the same internet tries to reset zone names that an I-Server has already established, the I-Server gets unhappy. A fix—which will entail a ROM replacement—should be available by the time you read this. But until these problems are solved, we do not recommend either of these products. Remember, with routers, reliability comes first.

The InterBridge (ROM version 1.12), NetBridge (ROM version 1.02), and Liaison (version 2.0) routers worked correctly, even when the others were providing incorrect information.

Message-Forwarding Speed

The primary function of a router is to isolate traffic, but it should also forward messages as quickly as possible. To test throughput, we compared the time required to copy a file from a node to a server on the same network with the time it took to copy the same file from the same node to the same server relocated to the other side of the router (see Figure 3). We ran both tests with two additional nodes generating a constant amount of background traffic. Because Liaison is a software router, you can choose between running it on a Mac dedicated to Liaison alone or as a background process. In
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background mode, you can run it behind a Mac acting as either a workstation or as an AppleShare server. We tested it in both stand-alone mode on a Mac Plus and running behind a Mac II workstation being used for heavy foreground word processing.

Liaison (running on a dedicated Mac Plus) and the TurboBridge were the fastest packet forwarders, adding a delay of only 35 percent to the local file-transfer time. Liaison running in the background on a Mac II and the NetBridge added a delay of 45 percent. (Liaison running on a dedicated II or '030 machine would be even faster.) The InterBridge added a delay of 75 percent, and the I-Server added a 100-percenter delay. So of the three routers found to be reliable, Liaison was the fastest, followed by the NetBridge, which was the fastest hardware router.

**Configuration Software**

To do its job, a router must first be configured. When you configure a router, you typically assign a zone name and network number for each of its LocalTalk ports. In some cases you can let the router assign its own names and numbers. The InterBridge, TurboBridge, NetBridge, and I-Server all come with stand-alone configuration applications. Liaison is configured from the Chooser. If you don’t know what you’re doing, router-configuration software won’t be as intuitive as a spreadsheet or a word processor. The manuals for all five of the routers we tested provide comprehensible instructions that lead you through the configuration process. Of these five manuals, Liaison’s is the best.

**Coming Attractions**

By the time you read this, AppleTalk Phase 2—an updated set of AppleTalk protocols that allows an AppleTalk network to contain more than 254 nodes—will be finding its way into corporate networks. Unless your Macintoshes are connected to a large corporate Ethernet or Token Ring network, you don’t need to worry about Phase 2 yet. But as Phase 1 is phased out, you will probably want to upgrade. All the vendors mentioned in this article will be coming out with Phase 2 upgrades to their products. Here are the details:

**Hayes InterBridge**

Hayes has announced InterBridge 2.0 ($799), due out by the time you read this. Factory-installed upgrades for version 1.0 owners will be available for $50 (or, for units purchased after June 12, 1989, free).

**Infosphere Liaison**

Infosphere is shipping a new version of Liaison ($295) that supports both Phase 1 and Phase 2 networks and includes automatic tools for making the migration. Upgrades will be free to those who purchased Liaison within 90 days of the new version’s initial shipping date; it will cost $50 for those who bought the product earlier.

**Nuvotec TurboBridge**

Nuvotec will maintain two separate products for now, a Phase 1 router and a Phase 2 version. The Phase 2 router ($499) and a Phase-1-to-Phase-2 upgrade (which will require a ROM change for a “nominal charge”) should be available by the time you read this.

**Shiva NetBridge**

A Phase 2-compatible NetBridge should also be available when you read this, for the same price ($499) as the Phase 1 unit. Shiva will offer a single product that intelligently determines whether it should act as a Phase 1 or Phase 2 router. For $100, current NetBridge owners can upgrade to Phase 2. The price includes new ROMs, software, and documentation.

**Solana I-Server**

Solana, like Shiva, plans to offer a single product ($695) that can serve as either a Phase 1 or Phase 2 router. The new router and a “nominal charge” upgrade, which will require a ROM change, should be available in September.

**Apple AppleTalk Internet Router**

Apple’s own Phase 2 offering is the AppleTalk Internet Router, a Mac software package to handle Token Ring, Ethernet, and LocalTalk gateways. Slated for release in “summer 1989” (which means your guess is as good as mine), it will cost $399.

Bridges will offer more information about Phase 2 products and strategies for “making the migration” as it becomes available. Next month, look for an in-depth report on what’s new in Phase 2 and how it will affect your network.

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The configuration software that comes with NetBridge, Liaison, and InterBridge shows routing-table status information that can be useful for troubleshooting a network containing several routers. The Shiva Internet Manager software has excellent on-line help, and it can help you configure and obtain diagnostic information on Hayes InterBridges as well as on Shiva NetBridges. Unfortunately, Hayes' InterBridge Manager software (version 1.0D) is not fully compatible with the currently shipping Mac System and Finder (System Software 6.0.3). It can hang if you’re using MultiFinder with another program running in the background. You can avoid the problem by not running under MultiFinder when you run InterBridge Manager, by starting up your Mac from the InterBridge Manager disk that Hayes provides, which has an older System and Finder on it; or — if you have it — by using the Shiva software instead, which is compatible with current System software. Hayes says it is now shipping version 1.0E of InterBridge Manager, which fixes the problem. Current InterBridge owners can call Hayes for a free upgrade.

Special Features

**Half-Bridging.** With half-bridges, you can configure your network so that from Seattle you can print to a LaserWriter in New York and access a mail server in Dallas. Although we did not test half-bridging, both InterBridge and Liaison can be used as half-bridges to connect to remote AppleTalk networks through dial-up modems. In addition, Shiva and Solana offer separate half-bridge devices.

**Configuration Passwords.** Liaison, NetBridge, and I-Server can be configured with password protection so that curious (or malicious) network users cannot reconfigure a network.

**Hidden Zones.** Liaison, NetBridge, I-Server, and TurboBridge can hide certain zones from selected network users. This feature can be very useful when your network contains dial-in AppleTalk modems — or when pranksters are constantly printing to the big boss's LaserWriter.

**Other Networks.** Liaison can be used as a LocalTalk-to-EtherTalk or LocalTalk-to-Arenet router instead of as a LocalTalk-to-LocalTalk router. It can also serve as a gateway between LocalTalk and Token Ring networks, using Apple’s new TokenTalk card and software (which should be available by the time you read this).

**Recommendations**

If you are certain that a router is, indeed, the solution to your network problem, remember that reliability comes first. Speed will most likely be your second consideration. Cost and additional features should probably be your lowest priorities (although the dial-in capability offered by InterBridge and Liaison could be a critical factor for some).

The Hayes InterBridge is the oldest, most experienced LocalTalk router. Although it is also the most expensive ($799) and far from the fastest, it has a proven track record. An InterBridge doesn’t break. In addition, this router comes with a built-in half-bridging.

Infosphere’s Liaison ($295) is also highly reliable when used on a dedicated machine or run in the background behind a server. However, don’t try to run it as a LocalTalk-to-LocalTalk router on an individual user’s workstation; you’ll be asking for trouble. Like InterBridge, Liaison also can be used for half-bridging, and it provides many useful security features. It is fast, and, if you have a spare Mac Plus sitting around or run the program in the background on an AppleShare server, it’s the least expensive. If you’ve purchased a dedicated Macintosh on which to run it, however, Liaison is the most expensive option.

The Shiva NetBridge ($499) is faster and less expensive than the InterBridge, and, although we’ve heard complaints about NetBridges with older ROMs causing problems, our tests showed ROM version 1.03 to be reliable. The NetBridge comes with very nice configuration software. It is solidly recommended for those who want a hardware router. Because the TurboBridge ($499) and I-Server ($695) are not 100-percent reliable, we do not recommend them at this time.

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The SupraModem 2400 is very easy to use. It features autoanswer and autodial (tone and pulse) for performing phone tasks, and it has a programmable-volume speaker for monitoring call progress. Storing phone numbers and user configurations is also simple because of the modem's programmable nonvolatile memory.

These features and others are explained thoroughly in the comprehensive SupraModem 2400 Operator's Manual. Once you understand the basics, the modem's quick-reference card makes finding command descriptions and other modem information quick and simple.

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**Star Performance**

An active star can make your network easier to manage.

By Kurt VanderSluis

In previous articles, we talked about troubleshooting passive-star networks, networks without repeating devices. In this article, we will discuss how to troubleshoot an active-star network. You create an active star by placing a repeater at the center of a network and connecting the network wires to the repeater. Currently, the only repeater available for making an active star in an AppleTalk network is the PhoneNET StarController from Farallon Computing. By the time you read this, the TurboStar from Nuvotech should offer some competition. (Bridges will have a full report on these two devices when the TurboStar ships.)

The StarController and TurboStar are multiport repeaters. Computing devices are usually connected to the repeater ports with ordinary telephone wire that is already installed in a building. Each port of a repeater has its own signaling hardware, and one or more devices can be attached to its wire segment. When two devices are on the same wire segment, they communicate with each other passively—without amplification. But when they are on different wire segments, they communicate through the repeater. The repeater receives a signal on one port, amplifies it, and sends the amplified signal out through the other ports. Because they amplify signals, repeaters greatly extend the total length of wiring you can have in your network.

Both repeaters are relatively expensive (more than $1,500), but they cure one of the most pervasive network problems: guerrilla wiring. In most companies, the first LocalTalk networks were installed by users who strung the wires themselves, often without the company’s approval or consultation. This commando-style networking worked because of the forgiving nature of LocalTalk. Users didn’t care if there were wires poking through the carpet as long as CommandP made a page pop out of the printer. The guerrilla networkers probably looped wires through the ceiling and around doorjams, used inappropriate and illegal cabling, and made passive junctions with abandon.

Such practices are inappropriate for larger networks. Guerrilla wiring is hard to manage; hard to troubleshoot; messy; and hard to keep running in a busy, dynamic environment. If you’ve pushed your wiring past its electrical, functional, and aesthetic limits and need to clean it up, a multiport repeater can solve some of your problems overnight.

Problems will still occur, however, and both the StarController and the TurboStar offer network-management capabilities that can help you solve them. Probably the most useful management tool is the line test, which is part of the StarController’s StarCommandDA. The line test tells you the condition of the wiring attached to the ports. To perform the line test, you must first connect your Mac’s modem port to the management port of the StarController.

When the test shows that the wiring is good, there are two possible interpretations, the first being that the wiring really is good.

The second interpretation stems from the fact that a StarController port with nothing connected to it returns a “good” test value. You can use CheckNET or Inter-Poll, from a computer connected to a port other than the one being investigated, to check whether or not the devices on the suspect port are visible on the network. If they are visible, the connection is good, and the wiring is OK. If not, it’s possible that the wiring on that port is no longer connected to the StarController. The Amphenol cable connection to the side of the StarController is flaky: Sometimes the connector gets cocked in its jack and disconnects some of the ports. There’s a simple solution: Tape the connector in place with a piece of duct tape.

When the line test shows “marginal” wiring, it can mean you are losing some packets because the wires are too long or the termination is done improperly. But because of the way the line test is performed (which we won’t discuss), you can get a “marginal” result on a port that was not intended to be connected to a device. The line test tests passive junc tion, to check whether or not the devices on the suspect port are visible on the network. If they are visible, the connection is good, and the wiring is OK. If not, the test value. You can use CheckNET or Inter-Poll, from a computer connected to a port other than the one being investigated, to check whether or not the devices on the suspect port are visible on the network. If they are visible, the connection is good, and the wiring is OK. If not, it’s possible that the wiring on that port is no longer connected to the StarController. The Amphenol cable connection to the side of the StarController is flaky: Sometimes the connector gets cocked in its jack and disconnects some of the ports. There’s a simple solution: Tape the connector in place with a piece of duct tape.

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\end{itemize}

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\begin{itemize}
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  \item Donkey Doo (2707) - Like "Donkey Kong." Has unlimited levels.
\end{itemize}

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\begin{itemize}
  \item Stars (2202) - Star charting - Astronomy (Breathtaking graphics and really fun education.)
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\end{itemize}

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\end{itemize}

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- BAR CODE: 281
- CABLES: 281
- COMPUTER SYSTEMS: 281
- DATA ACQUISITION: 281
- DISKETTES: 281-282
- GENERAL: 282
- INSURANCE: 282
- MEMORY UPGRADES: 282-284
- NETWORKING: 284
- PERIPHERALS: 284
- PRINTERS: 284
- SCANNERS: 284
- SECURITY: 284
- USED EQUIPMENT: 285

## SOFTWARE
- ACCOUNTING: 285
- BAR CODE: 285
- BUSINESS: 285-286
- DESKTOP PUBLISHING: 286
- EDUCATIONAL: 286
- EMULATION: 286
- ENGINEERING: 286
- ENTERTAINMENT/GAMES: 287
- FINANCIAL: 287
- FONTS: 287
- GENEALOGY: 287-288
- GRAPHICS: 288
- LANGUAGE TOOLS: 288
- MUSIC/MIDI: 288
- PUBLIC DOMAIN: 288-289
- RELIGION: 289
- SCIENTIFIC: 289
- STACKWARE: 289-290
- STATISTICS: 290

## MISCELLANEOUS
- ACCESSORIES: 290-291
- CATALOGS/PUBLICATIONS: 291
- DATA CONVERSION SERVICES: 291
- DESKTOP PUBLISHING SERVICES: 291-292
- INSURANCE: 292
- MAILING LISTS: 292
- RECRUITMENT: 292
- SERVICES: 292
- SUPPLIES: 292

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</tr>
</thead>
<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
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</tr>
</tbody>
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<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
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<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Item</th>
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</tr>
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<td>presentations a more dramatic dimension—animation and sound.</td>
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<td>and HyperSound™ software allows you to record and play back live</td>
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<td>or pre-recorded sound on your Macintosh. Combine with Apple's</td>
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<thead>
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<thead>
<tr>
<th>Case Type</th>
<th>MAC &amp; VISA</th>
<th>MAC SE</th>
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<table>
<thead>
<tr>
<th>RS#</th>
<th>ADVERTISER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>136</td>
<td>Abacus</td>
<td>146</td>
</tr>
<tr>
<td>66</td>
<td>Abaton</td>
<td>47</td>
</tr>
<tr>
<td>NA</td>
<td>Acius</td>
<td>172</td>
</tr>
<tr>
<td>NA</td>
<td>Adobe</td>
<td>170</td>
</tr>
<tr>
<td>NA</td>
<td>Adobe</td>
<td>301</td>
</tr>
<tr>
<td>61</td>
<td>Allan Bonadio</td>
<td>199</td>
</tr>
<tr>
<td>71</td>
<td>Altos</td>
<td>28</td>
</tr>
<tr>
<td>159</td>
<td>Appsylt</td>
<td>162</td>
</tr>
<tr>
<td>98</td>
<td>Ashton Tate</td>
<td>90-91</td>
</tr>
<tr>
<td>162</td>
<td>Auto Desk</td>
<td>182-183</td>
</tr>
<tr>
<td>42</td>
<td>Avery</td>
<td>40</td>
</tr>
<tr>
<td>180</td>
<td>BDT</td>
<td>282</td>
</tr>
<tr>
<td>116</td>
<td>CD&amp;A Computer Sales</td>
<td>252</td>
</tr>
<tr>
<td>15</td>
<td>Central Point</td>
<td>293</td>
</tr>
<tr>
<td>157</td>
<td>Centron</td>
<td>299</td>
</tr>
<tr>
<td>NA</td>
<td>Claris</td>
<td>112</td>
</tr>
<tr>
<td>119</td>
<td>Compuserve</td>
<td>169</td>
</tr>
<tr>
<td>36</td>
<td>Computer Friends</td>
<td>276</td>
</tr>
<tr>
<td>101</td>
<td>Connectix</td>
<td>117</td>
</tr>
<tr>
<td>147</td>
<td>Cricket Software</td>
<td>215</td>
</tr>
<tr>
<td>24</td>
<td>CTA</td>
<td>159</td>
</tr>
<tr>
<td>33</td>
<td>Dantz Development</td>
<td>83</td>
</tr>
<tr>
<td>72</td>
<td>Data Translation</td>
<td>187</td>
</tr>
<tr>
<td>189</td>
<td>DataViz</td>
<td>259</td>
</tr>
<tr>
<td>5</td>
<td>Dayna Communications</td>
<td>256</td>
</tr>
<tr>
<td>80</td>
<td>Deneba Software</td>
<td>9</td>
</tr>
<tr>
<td>53</td>
<td>Design Science</td>
<td>155</td>
</tr>
<tr>
<td>84</td>
<td>Diehl</td>
<td>197</td>
</tr>
<tr>
<td>11</td>
<td>Digital Vision</td>
<td>153</td>
</tr>
<tr>
<td>120</td>
<td>Diskette Connection</td>
<td>278</td>
</tr>
<tr>
<td>126</td>
<td>DPI</td>
<td>108</td>
</tr>
<tr>
<td>170</td>
<td>Dr. Mac</td>
<td>273</td>
</tr>
<tr>
<td>109</td>
<td>Dubl Click</td>
<td>269</td>
</tr>
<tr>
<td>110</td>
<td>Dubl Click</td>
<td>258</td>
</tr>
<tr>
<td>16</td>
<td>E-Machines</td>
<td>159</td>
</tr>
<tr>
<td>20</td>
<td>E-Machines</td>
<td>161</td>
</tr>
<tr>
<td>131</td>
<td>Ehman Engineering</td>
<td>115</td>
</tr>
<tr>
<td>128</td>
<td>Electronic Arts</td>
<td>128</td>
</tr>
<tr>
<td>NA</td>
<td>Farallon Computing</td>
<td>254-255</td>
</tr>
<tr>
<td>162</td>
<td>FWS Software</td>
<td>237</td>
</tr>
<tr>
<td>97</td>
<td>GCC Technologies</td>
<td>99</td>
</tr>
<tr>
<td>99</td>
<td>GCC Technologies</td>
<td>101</td>
</tr>
<tr>
<td>104</td>
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</tr>
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<td>105</td>
</tr>
<tr>
<td>NA</td>
<td>GEISCO</td>
<td>295</td>
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<td>Micron Technology</td>
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<td>Microsoft Press</td>
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<td>Rampage</td>
<td>193</td>
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<td>274-275</td>
<td>Software That Fits</td>
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<td>Solution Int'l</td>
<td>63</td>
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<td>Software Ventures</td>
<td>163</td>
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<td>Sun Remarking</td>
<td>37</td>
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WHY MORE PEOPLE WILL BE BUYING MACINTOSH PRODUCTS...

For dealers only. MacUser magazine and Ingram Micro D have joined forces to offer resellers the Macintosh Pocket Selling Guide. It's a pocket-sized reference guide packed with everything a salesperson needs to better explain today's advanced Mac Products.

Some of the Guide's features include:
- A complete listing of MacUser's highly-respected MiniFinders. These capsule reviews have long been used by retailers to guide buyers in their product purchase decisions.
- A complete industry directory that lists support information for every Macintosh vendor.
- A complete glossary that defines many of the commonly-used terms in the Macintosh market.

More power to you.

The most powerful part of the PSG is the "Sales Briefs." Eye-catching pages that summarize the most important facts about individual products, enabling a salesperson to quickly pass on vital information to potential buyers. You'll make more sales using the "Sales Briefs."

If you would like more information about the MacUser/Ingram Micro D Pocket Selling Guide, contact Ingram Micro D.
Bobker's Dozen

Good Things and Small Packages

No magazine can review every product released into the Mac marketplace these days. Even if every product were worth a review — and that's a very big if — there are far too many good products. And sometimes some of the smaller products — especially those from less well-known companies — get overlooked in the increasingly cluttered market.

Most of the products I'll report on will be regular commercial products. One or two will be shareware or public-domain software, and now and then I'll tell you about products that haven't been released yet but that I've had a chance to take a good look at.

Since I'll be telling you what I think about lots of products, it's important that you know my biases. I've been reviewing Mac software since MacUser's first issue in 1985. I strongly favor the elegant, the fast, and the useful. I like and use tons of utility software, and I'm not easy to please. Good isn't enough; very good barely earns a place on my hard disk.

Programs that invent their own interface don't get high marks, but I do like programs that improve on the standard interface.

By Steven Bobker

1 PictureBook

This month's best product is Loop Software's PictureBook. If you use Apple's Scrapbook DA at all, you know what a great idea and how handy it is. You also know that it's pretty limited. Several developers have created enhanced and improved scrapbooks. Most of them are quite good. In fact, Solutions International's SmartScrap won the 1987 Eddy award as the best new DA of 1987 (see "3rd Annual Editor's Choice Awards," February 1988). SmartScrap is a difficult act to beat.

PictureBook does just that, though, snatch the title as the best scrapbook utility. PictureBook isn't just a scrapbook; it's a format converter, sizing utility, and clip-art cataloger. It does more than any similar program and works smoothly and relatively transparently. It can convert Scrapbook or SmartScrap files into its own format, and it's smart enough to preserve a copy in the original format.

Aside from being a full-featured scrapbook, with facilities for annotating each item and creating useful catalogs, PictureBook has the wonderful ability to resize (to exact pixel precision) anything that can be copied to the standard Mac Clipboard.

Items on the Clipboard can also be cropped with four-click-and-drag crop lines, a vast improvement over the more common side-the-corner-handle method. To get precise cropping, you can quickly magnify images and then return them to the original size, after cropping, with a single click.

Here's how much I like PictureBook: I rename my most-used DAs by putting one or more spaces in front of their names (using Suitcase II or the utilities included with Font/DA Juggler and MasterJuggler). That forces them to the top of the Apple menu and makes them easier to use. I promoted PictureBook to the top soon after acquiring it, a meteoric rise in my system.

Loop Software
301 Industrialplex Blvd., Baton Rouge, LA 70809
(504) 281-7221; $24.95

2 Pyrol

At $24.95, Pyrol is as cheap a stand-alone utility program as you'll find, but don't let its tiny size, tiny price, or tiny package fool you. It's the best screen saver (or blanker) available. Indeed, its main failing is that the fireworks display it produces tends to mesmerize users.

The controls appear in your Control Panel. The latest versions are "intelligent" and can be set to refrain from darkening the screen during, for example, long downloads from BBSs. They also understand and work correctly if you are running a multiple-monitor setup; the fireworks appear only on the main screen, but all auxiliary screens are properly darkened.

Fifth Generation Systems
11200 Industrialplex Blvd., Baton Rouge, LA 70809
(504) 281-7221; $24.95

3 ExpressWrite

ExpressWrite is one of the new breed of word-processing DAs. It (and QuickLetter, the first of this kind, reviewed in the April '89 issue) goes far beyond the text-processing capabilities of the widely used miniWriter and McSimp DAs. ExpressWrite is an excellent program and would be the clear choice if only it were able to handle graphics. Unfortunately, this version doesn't. I want my letter-writing DA to be able to handle my letterhead and put some graphics into the return-address area of envelopes.

ExpressWrite does handle many more formatting options than QuickLetter, however, and its interface is more intuitive. Its mail-merge abilities rival those of all but the most expensive dedicated mail programs. It just needs to print a bit better and be able to import and use graphics. When that happens, it will be able to replace most light-duty word-processors.

Exodus Software
8820 Winton Road, Suite 304
Cincinnati, OH 45231
(513) 522-0011; $89.95

300 MACUSER SEPTEMBER 1989
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4 MugShot

MugShot is a free utility available from the major national electronic services (MAUG on CompuServe, The Mac Roundtable on GEnie, and the Mac forum on MacNet).

MugShot creates a report that lists your important system-software data. It also lists all installed DAs, INITs (now more or less officially called Startup documents), cdevs, and RDEVs. This information is vital for diagnosing software problems: publishers and developers need it to efficiently address your problems.

Operation couldn’t be simpler. Just launch MugShot and, when its window appears, press the Dump Info button.

Nothing seems to happen, but Mug Shot, in a flash, creates a text file that contains all the data. The file is named _Rap Sheet_ (overwriting any existing _Rap Sheet_ file without warning). If you wish to save the information, rename the _Rap Sheet_ file as soon you return to the desktop. I recommend that you use the date and your name as the new filename.

MI Concepts
P.O. Box 8822
Kentwood, MI 48618

5 Just Enough Pascal

Symantec’s Just Enough Pascal is an odd program: It’s both a Pascal (Lightspeed Pascal, to be exact) tutor and an excellent introduction to Macintosh programming. (You have to have Lightspeed Pascal to use Just Enough Pascal.)

Just Enough Pascal consists of 20 lessons or stages that lead to a finished small application. By the time you work through all 20 stages — with the help of a short but awesomely well written manual — you’ll have a good grounding in both Pascal and Mac programming.

If you have some knowledge of Pascal on other systems and want to get started in Mac programming, Just Enough Pascal is just the ticket. It’s equally good if you understand Mac programming and feel the need to learn Pascal.

Absolute neophytes to both Mac programming and Pascal can also use it, but it isn’t really a tutorial program. If you’re starting from scratch, there are better ways to do so.

I had put off really delving into Mac programming for a long time, and I had lots of good excuses: no time, too difficult, manuals aimed at folks who already knew what they were doing, and so on. Just Enough Pascal broke my resistance. It’s fun to use, the material is broken into intelligently sized chunks, and the manual is a delight. And I’m far more knowledgeable about Mac programming as a result.

Symantec
10201 Torre Ave.
Cupertino, CA 95014; (408) 253-9600
$75

6 Hermes and Tribune

Doug Miles’ Hermes and Tribune fonts are subtle remakes of Apple’s mainstay Helvetica and Times. The line weights are thinned down in the larger sizes. The very big sizes, intended primarily for users who need 3X and 4X sizes for use with ImageWriter LQs, LaserWriter IIscs, and fax modems, are much better than the Apple-supplied equivalents. I was somewhat dubious of the claims in the manuals (yes, these fonts come with nice manuals that you can print out) until I tried them. The improved results were immediately obvious.

There are some very nice touches here. If you use a PostScript printer and have Font Substitution switched on (as you almost always should — On is the default setting in the Page Setup dialog), you get true WYSIWYG performance from these fonts.

A bonus is the inclusion of a special version of 10-point Courier. It’s the best match I’ve ever seen for IBM’s 12-pitch Courier typewriter face. If you need to fake the output of an IBM Selectric, this font makes it a snap.

Miles & Miles, 704 N. Water, #1
Ellensburg, WA 88926; (509) 925-5280, $59.95

7 Screen Gems

Screen Gems is a set of five programs aimed at Mac II users who have color monitors, although the programs also work on color monitors attached to SEs. Some of these programs are so good that Apple or the color-monitor vendors should be the ones providing them.

Dimmer and Switch-a-Roo are basic tools. Dimmer is a different sort of screen saver. Instead of blanking the screen, it dimms it to a level you specify. Switch-a-Roo is an Fkey that flip-flops your screen between two monitor settings. For example, you can set the flip to 1-bit black-and-white mode for picky programs and increased speed and then flop to 8-bit (256-color) mode for your works-of-art. A simple keyboard command equivalent moves you from one to the other.

Color Desk puts a full-color background behind any desktop — pretty, although it can eat up a lot of memory (up to 320K!). Globe is a rapidly spinning colored map of the earth that actually uses round windows. It works perfectly in the background under MultiFinder and makes a very nice demo piece. TN-3 lets you customize the color set that appears on the Finder’s Color menu.

Microseeds
7030-B W. Hillsborough Ave.
Tampa, FL 33611; (813) 882-9635
$79
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**Calendar-Maker**

CalendarMaker was reviewed in these pages long ago. Since then I've been amazed by how many people use CalendarMaker printouts for their personal schedules. That's the ultimate compliment for any application.

CalendarMaker and its bonus utility, Icon Mover, are simple programs. The calendars can be customized with graphics and icons or left mostly blank so you can write information in as required. The all-important printing functions are well done. If you're using an ImageWriter (any flavor), you can specify any paper size you want.

**DynoDex**

DynoDex isn't out yet, but it's scheduled to be released by about the time this magazine hits the stands. It already looks like my choice for my all-important name-and-address file. DynoDex consists of a nifty little database and some superb print routines that print your files laid out correctly on the front and back of special paper (you flip the pages manually for the printer) that is perforated and punched to fit standard Filofax and Day Runner organizers. Even in prerelease form, this product has elegant written all over it.

**Click-Paste**

Click-Paste is a utility that puts a scrapbook function at the tip of your cursor. To use it, simply hold down the Option and Shift keys (or others of your choosing) as you press the mouse button. Up pops Click-Paste. You can now paste the contents of the Clipboard to Click-Paste's special folder or select any previously stored material. Click-Paste works with ordinary text, bit-mapped or object-oriented graphics, PageMaker and HyperCard material, and unclassified material. My only complaint: It stores its files in a folder that must be named Scrap and that must be kept at the root level of your hard disk; that's inegalant. I'd like to be able to place the Scrap folder inside another folder and change the name to something that doesn't make me want to throw it away every time I see it.

**SimCity Terrain Editor**

The SimCity Terrain Editor should have been included with SimCity, the excellent and popular city-planning simulation. The basic program provides only a limited range of maps to build on. The Terrain Editor lets you be a land developer as well as a city planner. You can also duplicate any real terrain.

**LANDesign**

LANDesign, a versatile land-surveying program, is aimed at a limited audience. Users have many options. Although that's often a drawback, it can also be an advantage: The program lets surveyors operate within the program in the ways they worked before they had a Mac to help them.

The interface is complete and intuitive — even new Mac users should be able to use LANDesign immediately. All standard COGO (coordinate geometry) features are supported, and all objects can be named with both character identifiers and labels.

The program is intelligent; for example, it completes polygons automatically. It can also do elaborate dimensioning. I was particularly impressed by the excellent design of the interface and overall elegance of this very complex program.
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Visit to a Backward Planet

Esnesnonian was seen without the usual dark-blue suit, white shirt, and conservative red tie. But Apple persisted in requiring its employees to wear loose collars, sport coats, and baggy pants. The company thought this distinction was partly responsible for its becoming the biggest company in the galaxy.

Then it happened. Some entrepreneurs in the desert put together a desktop computer called the Rialto, using a microcomputer chip. The event was pooched by Apple in spite of the fact that a whole slug of little companies cropped up, including one called IBM (Iitty Bitty Machines).

A couple of years passed, with most of the machines modeled after the big Apple mainframes: They all had the mouse and the graphical icon-based interface and clear screens with millions of colors. Nobody took the machine's power seriously.

Then it happened. IBM's Wart Tomson decided to take a chance with some technology that he had found at Canon's Los Altos Research Center (LARC). (Canon was the company that invented the Canographical copying machine that made billions of dollars.) Unfortunately, the company languished as a monopoly and was later overshadowed by Xerox and other aggressive firms in that industry. Nonetheless, Canon maintained a stunning research facility to develop products that would never see the light of day. Apparently the CEO, a man who always wore a fez and called himself Natalie, was quite superstitious and refused to ever market a new product. He decided instead to buy healthy firms and find ways to make them go broke as part of some religious ritual. So the research was there for the taking.

Some sort of secret deal was made, and Tomson ended up with the interface of the future: the command-line interface and the A> prompt. It was revolutionary. Nobody had seen anything like it. It was easy to use: You just told the computer what you wanted to do, using easy-to-remember commands that were listed in a small book. Thus began the first 100 days of the revolutionary new IBM PC. Fanatics came on the scene extolling the superiority of the command-line interface. The litany was always the same: It was faster; it didn't need a mouse; it was more efficient; it was easier to use than a complicated graphics-based interface. Most importantly, it was cheaper to build.

Magazines appeared. The A> prompt symbol was made into a flag and flown over the West Coast manufacturing plant for the PC. The command liners were all considered crackpots, weirdos, and screwballs.

In the interim, Apple, on a lark, built a low-priced microcomputer called the Macintosh. It sold like hotcakes if for no other reason than that it was made by Apple. But within a few years, sales lagged as Apple clones and the world demand for the command-line interface took its toll on the company. So Apple met with billionaire software guru Gil Bates, who was cajoled into copying the PC idea and designing a new operating system and interface similar to the command-line interface on the PC.

Bates and his hordes of programmers worked and worked. Weeks went by. Months went by. Finally, the company unveiled Blinders, the new operating-system shell for the Mac. Apple thought it was a good start. It was a command-line interface all right, but before you could give it a command, you first had to position the cursor on the command line with the mouse. "Kind of clunky," shouted the critics. Worse, it was slow. Nobody used the product, so, a year later, Bates unveiled Blinders 2.0. "Hurray!" the critics shouted. It no longer needed the cumbersome mouse. And it was noticeably faster.

IBM, meanwhile, revealed that a sweet deal between Tomson and Bates had resulted in some sort of agreement that allowed Bates and Apple to use some proprietary tricks that IBM had invented. But they could use them only for version 1.0 of Blinders, not 2.0. So IBM sued Apple and Bates.

The user community was upset by this turn of events. After all, everyone now agreed that the command-line interface was the interface of the future. There was no turning back: the graphical interface with all its icons, crazy Command keys, and clumsy mouse was doomed. Lawsuits would harm progress.

Even an old minicomputer operating system, EUNUCHS, developed from the outset with a graphical user interface, was given new life when a shell was developed that allowed it to use simple commands. Some of the commands were only one character long. "What power!" shouted the critics. It was amazing to witness the hitherto unimaginable power of a single keystroke.

The rest is history. The command-line interface became the interface of Esnesnon. Rumor had it that some graphical-user-interface diehards fled to a planet in a distant galaxy to reestablish the graphical interface as a standard.

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