MACINTOSH SYSTEM 7
The Complete Sourcebook

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Windcrest®/McGraw-Hill

To Janet, whose love and strength have always been my inspiration.

TRADEMARKS

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Introduction—
Launching the Apple Macintosh System 7

On May 13, 1991 at the Worldwide Developers Conference in San Jose California, John Sculley and other Mac luminaries officially christened Apple's new Macintosh operating system. Down the street from the San Jose Convention Center where WWDC 91 was being held, over 60 software publishers were assembled in the Fairmont Hotel ballroom to demonstrate new products being developed for System 7. Banners in front of the hotel proclaimed the historical significance of the number 7:

The 7 Seas
The 7 deadly sins
The 7 voyages of Sinbad
The 7 wonders of the world
The 7 colors of the spectrum
The 7 articles of the U.S. Constitution
And of course,
Snow White and the 7 dwarfs

The number 7,
which has played a significant role throughout history,
is about to change the future of personal computing.

Inside the Fairmont the same message was repeated on T-shirts, which were handed out to press visitors attending a preview of the new S/7 software products.

Staging of the System 7 roll out was perhaps not as spectacular as the early Mac extravaganzas when founder Steve Jobs was the reigning monarch at Apple. Some of you might remember the incredible one-minute TV commercial aired during the 1984 Super Bowl, which announced the original 128K Macintosh. The commercial was an artistic triumph, winning top awards for the year—even though it was never aired again. More importantly, however, was the accuracy of its prophetic message—*Macintosh was about to change the future of personal computing.* Seven years later Apple is proclaiming a similar prophecy for System 7—to *again* change the future of personal computing.

There can be little doubt that Apple's 1984 prophecy was an accurate forecast of the future. Even though the Mac has never captured more than 18% of the personal computer market, Apple's innovations have been sufficient to motivate both Microsoft and IBM to imitate the Mac interface. Microsoft introduced Windows in 1987, and the latest release, 3.0, is finally approaching the Mac's sophisticated ease of use.

Apple's response is a high seas adventure into new waters aboard the *AMS 7* (*Apple Macintosh System 7*). If the original 128K Macintosh was Apple's 1984 flagship, AMS 7 has become the new flagship in 1991. In fact, Apple advertisements herald:

> ## Introducing the first computer in history that's easier to use and more powerful than a Macintosh.
>
> ## Congratulations.
>
> ## You already own it.
>
> ### *Introducing System 7 for Macintosh.*

Is System 7 really that big a deal? The answer is *yes*. While there are a lot of slick new features that any Mac user will find appealing, the real importance of System 7 is perhaps less obvious, but much more pervasive. It lies just below the surface in System 7, and you might not notice it at first. It's the new level of *connectivity* introduced with System 7, which will provide the lasting value of Apple's latest innovation.

Macs have always been easy to connect together. Every Macintosh ever made has included built-in networking. When the LaserWriter was introduced, people had their first significant reason to connect Macs—to share a high-quality printer. And when Macs were connected, some people began to find other uses for the network—file sharing, electronic mail, and connecting Macs to big computers (minis and mainframes).

So what's the big deal about System 7 and connectivity? Most of the previous solutions were after-market add-ons. They weren't always smoothly integrated with the system software, which meant users didn't experience the same consistent interface they had come to expect with Mac applications. Just like the competing world of Microsoft DOS com-

puters, every solution had to be learned from the ground up. In contrast, System 7 lays the foundation for a consistent method of exchanging information:

- Between applications on the same Mac
- Between applications on two different Macs
- Between a Mac and another computer

The importance is that consistency leads to ease of use, which leads to more use. The result is that people will begin to share information using System 7 almost as effortlessly as picking up the phone to call a friend. We say *almost* because it will still require a little more training than learning to use the phone. But it will probably be easier to learn than some of the voice-mail systems you routinely encounter today, which lack the visual clues provided with System 7.

Who should read this book

While we believe that connectivity is System 7's most important and durable advantage, you don't have to be a technical wizard to appreciate Apple's new system software. System 7 is something that all current and potential Mac users will want to learn more about. Even if you don't have any immediate plans to start using System 7, you'll want to find out what's in it for you. Although we've assumed that you have some prior Macintosh experience, it isn't essential in order to learn about System 7.

You might be one of the over 5 million current Mac owners who's grown accustomed to the familiar Mac interface—a *look and feel* that has remained basically unchanged since the Mac was introduced in 1984. Perhaps you've been reading about System 7, or have heard about it from a friend. And maybe you're wondering if you should upgrade or just stay with what you know. How much will it cost? Can I use it on my current Mac? Will my old software run with this new system? Will the new 7.0 applications work with my old System and Finder? Do I really need all the features in 7.0? We'll address these concerns and maybe some more you haven't yet thought about.

Perhaps you're a new Mac owner, or you're considering one of the new lower-cost Mac Classic or LC models. Will my new Mac still be easy to learn and use with System 7? I've heard it's great, but what's in it for me?

Maybe you've already started using your new Mac that came with System 6. Should I switch to this new System and Finder? And if I do decide to switch, how do I get it and install it? What if I run into problems—is there anyone around to help? There *is* help available—both in this book and directly from Apple's new Help Line services. We'll take you through a step-by-step process for installing System 7 and learning its new features.

You might even be the Mac "guru" at a small company or the resident wizard in a Mac-based department of a larger company. Of course you've already installed System 7 on your own Mac—that's why you're the wiz! But others are beginning to ask you about it. When do I switch? Can I run both System 6 and 7 on our network? What about file and application sharing over the network? How does it work? Does it affect performance? Naturally you'd like to maintain your stature as resident Mac expert, but you've been through enough *bomb* messages to know that installing a new operating system can often produce some unexpected results. Where do you go for a quick cram course? We'll share our experience with these issues and several more as we help you navigate the mysterious waters of System 7.

How the book is organized

As you've probably noticed by glancing at the Table of Contents and chapter headings, we've chosen a nautical theme for this book. Frankly, we find too many computer books are dry and lack room for a little fun along the way. That's certainly not the Macintosh way—it's designed for fun as well as serious work. So we've selected the first of Apple's list of historically significant 7s—The 7 Seas—as a symbolic metaphor of an ocean cruise on board Apple's new flagship, the AMS 7.

This adventure guide is organized in four sections, progressing from the basics to more advanced topics, as outlined below:

Section I *Adventure Planning Kit*
Planning for your 7 Seas adventure begins with a travel brochure that shows off some of the exciting new features on the AMS 7. After browsing through this quick overview of System 7, you might be inclined to cast off immediately. However, experienced travelers know that a little planning goes a long way toward making their trip more enjoyable. So chapter 2 takes a serious look at what you'll need to prepare for System 7, including

lots of tips for upgrading your hardware and software. In chapter 3 we take time out for some of our travellers who aren't yet convinced they're ready for the voyage. If your budget can't quite afford the upgrades or you just want to wait and see for awhile, we'll review several software packages that can give you some of System 7's features while you remain with System 6.

Section II   *Smooth sailing on the AMS 7*

When you're ready to embark, the first step is a successful installation of System 7. We look at several ways to get a copy of the new software, as well as provide you with step-by-step instructions for making a smooth transition from System 6. Once on board the AMS 7, there's a guided tour of the bridge, where you'll learn how to navigate the desktop and customize its look and feel. Chapter 5 includes tips and techniques to make the most of System 7's new Finder features, which make navigation a breeze. In chapter 6 we'll go below decks for a closer look at the new System Folder—the engine room of the AMS 7, where you'll learn the mechanics for maintaining a smooth-running ship. Finally, in chapter 7 we'll look at TrueType™ and explain how it helps to make a trip on the AMS 7 a "fontastic" voyage. We'll also reveal some of the mysteries of fonts and how TrueType™ works with Adobe and bit-mapped versions.

Section III   *System 7 savvy programs and other events*

Every ocean cruise has a bountiful program of daily events to please every taste and interest. The AMS 7 continues this tradition by providing new features in your favorite programs, as well as entirely new software that will enhance your daily routine. In chapter 8 we'll take a look at some System 7 savvy programs and their new features. We've also included some tips on working with multiple programs and operating with virtual memory. In chapter 9, we'll go a little beyond most of today's applications and explore the world of IAC (interapplications communications). IAC promises a rich future by combining the best parts of several programs to deliver customized applications for your unique needs. We'll take a peek at the System 7 features that makes this possible and show you how some software developers will be able to take advantage of them.

Section IV   *The Computer Islands*

Island cruises offer many ports of call, where travellers can disembark and sample the local culture, returning to ship with treasures with which to remember their adventure. In the past, personal computing has been

likened to a series of "islands"—separated by open seas, which made it difficult to share information. The AMS 7 provides a convenient and comfortable vehicle for bridging these gaps, allowing everyone to *AppleShare* their information treasures. In chapter 10 we'll reveal some of the mysteries of networking and simplify some of the technobabble that seems to surround the issues of connecting computers. Actually, Apple has done a remarkable job in providing a simple and elegant method to link Macs to other computers with System 7. So you might not need to learn everything we've included in chapter 10. In chapter 11, we'll concentrate on networking with System 7, and include lots of tips and techniques to make sharing a breeze. In our final chapter we'll take a look at some of the features that didn't quite make it into this release of System 7, but could be added later.

How to use this book

We've organized this book so that you can either read it from beginning to end or select the chapters that match your interest and current level of System 7 savvy. Each chapter is mostly self-contained, but if you're new to System 7, you'll probably want to start with chapter 1 for a quick overview of the new features.

If you've never worked with a Macintosh before, you'll probably gain more from this book if you first learn some Mac basics—like pointing, clicking, and dragging objects with the mouse. These skills are covered in the manuals and disks that come with every Macintosh.

After you've checked out the new features guide (chapter 1) and have made sure your Mac is properly equipped to run System 7, we strongly recommend you follow the installation procedures included in chapter 4, or those that come with the System 7 package from Apple. After that, you can begin experimenting with any of the features that interest you.

Section II covers features that are available immediately—they don't require a network or System 7 savvy applications. In Section III, however, you'll need to upgrade your software to take advantage of System 7's new features, like Publish and Subscribe. Likewise, you'll need at least two Macs connected with some form of network cable to try out some of the features covered in Section IV. Of course, you can still read about the features without actually trying them.

Conventions used in this book

Throughout this book we've used the following conventions and abbreviations to simplify and hopefully enhance your reading experience.

AMS 7   stands for *Apple Macintosh System 7*, the name we've given to the new operating system that is the subject of this book. It's similar to the abbreviation DOS (in form only) and it also resembles HMS (Her Majesty's Ship), which is in keeping with our nautical theme.

System 7 or S/7   refers to all versions, although we sincerely hope and expect that System 7.0 is so solid that it won't require a minor revision suffix such as 7.0.1. The same convention applies to System 6. If you're planning to stay with S/6, the latest version is 6.0.8, which will probably be the final revision.

Icons   whenever possible, we've tried to incorporate appropriate icons to provide visual cues that correspond with the topic or item being discussed. If you have a color Mac, your icons might look a little more classy than our black-and-white versions, but you shouldn't have any trouble recognizing them.

Menu commands   we've used a different font to signify a menu item, such as the new **Find** command. The same convention is used with dialog box options, as well as other places where you interact directly with the Mac. If a keyboard equivalent is available, it will generally follow the command, such as **Find (⌘-F)**.

History of System 7

Although Apple first began to publicly describe its plans for System 7 early in 1989, work had begun at least a year earlier. A lot of ideas for improving the Mac's operating system were circulating inside Apple in 1988, when System 7 goals were being formulated. Apple's software engineers wanted to achieve two primary goals:

- Enhance the Mac interface for users

- Provide new tools for software developers to build more exciting and useful applications.

The history of the Macintosh has been a series of peaks and valleys. Apple has consistently achieved its successes through innovation—by

adopting bold new strategies that have led the industry. System 7 is yet another major step in this continuing saga, and to understand its history is also to understand the Mac's history.

Since the Mac's initial rollout in 1984 there has been an ongoing contrast between Apple and the rest of the personal computing world. This difference is rooted in Apple's philosophy of personal computing. The cornerstone of Apple's philosophy is to produce the best possible personal computing experience for its customers. Hardware and software are developed to achieve that exceptional experience, and are therefore in a supportive role rather than an end in themselves. In contrast, Apple's competitors tend to emphasize features of their hardware and software as if they were the ultimate goals.

Sure it's nice to be able to brag that you have the fastest CPU on the block or even the slickest looking windows and icons, but what does it do for you? Are you more productive or empowered to be more creative? Not just in some minor incremental step, but in a major way?

Sadly, for many personal computer users, Apple's competitors have often succeeded in focusing primary attention on the features race. In the early days the Macintosh was available only in a "compact" format, which today includes the Mac Classic and SE/30 models. Competitors focused on a wide range of optional monitors and expansion slots in their boxes that could accommodate cards that added functions to the basic unit. Despite their physical limitations, however, the early Mac models held a significant edge in ease of use and learning. This appealed to a select group of buyers who appreciated the ongoing value that the Mac delivered.

After struggling through the early years, Apple's innovative and friendly Mac user interface finally gained a significant if not dominant share of the personal computer market. Studies by the Gartner Group and other highly regarded industry observers repeatedly found that the Macintosh was easier to learn and, in fact, promoted more use than the competing MS-DOS-based machines. People actually liked working with a Macintosh, and because they enjoyed the experience they took the time to learn more applications. Moreover, learning the second, third, and fourth applications was successively easier because almost all Mac applications have a similar look and feel. Each learning experience was transferable and reinforced the previous experience.

Unfortunately, most PC buyers didn't understand the importance of the *learning* component until it was too late. They focused instead on the most visible cost of a personal computer—hardware investment. And until recently, Macintosh hardware was more expensive than machines that used MS-DOS. Consequently, DOS-based clones are now the biggest portion of the installed base of personal computers.

The true cost of owning a personal computer can be described by two simple equations:

Total cost = hardware & software cost + *learning investment*

Value = benefit derived – total cost

The average PC buyer tends to discount the *learning investment*, perhaps believing that it has negligible value because it generally doesn't require an initial cash layout. At least until you begin to add the cost of buying books and software and taking specialized courses to learn how to operate your computer.

Even more significant, however, is the time needed to become proficient at a particular task or software package. If the investment in learning is too great, a user might become discouraged and never achieve the expected benefits. When the benefits derived from the investment equal zero, then the value received is worse than zero—actually a negative number. This is precisely what many DOS owners have discovered. After the initial enthusiasm wears thin, they begin to realize that they might never achieve the expected benefits. Lofty plans to automate the family budget and plan next week's meals give way to the realization that it's cheaper and a lot easier to do it the old-fashioned way.

The really sad consequence is that many PC owners have become disenchanted with the whole concept of personal computing—at least in their homes. They might struggle through the learning required to perform certain tasks where they work. They might even still own a PC, hoping that their children will find it easier to learn than they did, and rationalizing their investment as an educational aid. But the simple truth is that home uses for personal computers have never really achieved the success that was predicted.

Growth in the computer industry has been sustained by business purchases of PCs. Lately, however, many businesses have reached the satura-

tion point, with PCs available to nearly every knowledge worker. Both IBM and Microsoft began to realize several years ago that this would occur, and they needed to address the ease-of-use and learning issues. Microsoft introduced Windows and IBM announced plans to develop a similar product called OS/2 with Presentation Manager. Fortunately for Apple, neither product achieved much success during the first few years. While they managed to imitate the look of the Mac's friendly desktop, the beauty was only skin deep. Underneath the Windows facade lurked the unfriendly world of DOS, and few applications were developed to the same level of consistency shared by Macintosh programs. Moreover, the early versions of these Graphical User Interfaces (GUI—pronounced *gooie*) were much slower than the Mac and required huge amounts of overhead to operate.

As computers became more powerful, their additional speed began to compensate for the ponderous overhead of these GUIs. The Mac, however, never suffered from the same overhead problems because the original Mac designers had cleverly included special programs called *toolbox routines*, which were built into the hardware. These programs handle many of the standard images displayed by the Mac, such as windows and dialog boxes.

At the same time that computers were growing in speed and capabilities, some software developers (notably Microsoft itself) began to create applications to operate with Windows. These applications looked remarkably similar to their Mac counterparts, following the same consistency that had made the Mac so easy to learn and use. After five years of innovative superiority over DOS, Microsoft's recent success with Windows was increasing pressure on Apple to make the next bold move in the advancement of personal computing. Although Apple had successfully commercialized the GUI concept, Windows was catching up to the Mac's familiar easy-to-use Finder. Even if most of the PC applications didn't yet follow a consistent Windows style interface, the competition was bearing down on Apple's advantage.

The time had come for Apple to again lead the industry with the next round of innovation. At the Worldwide Developer's Conference in May of 1989, Apple described a long list of features intended to be included in System 7. They targeted rollout for the first quarter in 1990, which turned out to be overly optimistic. The changes planned for System 7 required a

virtually complete rewrite of the Mac's operating system, which was nothing short of a monumental effort.

One year later at WWDC 90, Apple distributed an alpha version of System 7 to developers. Software typically goes through two distinct development phases. *Alpha* versions are the first, often containing numerous bugs and subject to substantial changes in the set of features that are ultimately included in the final release. Alpha is followed by a *beta* phase, where features are frozen and problems (bugs) isolated. Even though the May 1990 release was still in alpha testing, Apple remained optimistic and planned for a fourth quarter rollout. As the date approached, the rollout was again postponed, and a beta version was sent to developers in October, 1990. This was followed by another beta version in February of 1991. Finally, on April 25, 1991 the *golden master* version of System 7.0 was frozen, and copies were produced for the May 13th rollout.

During the testing phases, as many as 25,000 people were running System 7 daily—certainly one of the largest software testing programs ever conducted. While many were disappointed at the delays in System 7's rollout, it allowed time for extensive testing and debugging. It also gave third-party software developers additional time to prepare upgrades for their programs. As a result, most of the mainstream applications were compatible or mostly compatible with System 7 right from its initial release.

Apple's engineers regard System 7.0 as *rock solid*, with fewer bugs than any previous release. By its nature, system software is highly complex, technically challenging, and almost impossible to perfect. Nonetheless, our experience to date confirms that System 7.0 is highly reliable and has been worth the wait.

About the author

Gordon Campbell is a visionary MIS executive and Macintosh advocate. Since 1985 he has championed the Mac as a vital resource that can help organizations gain a competitive edge. To demonstrate that vision, he led the successful installation of more than 300 networked Macs, integrated with multiple IBM AS/400 midrange computers, for an international pharmaceutical firm. He has applied the Macintosh in a broad array of uses, ranging from standard business packages to custom-built applications. As a result of his vision, Macintoshes were used to design, manage,

and implement a number of innovative projects, including a cooperative processing budget system, an executive information system, a clinical trial system, and one of the first sales force automation systems based on Apple's new notebook computers.

He is also an avid Macintosh user with extensive first-hand experience in presentation packages, spreadsheets, business graphics, word processing, project management, and database applications. He enjoys being at the leading edge of information technology and believes that the Macintosh is a key component in achieving a competitive business advantage—on both a personal and enterprise level. Campbell is a charter member of MacIS, an organization of information systems executives with large installed bases of Macintoshes. He is also a member of the Society for Information Management, an international organization of senior MIS executives from industry and higher education.

About the contributors

Max Devlin is a Macintosh consultant and trainer. He has developed and taught courses in desktop publishing, word processing, and Macintosh basics at Albright College in Reading, Pennsylvania.

Frank Sayre supervises user training at the University of Texas in the Austin Computation Center. He is also a consultant to business and government organizations on computer automation and training issues. Sayre has worked with System 7 since the beta releases and is currently collaborating with David Cook on a work-group computing book.

David Cook is a systems analyst at the University of Texas, where he develops and teaches Macintosh workshops. He has extensive experience in government and higher education and has conducted research on technology transfer and expert sytems.

Michael Morrison is a computer programmer and technical writer in the Computation Center at the Univesity of Texas. His primary area of expertise is Macintosh networking and linking Macs to mainframes.

Kirk Mackes has primary responsibility for supporting over 400 Macintosh users in an international organization. He has been a Macintosh consultant and expert since the days of the original 128K Mac.

Section I

If you've been using earlier versions of the Mac's System and Finder, you're probably wondering how System 7 is different. Perhaps you're asking yourself, "should I upgrade to the new software?" Maybe your first reaction is, "of course I'll upgrade" or you might be skeptical and wonder, "is it worth it?"

In this section we'll take a look at the new features as well as what you'll need to operate System 7 on *your* Mac. Chapter 1 is a travel brochure, with lots of pictures illustrating life on board Apple's new flagship—the AMS 7. After your quick tour, we'll take you through a list of issues and ideas to help you prepare for your trip on the AMS 7. In chapter 2 we'll also consider timing—when to plan your 7 seas adventure. If the cost of upgrading doesn't quite fit your budget or you just feel like waiting a while longer, chapter 3 offers some tips on how to make the most of System 6. We'll look at various utilities and software that provide some of System 7's features while you're waiting for your departure date.

Let's get started with a quick look at System 7's new features, so you can begin to get a feel for what it would be like on the AMS 7.

What's new in System 7— A travel brochure

Welcome aboard the AMS 7—Apple's new flagship bound for adventure and excitement on the 7 Seas. This is a luxury liner designed to enhance your personal computing experience and featuring the latest innovations. We'll begin our tour with a view from the bridge, where you'll get a bird's eye view of the new desktop. We'll stay long enough for a quick look at some of the great new navigational gear that's been added to help steer a safe course through nested folders and other hazards of the deep. Then we'll go below decks for a peek inside the System Folder. While we're in the engine room you can take a quick look at virtual memory and some new techniques for sharing information over a network. So let's get started—all hands on deck!

▨ The desktop

Your first look at the desktop (see Fig. 1-1) will seem familiar if you've been working with earlier versions of the Finder. You might notice two icons in the upper right corner of the menu bar and something a little different about the menu lists, but there are no major surprises.
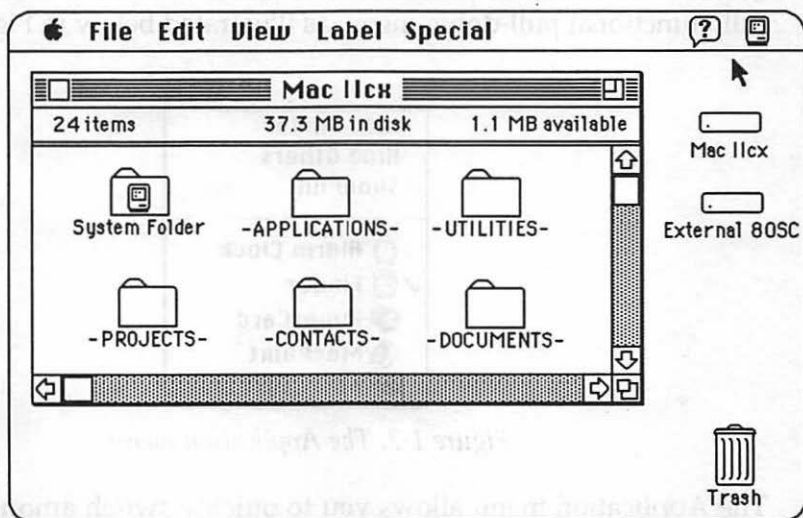
Figure 1-1. System 7 desktop

Most of us have grown comfortable with the Mac's desktop metaphor and System 7 builds on this successful heritage. Many of the AMS 7's new features are enhancements that make the Mac even easier to use.

Full-time MultiFinder

In earlier versions, MultiFinder was an option you could select to open multiple applications at the same time. With System 7, MultiFinder is automatically available at all times. As with previous versions, a miniature icon appears in the upper right corner of the menu bar, representing the currently active application. At the desktop level, the active application is the Finder.

If you worked with MultiFinder previously, you probably know that you could switch applications by clicking on this miniature icon. With each mouse click, MultiFinder would cycle through the list of open applications. This could be a tedious process when several applications were open. The desired application always seemed to be last on the list. There was a more direct way—you could select the application you wanted from the ⬧ menu. Unfortunately, the list of applications always appeared at the very bottom after all of the desk accessories. This usually meant an equally annoying delay, to scroll beyond the bottom of the screen and find the application.

System 7 solves these problems. The miniature icon has finally become a fully functional pull-down menu, as illustrated below in Fig. 1-2.

Figure 1-2. The Application menu

The Application menu allows you to quickly switch among several open applications, eliminating tedious clicking or scrolling steps. But that's not all—the new menu offers even more! When you have several applications

and folders open, navigation between windows can become confusing and distracting. Window clutter is eliminated with two new **Hide** commands. **Hide Others** temporarily conceals all windows except the currently active application. You can also hide the active application's window, which automatically switches to the Finder if no other applications are revealed.

The Help menu

A new icon appears next to the Application menu, which controls a feature called *balloon help*. It is activated by selecting **Show Balloons** from the menu. Whenever the pointer is over an object on the screen, a description pops up in a *balloon*, as shown in Fig. 1-3.
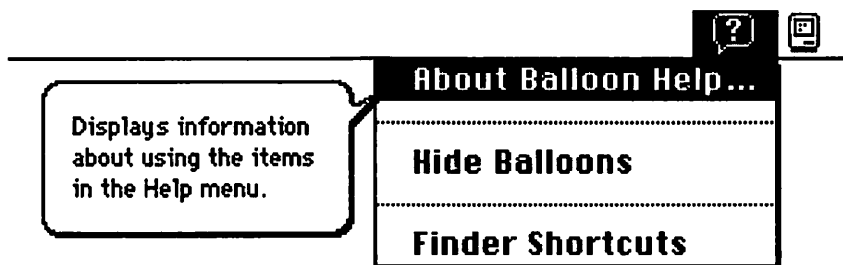
Figure 1-3. Balloon help

At the Finder level, balloon help is most beneficial to a new Mac user. Experienced users might learn a few things they didn't know, but will probably find balloons annoying after a little experimentation.

Balloon help is most useful when selected while using an application program that has been upgraded to include it. For example, pointing at the tool palettes found in paint and draw programs would display a balloon describing what function each tool performs. As software developers incorporate balloon help in their applications, it will begin to deliver its most important benefits. Because this feature is now part of the system, it's likely to become the standard method for displaying help messages, providing a consistent approach across applications. We don't expect, however, that it will completely replace the custom help features found in many applications today. Some important information can't be linked to a particular object on the screen, or might be too lengthy for a balloon to handle effectively.

Trash

The trash is no longer emptied automatically. Items remain in the trash until the **Empty Trash** option is selected from the Special menu at the desktop. A dialog box appears asking:

> ⚠ **The Trash contains 1 item. It uses 2K of disk space. Are you sure you want to permanently remove it?**
>
> (Cancel)   [**OK**]
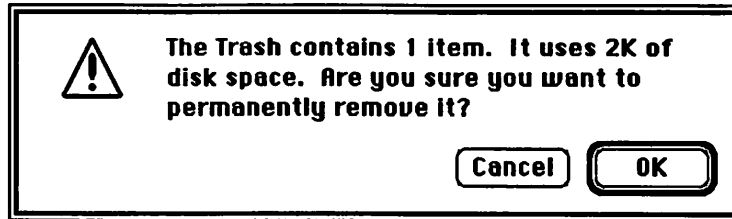
Figure 1-4. Empty trash warning

If you don't want the warning dialog each time you empty the trash, select the Trash icon and choose **Get Info (⌘-I)**. You'll see the window shown in Fig. 1-5.

Trash Info

Trash

Where: On the desktop

Contents: The Trash is empty.

Modified: Mon, Apr 15, 1991, 6:08 PM

☒ **Warn before emptying**
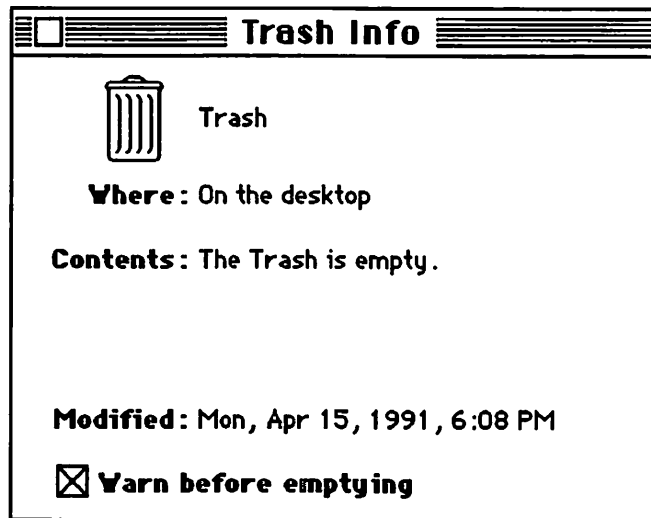
Figure 1-5. Trash Info window

Turn off the Empty Trash warning by clicking to remove the **X** from the **Warn before emptying** option.

✥ Navigation

Locating and launching a document or application is much easier with System 7. Enhanced list views and keyboard navigation allow rapid access through Finder windows. The new **Find** command is both powerful and simple. It automatically locates and opens the window containing the target object. And for convenient access to frequently used items, any application, document, or folder can be displayed in the ✦ pull-down menu.

Finder windows

When displayed in any of the list views (by Name, Date, Size, or Kind), folders and documents appear in outline fashion, as shown in Fig. 1-6.

Name	Size	Kind
▷ ☐ -PROJECTS-	978K	folder
▷ ☐ -UTILITIES-	2,529K	folder
▽ ☐ System Folder	5,108K	folder
▽ ☐ Apple Menu Items	—	folder
☐ *›APPLICATIONS*	2K	alias
⟁ Alarm Clock	14K	desk accessory
▥ Calculator	9K	desk accessory
▤ Chooser	30K	desk accessory
▦ *Control Panels*	2K	alias
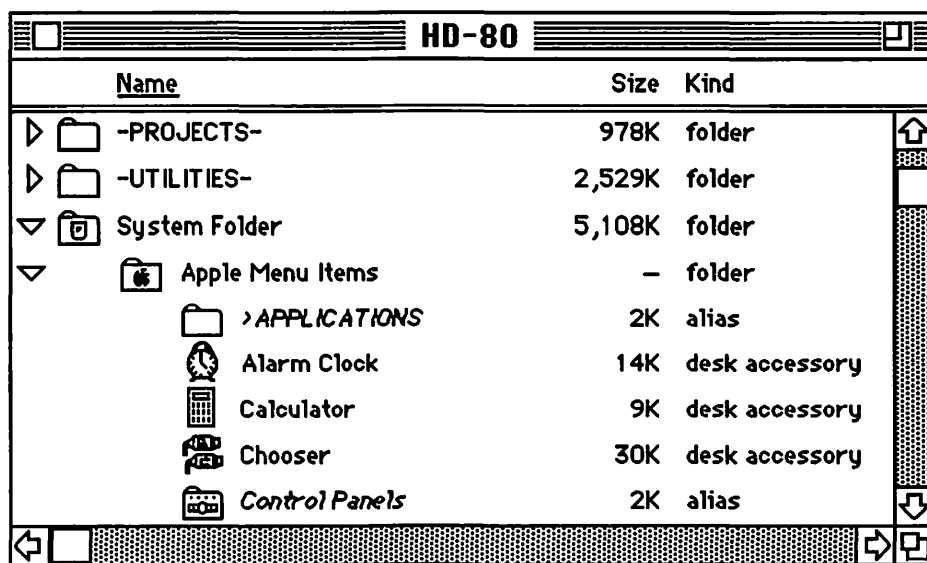
Figure 1-6. Outline view

Clicking the small triangle next to a folder's name opens the next level of the list view. You can "dig down" as many layers in the outline as you want. Outline views also allow you to select items from different folders by holding down the Shift key as you click each icon. This can come in handy if you want to work on several documents. Select the items, drag them to the desktop, and begin working. When you're finished, select the same items and chose **Put Away** (⌘-Y) from the File menu and they'll automatically return home.

The Find command

The Find File DA has been replaced with a new **Find** (⌘-F) option in the Finder's File menu, which is significantly more powerful and convenient .
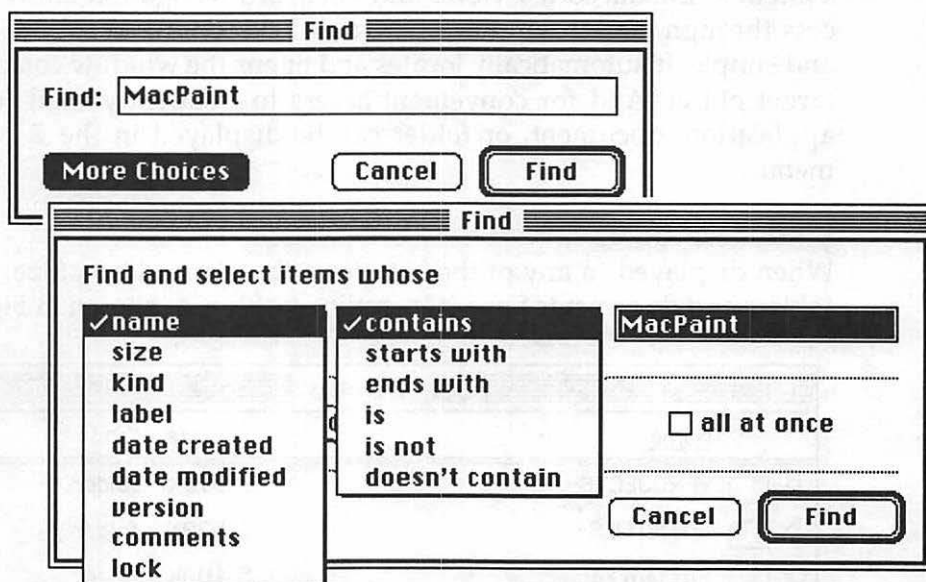
Figure 1-7. Find command options

Clicking the **More Choices** button in the Find dialog box allows you to specify search criterion with a variety of choices (Fig 1-7). **Find** locates the item and pops open the window containing it, as shown in Fig. 1-8.
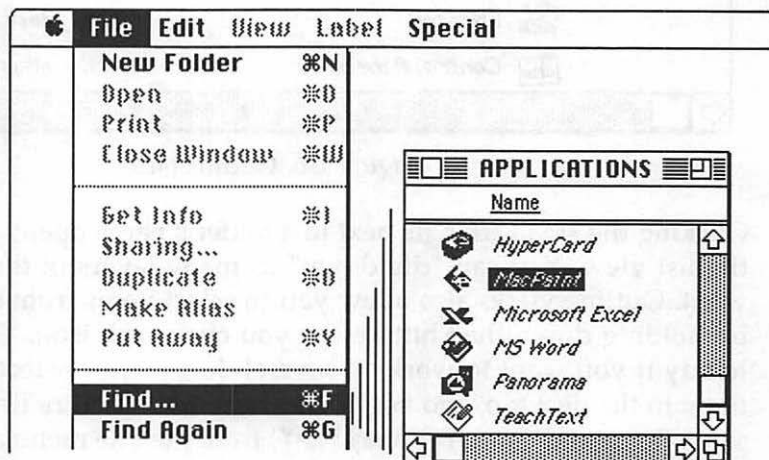
Figure 1-8. Find command results

Pop-up menus

When you've popped open a window using the **Find** command, you might want to determine its location. By holding down the ⌘ key and clicking the title of the window, a pop-up menu like the one illustrated in Fig. 1-9 will list all the folders in which the item is nested.

Figure 1-9. Pop-up menu list

Keyboard navigation

The keyboard can now be used to select items in Finder windows and in open folders. Keying in the first letters of a name will select the item or the one closest to it alphabetically. Pressing the Tab key will select the next item alphabetically. Arrow keys will move between items in the direction of the arrow. Once you have selected an item, pressing Enter or Return opens the item name for editing. This helps avoid accidently typing over the existing name when you really don't want it renamed. Figure 1-10 shows the different kinds of display for selected items.

Figure 1-10. Selecting an icon or its title

Clicking on the icon selects the item, but does not open the title for editing. To edit the title you must click directly on the *text area* below the icon as shown in Fig. 1-10. This can become a little tedious, so it's generally easier to use the keyboard equivalent (Enter or Return) to select the title for editing. Once it's selected, click the cursor I-bar at the point you want to make a change.

If you can't remember the key sequences, the list in Fig. 1-11 is available by selecting **Finder Shortcuts** from the Help menu. There are five screens of shortcuts, so you might need to click the **Next** button until card-2 appears. The Help function conveniently remembers which card you viewed last and will display it again the next time you select shortcuts.
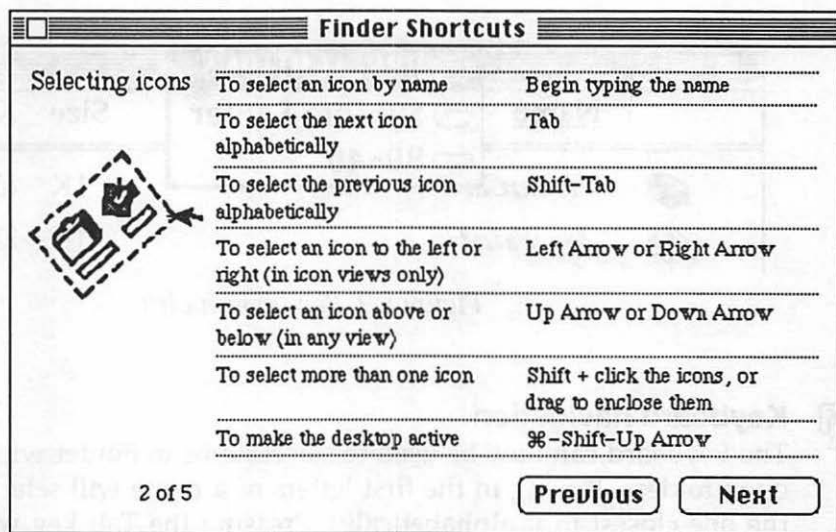
Figure 1-11. Finder shortcuts from the System 7 Help menu

Additional keyboard shortcuts are listed below in Table 1-1. You can use any of these shortcuts in the Chooser window and in a directory dialog box from an application.

Table 1-1. Additional keyboard navigation commands

Key	Movement
⌘-Up arrow	Open the folder that contains the current folder.
⌘-Option-up arrow	Open the folder that contains the current folder and close the current folder.
⌘-Down arrow	Open the selected icon.
⌘-Option down arrow	Open the selected icon and close the current folder.

Aliases

One of the most powerful new navigation features of System 7 is the ability to create aliases for any item. An *alias* is a small (2K) file that points to the original item. By double-clicking an alias you can open the original item without having to locate it. The original could be stored anywhere on your hard drive, on a floppy disk,or even on another Macintosh connected to your Mac through a network.

An alias is created at the desktop, by selecting the item and choosing **Make Alias** from the File menu, as illustrated below in Fig. 1-12.
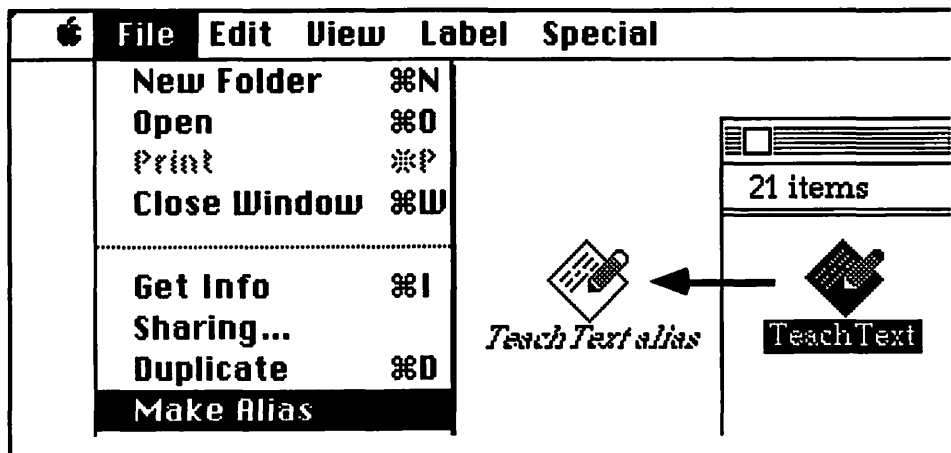
Figure 1-12. Creating an alias

You can distinguish an alias from the original because the title appears in *italic* typeface. If you want, you can change the name of the alias or move it to another location. The alias remembers the location of the original item, even if you later move the original to another folder. You can even make an alias of an item on a diskette, and store the alias on your hard drive. When you double-click the alias, the Mac will ask you to insert the appropriate floppy disk.

Aliases can be used in many convenient ways. For example, you might keep your original documents in a *Projects* folder and store an alias in a *Chron* folder. That way you can easily locate an item by date or by subject. We'll discuss additional ideas for using aliases in later sections and chapters.

The new Apple menu

In previous versions of the System, only desk accessories (DAs) could appear under the menu. With System 7, any item—applications, folders, or documents can be made to appear under the menu.

With this much flexibility, you could soon end up with a menu list that scrolls off the bottom of the monitor. Fortunately, there is an easy way to organize your menu. By creating folders, and including their aliases in the menu, you can quickly access groups of items. For example, you can create an *Applications* folder that includes frequently used programs or their aliases. Then make an alias of the Applications folder and include it under the menu as shown in Fig. 1-13, by dragging it into the Apple Menu Items folder contained inside the System Folder.
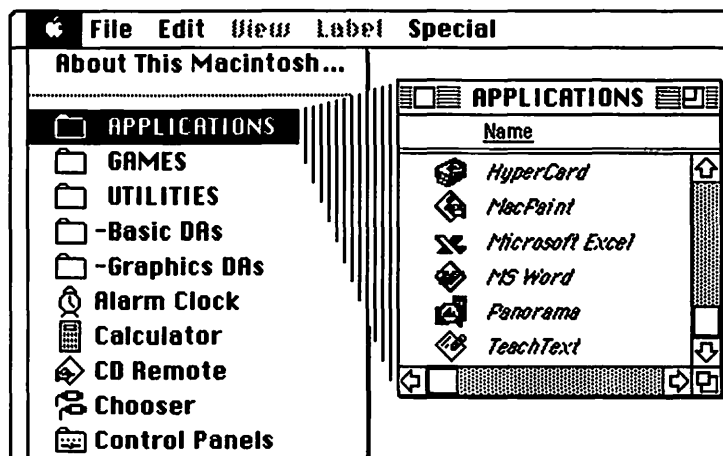
Figure 1-13. Using a folder of program aliases in the Apple menu

When you select the Applications folder from the menu (Fig. 1-13), it opens a window containing the items. Double-click an alias and it will launch the program.

Folders can be grouped together at the top of the menu list by prefixing the folder name with a special character. Because the menu lists items alphabetically, there are several characters to select from, including a space placed before the folder name. Keeping folders together makes it easier and faster to locate them with the mouse.

The System Folder

If you've been using your Macintosh for a while, you've probably been accumulating a lot of items in your system folder. As software for the Mac has evolved, the system folder has become cluttered and disorganized with INITs, CDEVs, and all sorts of specialized files from application packages. Apple's System 7 designers have introduced a series of special folders to help reduce the clutter, which are shown in Fig. 1-14.
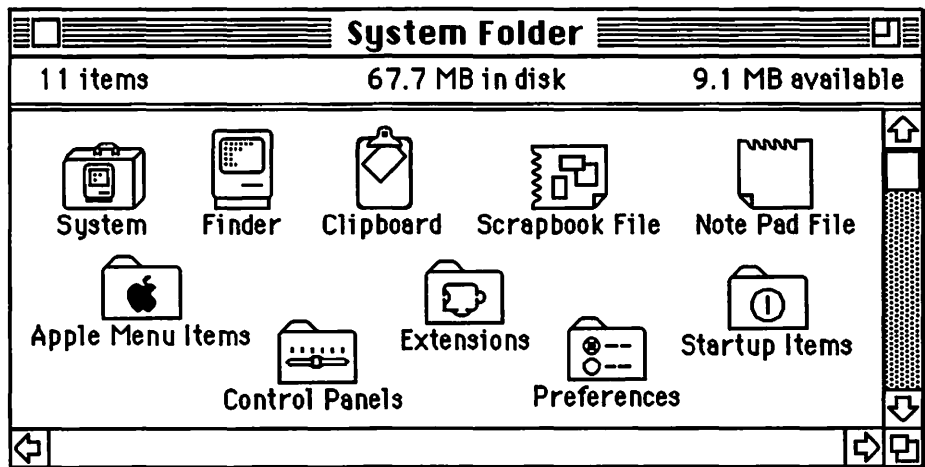
Figure 1-14. System Folder contents

When you drag a file onto the System Folder icon (not into the open window), the file could be automatically placed in the appropriate folder or the System file. This works for certain types of files, as described below in Table 1-2.

Table 1-2. Automatic System Folder storage

File Types	Folder or File Name
Desk accessories (DAs)	Apple Menu Items
Control panel devices (CDEVs)	Control Panels
System extensions (INITs) and printer or device drivers	Extensions
Fonts and sound files	System (file)

Fonts and sounds

Fonts were previously installed in the System file using the Font/DA Mover. Installing sounds required a special utility such as ResEdit or Riccardo Ettore's Sound Mover. System 7 makes it much easier to move and install both fonts and sounds.

Dragging a font suitcase over the System file will automatically install all of the fonts and sizes contained in the suitcase. Alternately, double-clicking a suitcase opens a window showing its contents. The System file can also be opened by double-clicking to reveal which fonts and sounds are currently installed, as shown below in Fig. 1-15.
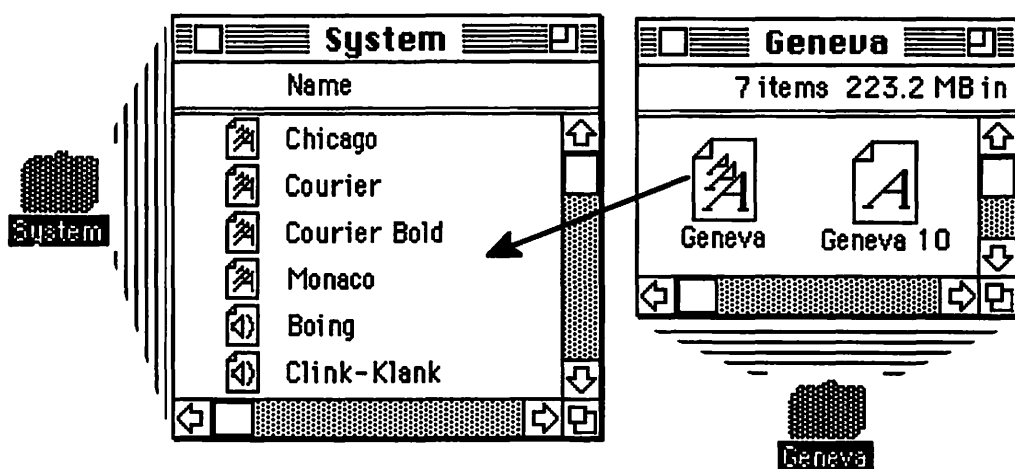
Figure 1-15. System and Font Windows

Because both suitcases and the System file are displayed as standard Finder-style windows, you can choose either icon or list views. Moving fonts or sounds is simply a matter of selecting and dragging. To install new fonts or sounds, drag the selected icons into the System file window. Likewise, any font or sound can be removed by dragging it out of the System file.

In addition, samples of a font can be viewed by double-clicking on its icon. Double-clicking a sound file icon will play the sound. Incidentally, sounds can also be stored in the Scrapbook, which now includes a "play" feature so you can hear the sound.

Apple Menu Items folder

Any item placed in the Apple Menu Items folder will immediately appear under the menu. The System 7 Installer automatically places standard Apple desk accessories in the Apple Menu Items folder, and includes an alias of the Control Panels folder for quick access, as shown in Fig. 1-16.
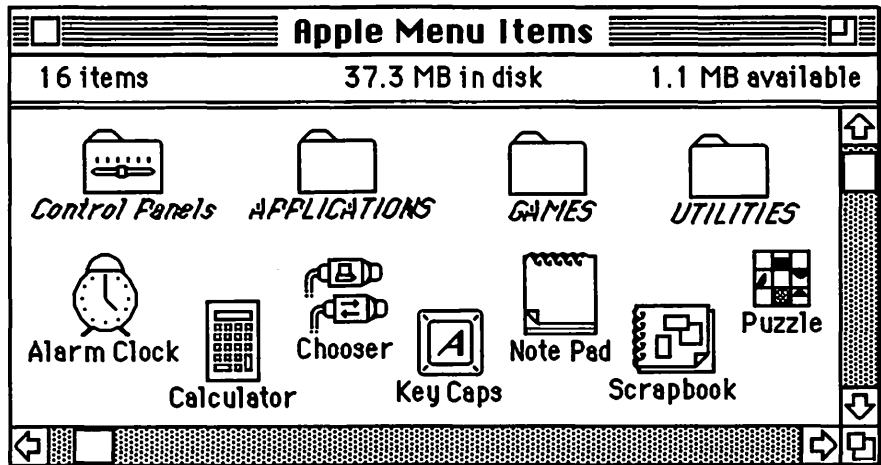
Figure 1-16. Apple Menu Items folder

You can add frequently used programs, documents, or folders to the menu just by dragging the icon (or its alias) into the Apple Menu Items folder. As suggested earlier, it's a good idea to organize groups of similar items together in folders. This can reduce menu clutter and shorten mouse movement to reach the item you need.

Desk accessories

In previous system versions, desk accessories were special programs that were installed with the Font/DA Mover and could be accessed only through the menu. With System 7, desk accessories (DAs) are converted to ordinary applications, which can be opened directly by double-clicking on their icon.

To convert a DA suitcase, simply double-click on its icon. A window will open, revealing one or more applications. Drag the applications from the suitcase window to any other location. They can be stored in the Apple Menu Items folder or placed anywhere you like. Because System 7 is always running MultiFinder, launching a DA is no different from starting any other program. In fact, when you open a DA it appears in the Appli-

cation menu list along with other open programs. This means you can leave one or more DAs open, and easily switch between them and your other open applications.

Control Panels folder

In earlier versions, the Control Panel was a special window you opened by selecting it from the ⚫ menu. On the left it included a scrolling list of icons, one for each installed control panel device (CDEV). Selecting a specific icon opened its controls on the right side of the window.

Under System 7, you still select CDEVs from the ⚫ menu. Actually, System 7's Installer places an alias of the Control Panels folder in the Apple Menu Items folder. When you select the Control Panels folder, a normal Finder-style window opens, containing separate icons for each CDEV, as shown below in Fig. 1-17.
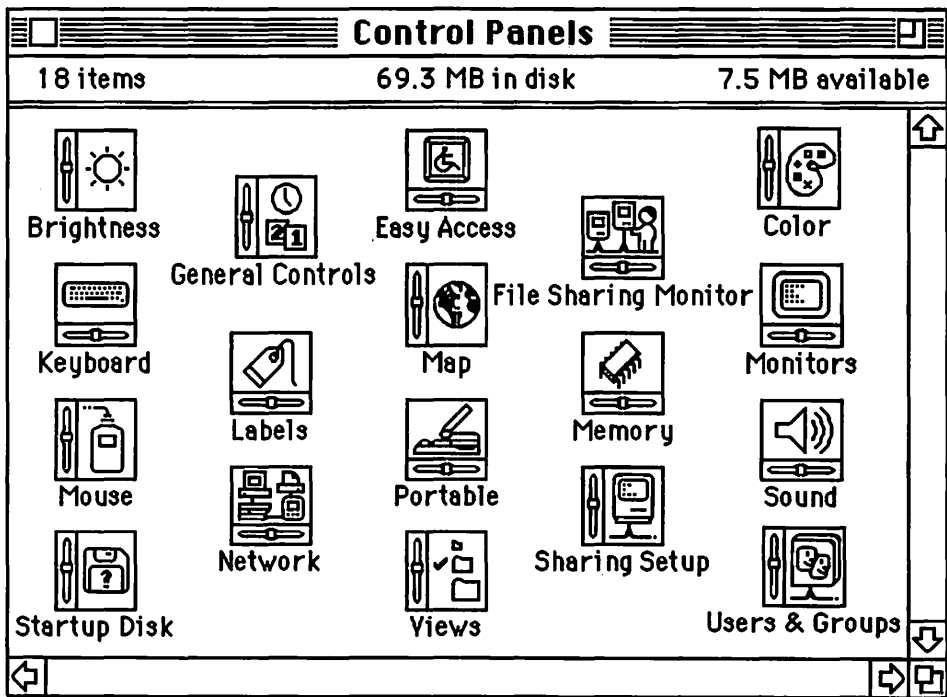
Figure 1-17. Contents of the Control Panels folder

Because control panels now appear in a standard Finder window, you can change the window to a list view to locate an item more quickly.

Double-clicking on any CDEV opens a control window (Fig. 1-18).
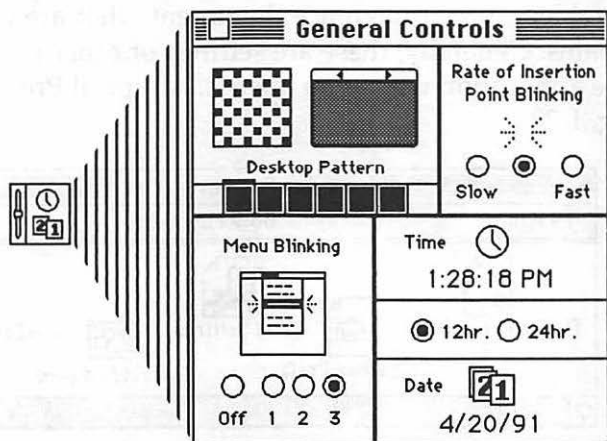
Figure 1-18. Opening a control panel device (CDEV)

In addition to the familiar control panels, several new items appear, such as Views, Labels, Memory, and special controls for sharing files over a network. We'll take a closer look at these in the following sections.

Extensions folder

The Extensions folder (see Fig. 1-19) stores system extensions, including initialization programs (INITs) and Chooser items, such as printer drivers.
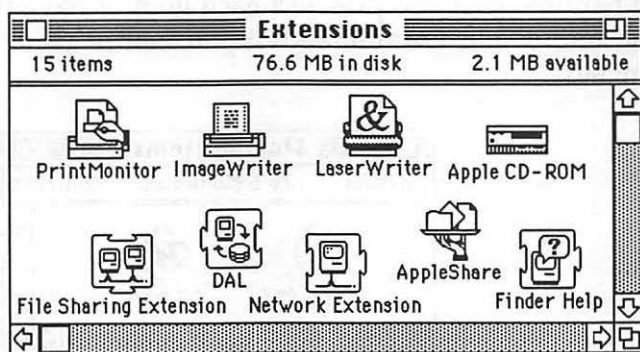
Figure 1-19. System Extensions folder

INITs don't have to be in the Extensions folder to work with System 7—it's mainly a matter of reducing clutter. In fact, some device drivers or INITs might not yet be System 7 savvy, and must be left outside the Extensions folder in order to function properly.

Preferences folder

This folder stores preference documents that are created by application programs. Generally, these are settings or other parameters that are used by the application when you open it. A typical Preference folder is shown in Fig. 1-20.
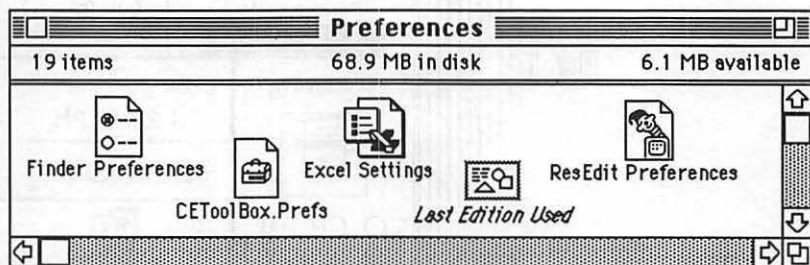
Figure 1-20. Preferences folder

If an application is "System 7 aware," it will automatically store its preference files in this folder. Otherwise, it might store these files directly in the System Folder.

Startup Items folder

In previous system versions you could specify applications, documents, or desk accessories to open automatically at startup. This was accomplished using the **Set Startup** command from the Special menu. The procedure required that you preselect each item or have the exact set of items (applications and DAs) already open before you chose the **Set Startup** command.
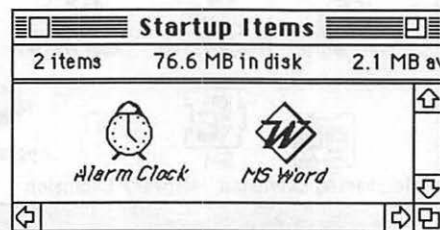
Figure 1-21. Startup Items folder

System 7 makes the process a little more intuitive. Any item placed in the Startup Items folder (Fig. 1-21) will automatically launch at startup. For example, you might select the Clock DA along with applications you use daily, make an alias of each item, and place it the Startup Items folder.

Customizing the desktop "look and feel"

Some new features in System 7 allow you more control over the appearance of the desktop and windows.

Color

The Color control panel has been expanded to include window style and color options. You can choose between a 3-D effect with color highlight or traditional 2-D black-and-white display, as shown in Fig. 1-22.

Standard Black & White window frame

Color

Highlight color:

Sample text

Color window frame with 3-D look

Color

Highlight color: Yellow ▼

Sample text

Window color:

▓	Standard
▓	Gold
▓	**Green**
▓	Turquoise
▓	Red
▓	Pink
▓	Blue
▓	Gray
☐	Black & White

▓	Purple
▓	**Yellow**
▓	Green
▓	Turquoise
▓	Red
	Pink
▓	Blue
	Gray
	Black & White
	Other...
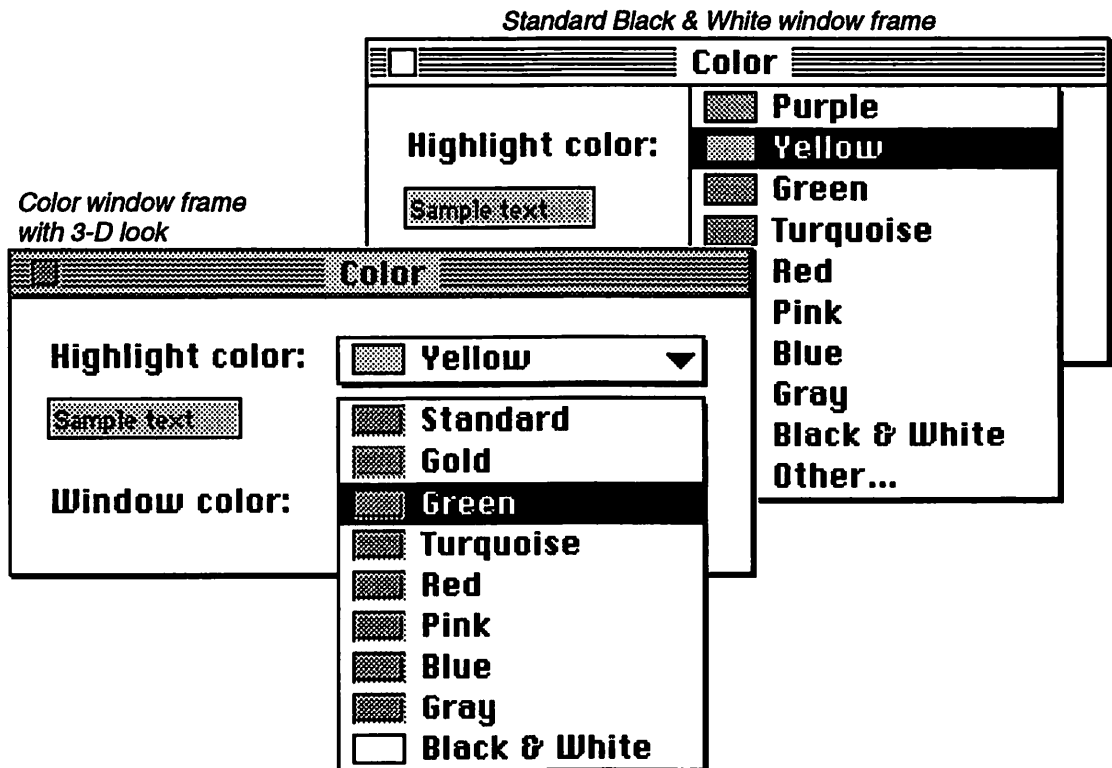
Figure 1-22. Color control panel options

Pop-up menus in the Color control panel allow you to select both the highlight color and the window color scheme. Gray shading gives the window bars a 3-D look on a color Macintosh if you select any window color option other than **Black & White**.

Custom icons

Tired of the same old icons on your desktop? System 7 allows you to create custom icons and paste them directly into an object. You can borrow icons from another document or create your own with a paint program. Icons can be color or black-and-white. For best results your picture should be 32 pixels square.

To change an icon, first select it and choose **Get Info** (⌘-I). Click on the icon image in the Info window and then **Paste** (⌘-V) your new icon to replace the original. The process is shown in Fig. 1-23.
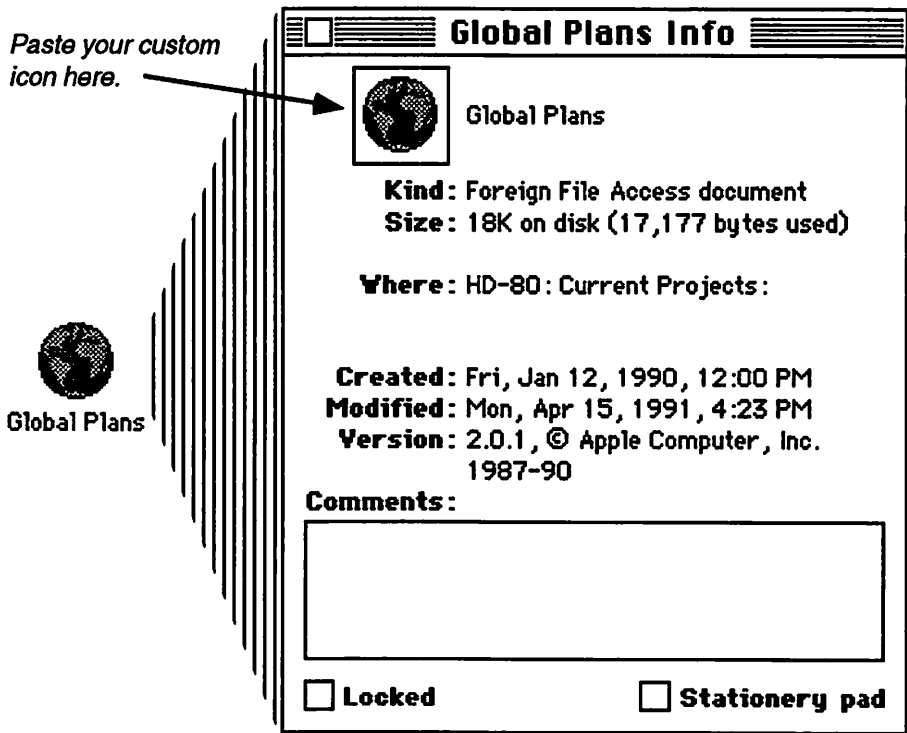
Figure 1-23. Installing a custom icon

You can also "borrow" icons from another document. Open its Info window, select the icon, and **Copy** (⌘-C) it to the clipboard. Then you can **Paste** (⌘-V) it into your target document, as described above. If you want to revert to the original icon, open the Info window, select the icon, and **Cut** (⌘-X) your custom icon. The original icon will magically reappear.

Labels

With earlier System versions you could assign a color to an icon from the Color menu at the desktop. System 7 allows you to associate a text label with each color. You can change text labels and their associated colors with the Labels CDEV in the Control Panels folder (see Fig. 1-24).
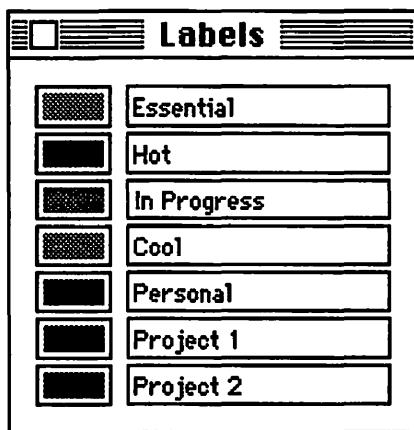
Figure 1-24. Labels control panel

The Labels menu replaces the former Color menu and is used to assign one of seven colors and text descriptions to icons. After assigning labels, they can be displayed in any list view (see Fig. 1-25).
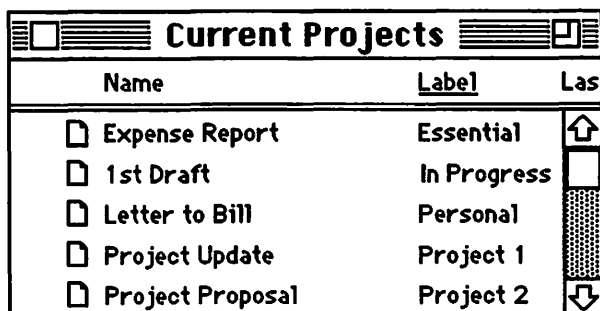
Figure 1-25. Window sorted by Label

If you choose **View by Label,** the window sorts all items in the same sequence assigned in the Labels control panel. **View by Icon** does not display the text label, but (on a color Mac) does retain the colors assigned to each item.

Views

Another new feature of System 7 is the Views control panel. Opening this CDEV allows you to customize several aspects of Finder windows, as shown below in Fig. 1-26.
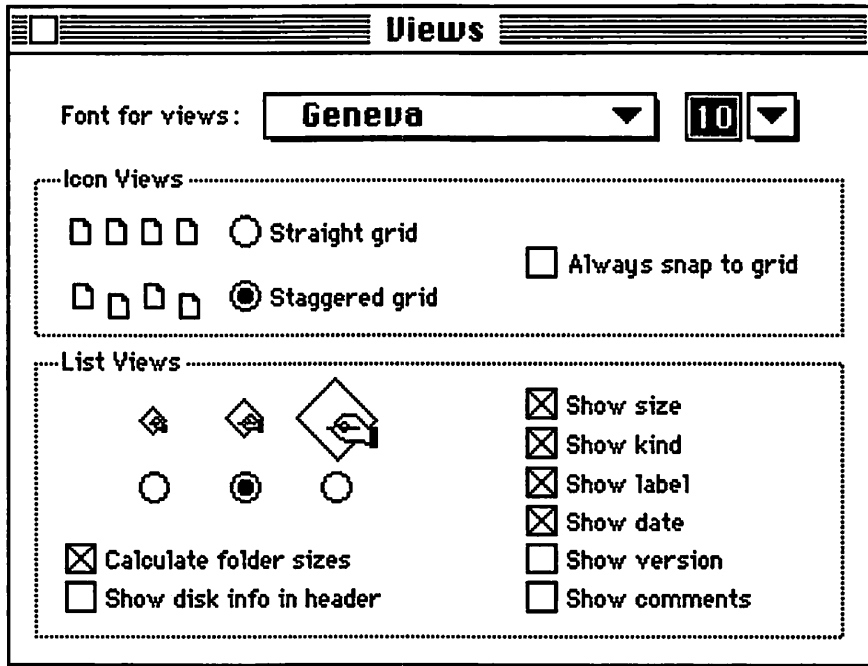
Figure 1-26. Views control panel options

If you've ever had trouble reading the tiny Geneva 9-point type on the screen, you'll welcome the ability to change both the size and font. Changes affect both icon and list views in the Finder windows.

Selecting **Staggered grid** is handy if your document names tend to be long and usually overlap in the **Straight grid** mode.

In the List Views portion, you can select icon size, as well as any combination of information to display in a list window. You also have the ability to display folder sizes in a list view—something that was unavailable in previous versions of the Finder. While this can be a convenient feature, it does slow down scrolling and you might want to keep it turned off, until you really need to know folder sizes.

Applications and documents

Opening and saving documents

System 7 offers a new way to open a document even if it wasn't created by the application. If a program is able to open a document, dragging the document icon over the application icon will automatically open it. For example, standard TEXT format documents can be opened by most word processing programs. Click and drag a TEXT document over your word processor icon as shown below, and release the mouse button. The program will launch and display the contents of the file.
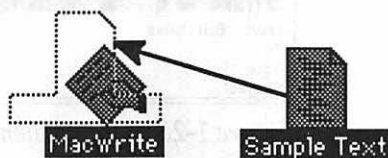
It's easy to determine if the program can open your document. If the application icon "highlights" while the document is over it, releasing the mouse button will automatically open it.

Another enhancement to System 7 are the Open and Save dialog boxes. To switch disks, you now click the **Desktop** button, which displays all available drives. Simply double-click the desired drive and locate the appropriate folder. The Save dialog box is shown below in Fig. 1-27.
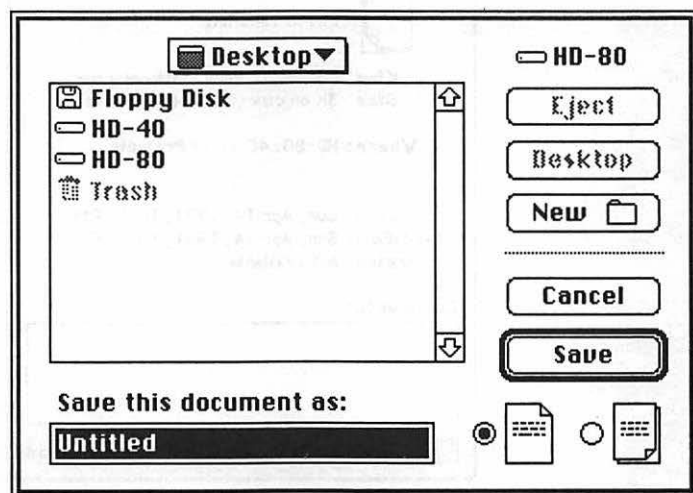
Figure 1-27. Save dialog box

Stationery pads

If you frequently use the same format for a report or memo, it might be useful to store a template of the document. System 7 establishes a standard format for templates called *Stationery pads*. They can be opened like a normal document, but you must save them under a different title, which prevents accidentally writing over your template.
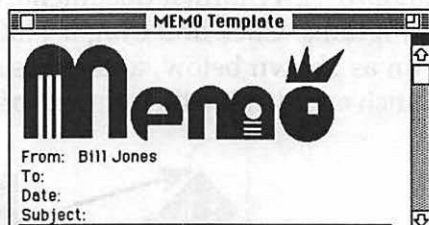
Figure 1-28. Sample memo template

If your application program takes advantage of System 7's new feature, two small document icons will appear in the Save dialog box (Fig. 1-27). Even if your program doesn't have these icons, you can still create a Stationery pad. Save your template as a normal document, then select the file and choose **Get Info** (⌘-I) from the Finder's File menu, and click the **Stationery pad** option as shown below in Fig. 1-29.
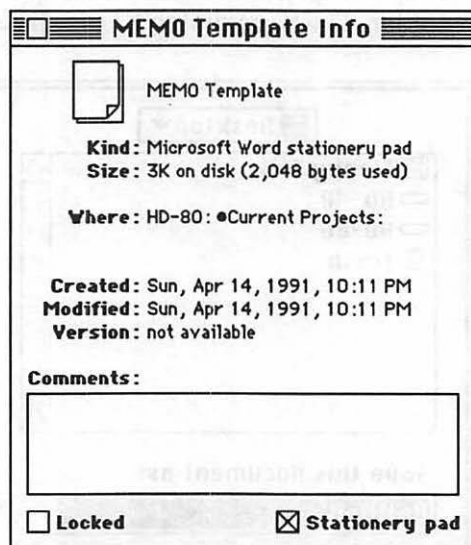
Figure 1-29. Document Info window

Publish and Subscribe

The Macintosh has always had the ability to copy information from one application document and paste it into another. System 7 extends this concept to an automatic updating capability, sometimes referred to as "live" copy and paste. When you edit the original material, changes are automatically reflected in "subscribing" documents. The process is illustrated in Fig. 1-30 below:
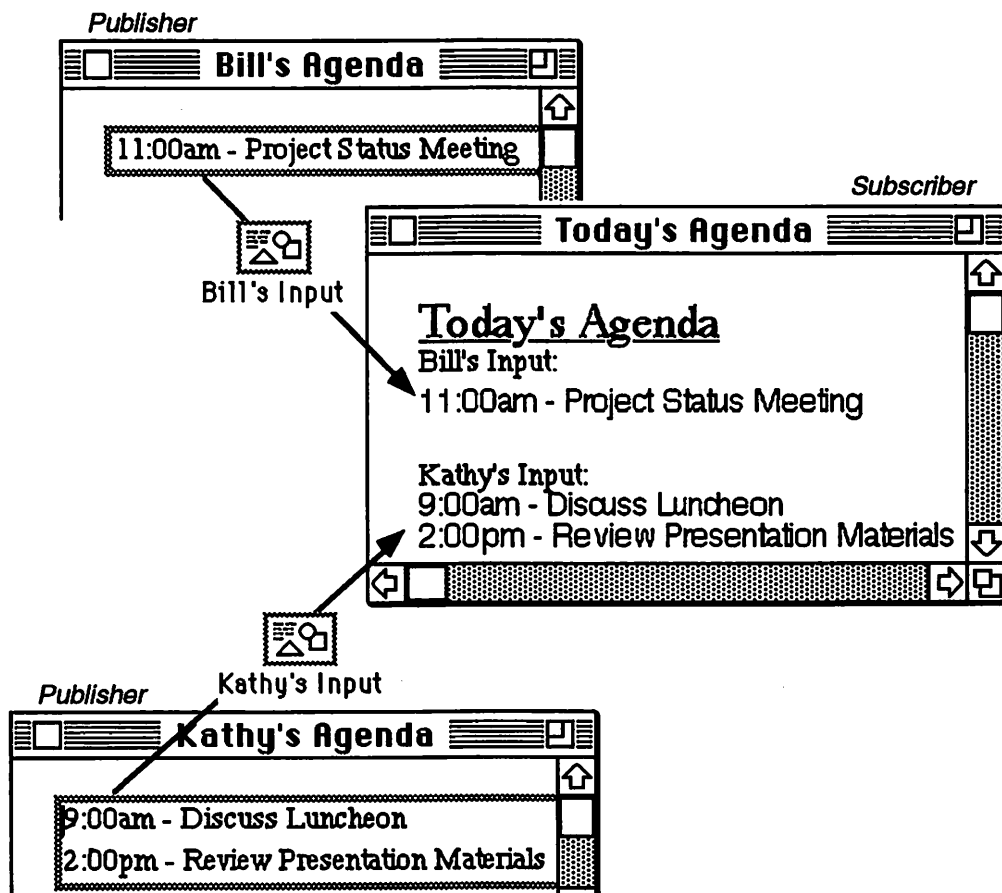
Figure 1-30. Publish and Subscribe example

In this example, both Kathy and Bill "publish" a portion of their daily schedule, making it available to a "subscriber." The document *Today's Agenda* subscribes to each of the published editions, inserting the result at appropriate points. Whenever Kathy or Bill makes a change to their

agenda, it is automatically reflected in the subscribing document, *Today's Agenda*.

Because this feature is new in System 7, application programs will need to be updated to take advantage of live copy and paste. If your program has been upgraded, it will include Publish and Subscribe commands in the Edit menu, similar to the ones shown below in Fig.1-31.

Edit	Font	Size	Style	Windows

Undo Typing   ⌘Z

Cut   ⌘H
Copy   ⌘C
Paste   ⌘P
Clear
Select All   ⌘A

Create Publisher...
Subscribe to...
Subscriber Options...
Show Borders

Figure 1-31. Publish and Subscribe menu options

Publish and Subscribe works automatically on a single Mac. It can also operate between multiple Macintoshes over a network, if the appropriate file sharing is activated.

This is an exciting new technology, which we expect will be implemented by most software publishers. It's based on Apple's new interapplication communication (IAC) architecture, which will also enable programs to call on each other to perform specialized tasks. For example, a drawing package might call on a word processing program to perform a spelling check on text blocks. This approach could eliminate the need for every program to have its own built-in spell checking facility.

TrueType™

TrueType™ is built into System 7, and provides higher-quality font images both on screen and on your printer.

TrueType™ fonts

In earlier versions of the System, bit-mapped fonts were used for screen images and dot-matrix printers. To achieve a reasonable level of quality, several font sizes had to be installed in your System file. By comparison, only one TrueType™ font file is required for each font style. This can significantly reduce the amount of storage space on your disk, while simultaneously increasing the quality of the fonts, as shown in Fig. 1-32.

A   A

Bit-mapped   TrueType

Figure 1-32. Bit-mapped versus TrueType fonts

TrueType™ fonts use outlines to describe the shape of each character. Each outline is actually a mathematical formula, so it can be scaled to any type size without distorting the character. If your application allows you to directly specify a font size by typing in the numerical value, you'll have complete control. Examples of nonstandard type sizes are shown below in Fig. 1-33.

F   F   F   F   F   F

8 pt   15 pt   21 pt   30 pt   44 pt   70 pt
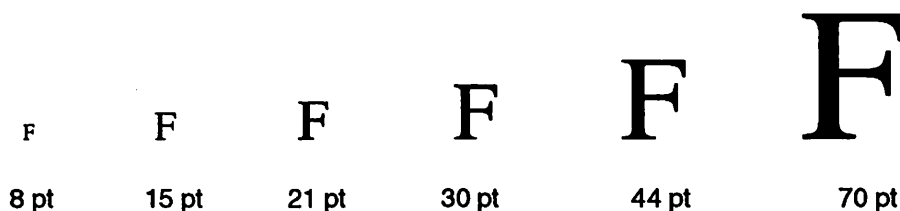
Figure 1-33. Nonstandard font sizes using TrueType

TrueType™ fonts work with existing application programs and do not require an upgrade to function properly. If you normally print to a device with less than a 300-dpi resolution, you should be very pleased with the results. Also, if you use the Mac for presentations and project the results on a large screen, you'll be happy with the improved screen images. Jagged screen fonts are now a thing of the past.

Virtual memory

Because MultiFinder is always on with System 7, you might occasionally find you have insufficient memory (RAM) to open another application. Apple recommends 2 megabytes of RAM as the minimum configuration for running System 7. If you have some unused hard disk space and the right model Mac, virtual memory could be an answer.

Virtual Memory (VM) uses a portion of your hard disk to temporarily store program information. To utilize VM you must have at least a 68030 CPU or a 68020 with a PMMU chip. If you own a Macintosh Classic, SE, Portable, or earlier modular units such as the Mac Plus, you cannot run VM. However, you can still use the other features of System 7. If you own a Mac II or Mac LC, you must have the optional 68851 PMMU chip in order to utilize VM. Other Macintosh models, including the IIx, IIcx, IIsi, IIci, and IIfx, can use the new virtual memory feature.

To turn on VM, open the Memory control panel (Fig.1-34) and click **On.**
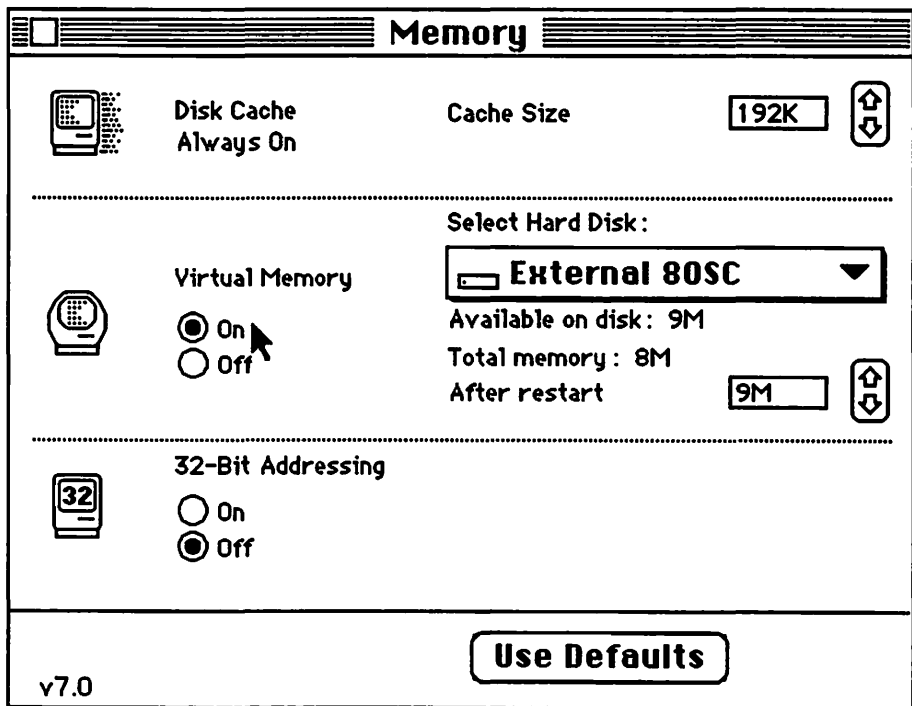
Figure 1-34. Memory control panel window

How much virtual memory to configure depends on several factors:

Available disk space

Amount of physical RAM in your Mac

Which model Mac you own

Apple recommends that you don't configure more VM than the amount of RAM you have installed. For example, if you have 2Mb of RAM, you should allocate no more than 2Mb of VM, for a total of 4Mb. You should also be aware that the amount of disk space required is equal to RAM + VM. In our example, turning on 2Mb of virtual memory will require 4Mb of disk space.

The final factor to consider is which model Macintosh you own. If you have a Mac with the latest ROM chip (IIsi, IIci, or IIfx), you can also turn on a feature called 32-bit addressing. This feature allows you to address up to 1 gigabyte of memory (RAM + VM). As a practical matter, the maximum physical RAM is 128Mb using 16Mb SIMMs in the Mac IIci and IIfx. This would yield a total of 256Mb of RAM plus VM.

On the other hand, if you have a Macintosh that predates the IIci (such as an SE/30, II, IIx, or IIcx), then the maximum total memory (RAM + VM) is 14Mb minus 1Mb for each card in your Mac.

After all of these considerations, you might not be very enthusiastic about using VM. In fact, Apple does not recommend VM for everyday work, but suggests that you have sufficient RAM for the programs you use routinely. Because performance might suffer, VM should be used only for occasional situations that demand a little extra memory.

RAM memory SIMMs have been steadily declining in price and today are available for less than $60 per Mb. At these prices, it might be more advantageous to consider upgrading your Mac's memory than counting on VM to solve your shortages. However, virtual memory could be an option if your budget is limited and you have the right Mac that can take advantage of this new feature.

In chapter 2, we'll discuss several upgrade options that you might want to consider, including performance and memory enhancements.

File sharing

One of the most powerful features of System 7 is the ability to share files on your hard drive with others connected to your network. In previous versions, a dedicated file server was typically used as a central point for file sharing. Under System 7, any Mac can function as a file server.

Sharing Setup

The first step in sharing your files with others on your network is to open the Sharing Setup control panel shown in Fig. 1-35.

```
▤□▤▤▤▤▤▤▤▤▤▤▤▤ Sharing Setup ▤▤▤▤▤▤▤▤▤▤▤

  ▣  Network Identity

  Owner Name :      │ Gordon                          │
  Owner Password:   │ •••••                           │
  Macintosh Name :  │ Home Base                       │

  📂  File Sharing

            ┌─Status────────────────────────────────┐
  │ Stop │  │ File sharing is on. Click Stop to prevent other
            │ users from accessing shared folders.   │
            └───────────────────────────────────────┘

  ◈  Program Linking

            ┌─Status────────────────────────────────┐
  │ Start │ │ Program linking is off. Click Start to allow other
            │ users to link to your shared programs. │
            └───────────────────────────────────────┘
```
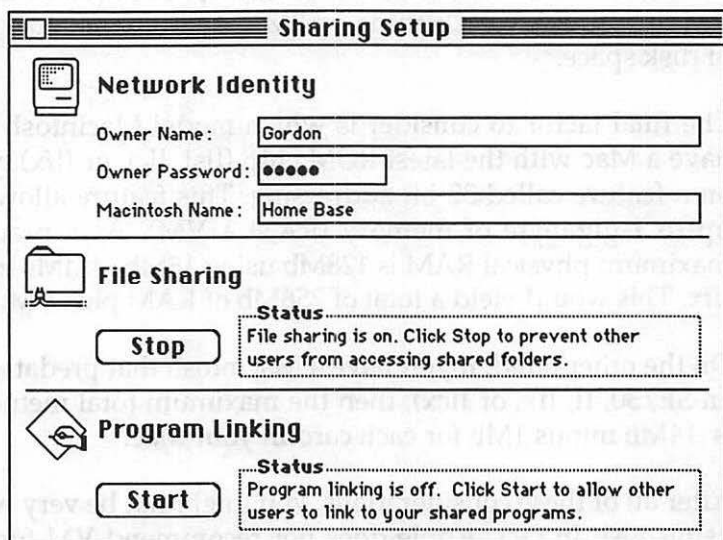
Figure 1-35. Sharing Setup options

You must identify your Macintosh to the network and then activate **File Sharing**. The name you give your Mac will appear in the Chooser when other people want to access your files. Your name and password allow you to access your Mac from another computer on the network. They also protect against unauthorized access to your files.

Sharing folders

After you have turned on File Sharing, you will need to identify which folders on your hard disk are available for others to use.

First select the folder, and choose **Sharing** from the Finder's File menu as shown in Fig. 1-36.
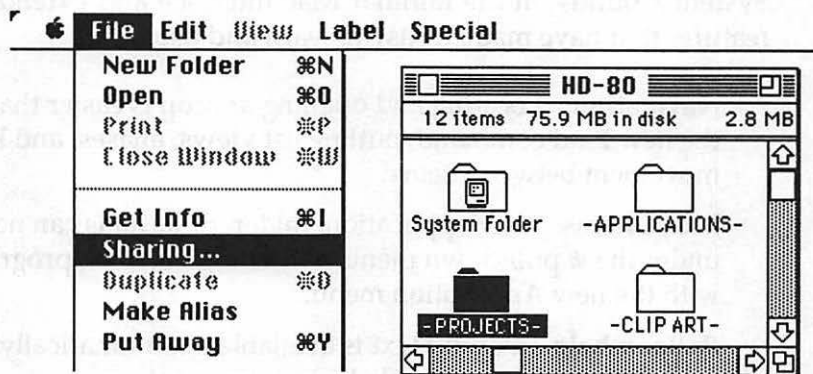
Figure 1-36. Selecting a folder for sharing

Then check the **Share this item and its contents** box, and set the type of access you want to grant to other users. The options are shown in Fig. 1-37.
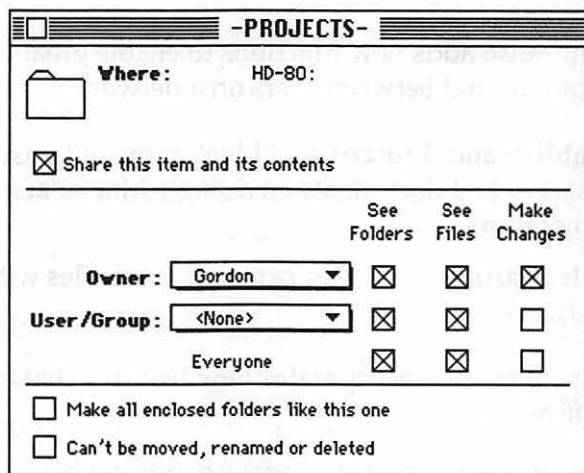
Figure 1-37. Sharing options

You have complete control over which folders to share and with whom to share them. Some of the options include:

- Sharing all the files in a folder with another individual or with a group of people. You define who is included in a group.

- Not sharing anything at all with others.

Highlights of System 7

System 7 builds on the familiar Mac interface and extends many of the features that have made it easy to learn and use.

Navigation Locating and opening an icon is easier than ever with the new Find command, outline list views, aliases, and keyboard movement between items:

Menu items Any application, folder, or its alias can now appear under the pull-down menu. Switching between programs is faster with the new Application menu.

Balloon help Pop-up text is available to automatically describe objects and features, simply by pointing at them.

System Folder Built-in "intelligence" recognizes specific types of icons, automatically placing them in appropriate subfolders or files. The Font/DA Mover is gone—suitcases and the System File can be opened with a double-click to view and move fonts and sound files.

System 7 also adds new functions to enable greater collaboration between applications and between users on a network:

Publish and Subscribe "Live" copy and paste automatically updates linked documents on a single Mac or across the network to other users.

File sharing Any Mac can now share files with other users on the network.

Finally, System 7 incorporates new features that extend the Mac's power and efficiency:

TrueType™ Built-in outline font technology provides high-quality character images, both on screen and in printed output. Fonts can be scaled to any size based on a single font file, saving disk space and simplifying installation.

Virtual memory For some Macs, physical memory (RAM) can be extended using space on your hard drive.

Preparing to use System 7—
When should I embark?

After browsing through chapter 1's *travel brochure* and seeing all of the exciting new features on the AMS 7, you might be asking yourself "how can I get on board?" Or perhaps you're still skeptical and thinking "tickets for anything this good must have a steep price. What will it cost me to take this trip? Do I really need it?"

In either case, you're probably interested in what's necessary for your departure to the 7 Seas. Perhaps your Mac is already able to run System 7— all you need is the software and some tips on installation. On the other hand, you might have to upgrade your hardware before your departure. And what about your favorite applications and utilities—are they ready for the high seas? But most importantly, are you ready for the AMS 7? Do you use your Mac on a network with other users? If so, can you take this cruise alone, or does everyone have to come along?

Before we dive into the details, consider some basic issues that might help you decide if you're ready for a 7 Seas adventure now, or if you should postpone your voyage for a little while.

Which type of traveler are you?

Are you a seasoned veteran of many voyages or is this your first trip? Macintosh users cover the entire spectrum from novices to advanced hackers. Since its introduction in 1984, the Mac has developed a broad following. Students and individuals use it for personal and educational applications. In the business world the Macintosh has gained acceptance by professional, technical, and administrative workers. In spite of its reputation as primarily a desktop publishing (DTP) machine, today's Macs service a full range of business tasks, from spreadsheets and word processing to sophisticated database and scientific applications.

In fact, one of Apple's goals with System 7 is to change how people think about the Mac. Apple is beginning to promote the Macintosh as the personal workstation of choice—both at home and in the office. To support this position, Apple has introduced a broad range of products that allow the Mac to connect to virtually any corporate mainframe or network.

Where and how you use your Mac could have a direct bearing on when you'll board the AMS 7. So let's take a look at some typical Mac users and a few of the issues they face in planning their 7 seas trip.

Seasoned travelers

When the Macintosh was first introduced in 1984, it attracted many "early innovators." These were people who loved the Mac and consumed virtually every facet they could learn about it. As a Mac pioneer it was a matter of survival. The world was covered with a sea of IBM blue and to a large extent still is. Those who dared to defy conventional wisdom and pursue the Apple rainbow often felt compelled to defend their choice. To many it became a matter of personal honor, and to some a kind of "holy war."

Early Mac "evangelists" eagerly adopted each new release of the System, even if it meant frequent appearances of the dreaded bomb message and the inevitable system crash. Many of these battled-scarred veterans have become members of the "power users" camp. Over the past seven years we have been joined by thousands more who fill their System Folders with countless INITs, CDEVs, DAs, and fonts. Power users are easy to recognize—they have an in-depth knowledge of at least five applications and a casual acquaintance with many more. Their desktops bear little resemblance to the Apple standard, and are often chock full of special add-on features.

If this description strikes a resonant chord in you, then your travel plans are obvious. You probably already have a copy of System 7, or soon will have one. The risks really don't matter very much, because you're confident you can command a System 6 lifeboat if something goes wrong.

If you're not yet a *power user*, it's a good idea to make friends with someone who is. It can save a lot of time and frustration when you hit an unexpected snag. Call your friend and describe the dilemma—chances are good that they'll have an immediate answer. If they don't have one, they'll probably dig into the problem and let you know the results. If you don't know anyone who fits this description, join a local users group. They,often include friendly people who can offer the help you need.

Mainstream Mac users

As the Mac has become more widely accepted, the installed base has broadened to include more casual users. To the seasoned veteran it might come as a surprise that not everyone spends eight hours a day in front of

their Mac. Today's average user routinely works with one to three applications for perhaps two or three hours a day. They find the Mac an effective and perhaps essential tool that helps them work more productively, but it doesn't dominate their life.

If you find this description fits your Mac habits, the upgrade decision is not quite so clear. You might choose to postpone upgrading until the risks are relatively low, and are more than offset by the benefits. Being a pioneer isn't as important to you as continuing to experience a smooth daily routine with your Mac.

Let the experienced travelers experiment with all of System 7's new features. They'll eagerly share the good news and the bad. In fact, when they begin to take System 7 for granted, it's probably time for you to take the plunge. This might happen sooner than some people expect—perhaps before the end of 1991.

The AMS 7 was first described publicly by Apple in 1989, but its maiden voyage has been delayed several times. During these delays, at least two major pre-release versions of System 7 have been widely distributed among software developers. As a result, the AMS 7 has been tested under a broad range of conditions, also giving developers the time to prepare their product upgrades. This is good news for anyone considering System 7. Most of the bugs have been revealed and corrected in the final release. And many applications developers have announced new System 7 compatible versions available within the first few months following the christening of AMS 7.

New Mac users

It's no secret that Apple's late 1990 introduction of the new low-cost Classic and LC has created a major increase in the number of Macs being sold. Most of these Macs have been purchased by first-time users.

If you bought your Mac before May 13th, it came with one of the 6.0.x versions of system software, which presents you with a very interesting dilemma. You're just getting familiar with the Mac and already there is a major upgrade available. Is the investment you've made in learning System 6 transferable, or would a change now just add confusion and uncertainty? We won't deny that there could be some initial confusion. But because System 7 builds on the basic Mac metaphor and actually makes

some aspects easier to learn, you'll probably find the transition relatively painless.

If you acquired your Mac shortly after the System 7 release, it came with System 6 installed, but it also included a coupon to mail in and receive a System 7 upgrade kit. Chances are good that you didn't leave your Mac in the box until you received the upgrade—you started using System 6 immediately. Now you're faced with the same dilemma—to switch or not to switch?

But which one do you choose? That's a tough one—if you're the conservative type and like to "play it safe," System 6 might seem like the best bet. If there are any bugs in 7 or compatibility problems with your applications, you can wait until the next release. However, as a new Mac user you don't have much invested in old methods or applications that might not run under System 7. In fact, you might be in the *best* position to jump right in and begin enjoying the benefits of System 7.

Applications software shouldn't be much of a problem for you. If you bought your packages just prior to System 7's release, it's likely that the software is compatible or the publisher will offer an upgrade at little or no cost to recent buyers.

Needs versus wants

Whether you're a new Mac user or a seasoned veteran, there is another basic issue to consider. Do you really need to upgrade to System 7, or is it more because you *want* some of its new features? Both reasons are valid and there's no need to feel guilty if it's more *want* than *need*. Nonetheless, being clear about your motivations might make it easier to overcome some of the hurdles to buying a ticket for the AMS 7 voyage.

Suppose you routinely work with two or three applications, including a word processor and a spreadsheet package. You've organized your monthly reports to copy results from the spreadsheet and paste them into the word processing document. With System 6, it generally takes several hours to complete this process, but with System 7's "live" copy and paste you could be done in less time. If the time savings is significant, it almost certainly can help justify the investment in upgrading. Even a small gain in productivity can be worth the effort, when you multiply it by the number of times you'll benefit. You have a bonafide *need*, which System 7 addresses.

On the other hand, suppose you perform a similar task with a single integrated package like Microsoft Works. In fact you do most of your work with this package, and only occasionally turn to another application. System 7's "live" copy and paste probably won't benefit you much, until Microsoft upgrades Works to take advantage of it. Yet you're still intrigued by some of System 7's other features and *want* to try them for yourself. At some point you're likely to upgrade anyway, so doing it now is merely investing in the future. You'll be that much farther ahead having learned System 7 when you really *need* to upgrade.

Whether you have a bonafide need or merely a strong desire to upgrade, you should consider both the immediate and longer-term benefits. Weigh these benefits against the potential for disrupting your daily work during the transition. Then decide if there is sufficient value to you personally, in making the change now or waiting until you're sure everything is stable.

Which features will work on *my* Macintosh?

All recent models can run System 7—or at least most of the features.

Table 2-1. System 7 feature levels

Level	System 7 Features	Models
Level 0	Can't run System 7—must upgrade to Mac Plus or higher	128K, 512K, and 512Ke
Level 1	All System 7 features except virtual memory	Plus, SE, Classic, LC, and Portable
Level 2	Limited virtual memory (lacks 32-bit mode).	SE/30, IIx, IIcx, and Mac II (w/PMMU)
Level 3	Full virtual memory (includes 32-bit mode)	IIsi, IIci, and IIfx

In Table 2-1, we've outlined the four levels of System 7 compatibility. These are like decks on a cruise ship—at each level you get a few more amenities. Unfortunately, at level 0 you're denied passage on the AMS 7, but all other levels share most of System 7's benefits. If you own an early Mac (128K, 512K, or 512Ke), you won't be able to run System 7 unless you upgrade your unit to at least a Mac Plus. Also, you must have a minimum of 2Mb of Random Access Memory (RAM) and a hard drive—System 7 will not run from a floppy disk.

Virtual Memory (VM)

VM is the only System 7 feature that might not be available to you, depending on which Mac model you use. For most users, limited VM capabilities shouldn't be a significant issue. Apple recommends VM for *occasional* situations—like when you're running several programs and need a little more memory to squeeze in that last application—not as a routine substitute for physical RAM. If you often encounter insufficient memory messages, add some RAM—you'll be happy that you did.

Level 1 features

All Macs from the Plus up to the IIfx can take advantage of the basic set of new System 7 features, which includes:

Finder 7.0   Improved navigation with the new Find command, outline list views, aliases, and keyboard control of movement between icons. More control over the appearance of icons, text, and windows at the desktop; "smart" System Folder, which automatically recognizes certain classes of icons and places them into appropriate subfolders; and direct access to fonts, sounds, and DAs—double-clicking allows you to display each item and view, hear a sample of the contents, and move them between windows.

TrueType™   Eliminates the jagged appearance of fonts both on screen and in printed output. Characters can be scaled to any size. Outline font files require less disk storage space than sets of bitmapped fonts.

Editions Manager   Enables live copy and paste between linked documents created by the same or different applications programs. Publish and subscribe features work on a single Mac or between several Macs on a network.

Personal AppleShare   Allows any Mac on a network to share files with others, without the need to set up a special dedicated file server.

Data Access Manager   Provides a standard interface for applications to access data from nonMacintosh computers, such as corporate mainframes and minicomputers.

Level 2 features

Macs in this category (SE/30, IIx, IIcx, and II with PMMU) can take advantage of System 7's VM feature—up to a maximum of 14Mb.

All Macs with paged memory management capabilities can run virtual memory. This feature is built into any Mac with a 68030 processor, and can be added to 68020 machines by installing a PMMU chip. Virtual memory calls upon the PMMU to write "pages" of memory out to your hard disk. When the active application needs something from one of these pages, VM automatically swaps the information back into physical RAM.

Because disk accesses are relatively slow, *paging* takes longer than if your entire program were loaded into RAM. Reading and writing information to disk is measured in milliseconds, while accessing RAM is measured in nanoseconds (1,000 times faster). Paging delays are why you should plan to use VM only occasionally, and not depend on it for your routine work.

The amount of virtual memory your Mac can access depends on which ROM chip it uses. ROM (read-only memory) is different from RAM (random-access memory). A ROM chip contains the core components of the Mac operating system. Instructions are permanently etched on ROM chips and generally upgraded only with the introduction of a new Mac model. There have been several different ROM versions, typically identified by their size—128K, 256K, and the new 512K ROMs. The SE/30, II, IIx, and IIcx models use the older 256K ROM.

These older 256K ROM chips utilize a 24-bit addressing scheme, which allows them to access 2^{24} bits, or 16Mb of memory, with:

8Mb allocated for physical memory (RAM)

6Mb for NuBus cards

2Mb reserved for ROM access and Input/Output.

System 7's VM feature can access all of the 8Mb reserved for RAM plus any portion of the 6Mb that is not used by NuBus cards. This yields a maximum of 14Mb (8Mb + 6Mb), reduced by 1Mb for each NuBus card installed in your Mac.

Apple recommends that you configure VM for no more than the amount of physical RAM in your Mac. For example, if you have 4Mb of RAM, you can add 4Mb of virtual memory for a total of 8Mb. However, if you have 8Mb of RAM in a level-2 machine, you are limited to 6Mb of VM for a maximum total of 14Mb.

Level 3 features

Recent Mac models (IIsi, IIci, and IIfx) include the latest ROM chip, which allows them to address up to 1 gigabyte of memory. This removes the 14Mb limitation found in level-2 Macs. The Mac LC also uses the new 512K ROM chips, but lacks a PMMU necessary to run VM, so it can access only up to 10Mb of RAM.

While all Macs have 32-bit processors, only those with new ROM chips can address 2^{32} bits, or 1Gb of memory. Older ROMs used the upper bits (25 to 32) for other purposes, resulting in 32-bit "dirty" operation. New ROMs are "32-bit clean," meaning all 32 bits are available for addressing memory.

Beginning with the Mac II, Apple stopped soldering ROMs to the main logic board and started placing ROMs in sockets. Socketed ROMs can be replaced, suggesting the possibility of upgrading your Mac to the latest 32-bit clean versions. However, Apple has not yet given any indication that they plan to offer such an upgrade. They have long regarded their ROM chips as proprietary and central to protecting their market position from clone makers. Providing upgrade ROMs could potentially release a large number of chips that might be used in Mac clones. Also, re-engineering ROMs for the older Macs is no small task, and would compete with other programming efforts aimed at new Mac models.

ROMs are not the only thing that must be 32-bit clean to take full advantage of virtual memory. Some application programs have assigned special functions to the upper bits, making them 32-bit dirty. If such an application is run with 32-bit addressing turned on, it will generally produce a system error. For quite some time, Apple has been urging software developers to change their programs to be 32-bit clean. While many have complied, there are still some that might not run properly in 32-bit mode. If you own one of these programs, you have two choices—turn off 32-bit memory or upgrade your application to a 32-bit clean version.

Cleaning up dirty ROMs

If you own one of the 32-bit dirty Macs (II, IIx, IIcx, and SE/30) which could otherwise utilize more than 14Mb, there is a third-party software solution. Connectix Corporation offers a control panel called *MODE32*, which effectively cleans up dirty ROMs. It operates in the background and allows 32-bit dirty Macs to utilize System 7's full VM capabilities.

With MODE32 installed, your Mac thinks it has 32-bit clean ROMs, which allows it to access up to 128Mb of physical RAM. System 7's Memory control panel expands to include options for turning on 32-bit addressing, as illustrated below in Fig. 2-1.
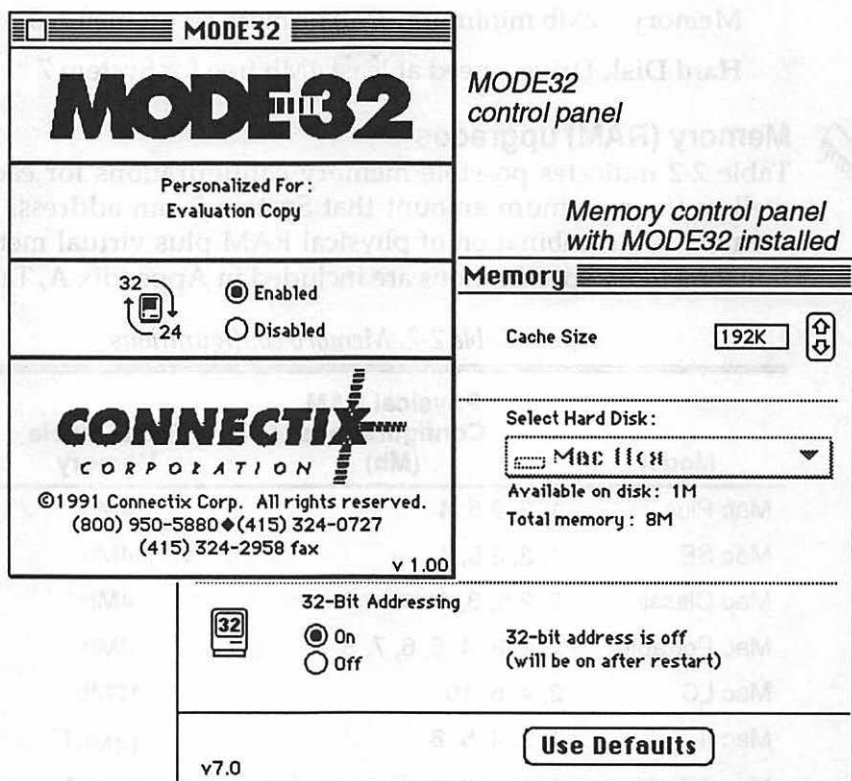
Figure 2-1. *MODE32 and Memory control panels*

By operating through System 7's Memory control panel, MODE32 is essentially transparent during normal operations. Connectix has been in the virtual memory business even before System 7, and they also offer a software product called *Virtual*, which enables VM features while running System 6.0.5 or later.

In September 1991, Apple announced they had licensed MODE32 from Connectix and plan to distribute it free of charge to Mac owners affected by the dirty ROMs. They also announced that future releases of system software would incorporate capabilities similar to MODE32.

Hardware upgrades for System 7

If you have at least a Mac Plus, there are two primary upgrades you might need in order to consider booking passage on the AMS 7:

Memory   2Mb minimum; 4Mb or more recommended

Hard Disk Drive   need at least 4Mb free for System 7

Memory (RAM) upgrades

Table 2-2 indicates possible memory configurations for each model, as well as the maximum amount that System 7 can address. Total usable memory is a combination of physical RAM plus virtual memory. (Additional memory specifications are included in Appendix A, Table A-1).

Table 2-2. Memory configurations

Model	Physical RAM Configurations (Mb)	Total Usable Memory	Required RAM Speed (ns)
Mac Plus	1, 2, 2.5, 4	4Mb	150
Mac SE	1, 2, 2.5, 4	4Mb	150
Mac Classic	2, 2.5, 3, 4	4Mb	150
Mac Portable	1, 2, 3, 4, 5, 6, 7, 8, 9	9Mb	100
Mac LC	2, 4, 6, 10	10Mb	100
Mac II	1, 2, 4, 5, 8	14Mb†*	120
Mac SE/30	1, 2, 4, 5, 8	14Mb*	120
Mac IIx	1, 2, 4, 5, 8	14Mb*	120
Mac IIcx	1, 2, 4, 5, 8, 16, 17, 20, 32	14Mb*	120
Mac IIsi	1, 2, 3, 5, 9, 17	1Gb	100
Mac IIci	1, 2, 4, 5, 8, 16, 17, 20, 32	1Gb	80
Mac IIfx	4, 8, 16, 20, 32	1Gb	80

Notes: *14Mb less 1Mb for each NuBus expansion card
†Mac II requires PMMU chip to address 14Mb

The configurations in Table 2-2 are based on using SIMMs (standard in-line memory modules), which plug into sockets on the Mac's main logic

board. A SIMM strip is a small circuit board typically holding 8 RAM chips. Common sizes include 256K, 1Mb, and 4Mb, although some recent Macs can also use 512K and 2Mb SIMMs. Newer Macs run at higher clock speeds, requiring SIMMs with faster access times, measured in nanoseconds (ns). You can substitute faster chips (with a lower ns rating) for earlier Mac models, but not the reverse. For example, 80ns chips will work fine in a IIcx, but 100ns SIMMs will not work in a IIci or IIfx.

In the Mac SE/30 and IIcx you can install up to 32Mb of physical RAM, but Apple's VM can recognize only a maximum of 14Mb, unless MODE32 is installed. However, you might be able to use the excess as a RAM Disk.

At the top end of the scale, recently introduced 16Mb SIMMs can allow the Mac IIci and IIfx to be configured with up to 128Mb of RAM. Using VM, you could theoretically have up to 256Mb of total memory available, provided that you also have at least a 300Mb hard drive. These are impressively large numbers by today's standards, but they could very well become commonplace in future years. Advanced applications such as digitized video images could require memory of this scale.

At a more basic level, 1Mb and 4Mb SIMM prices have dropped to the range of $40 to $60 per Mb, so upgrading your RAM might not be a major obstacle. How much memory to add depends upon how you use your Mac. If you typically run only one application at a time, you might be able to get by with 2Mb of RAM. However, if you plan to run multiple applications, you should upgrade to at least 4Mb. Remember that System 7 is always in Multifinder mode—consequently you could find yourself opening more than one application at a time, even if you've never done so before. There is an old adage that says "work expands to fill the time available." Today's memory equivalent might be "work expands to fill the RAM available." So consider adding the most RAM you can reasonably afford.

Installing SIMMs is relatively easy on Mac II models because the case can be popped open in seconds, and the sockets are easily located. Most SIMM vendors will provide detailed instructions. The principal installation risk is the potential of damaging chips with a static electricity discharge. The safest method requires a grounding strap to ensure that the chips are not damaged when handling them. The strap discharges any static electricity present in your body. Grounding yourself is a very important precaution *before* removing the SIMMs from their protective

packaging. If you are unfamiliar with electronic equipment or just want to avoid the risks, you should take your Mac to a qualified service technician to install your RAM upgrades.

The compact Mac models (Plus, SE, SE/30, and Classic) require special tools to open the case. While such tools are readily available, we do not recommend this as a do-it-yourself project for the average user. These models include a built-in CRT, which carries high voltage levels that might be present even when power is disconnected. Installing RAM or any other internal changes to a compact Mac should be performed by a qualified technician.

Hard disks

If your Mac lacks a hard disk drive, you'll need to add one in order to install System 7. Hard disk prices have also declined, with quality third-party drives now available at a reasonable cost. Entry-level internal drives (40Mb to 50Mb) are widely advertised at $200 to $300. Add another $50 for an external unit that connects to the SCSI port on your Mac.

How much hard disk capacity to add is mostly a matter of budget. Similar to our earlier comments about RAM, "work will expand to fill the available *disk* space." While System 7 might require only 4Mb of space, it is fairly easy to consume the rest of a 40Mb drive with application programs and documents. Hard drives come in a variety of sizes, ranging from 20Mb to over 1,000Mb. Cost per Mb is roughly the same regardless of size. Therefore, you might want to consider a larger drive, such as an 80Mb or 100Mb unit, provided of course that your budget can afford one.

If this is your first hard drive, you'll probably want to install it inside your Mac—it saves space and goes wherever your Mac goes. An internal drive can be installed in any model higher than a Mac Plus, which requires an external drive. If you already have an internal hard drive, adding an external unit can increase your flexibility. External drives are relatively portable, which can come in handy if you work on two different Macs. A second hard drive also allows you to install System 7 on one unit and keep System 6 on the other. If you encounter a snag with System 7, you can easily switch back to System 6 just by changing the startup device in the control panel and re-booting your system.

Disk driver compatibility

Before you install System 7 on your hard disk, you should be aware of some specialized software that controls how the Mac accesses the drive. Most third-party suppliers provide their own utility software, which is used to initialize the drive and establish basic performance characteristics. Typically, hard drives come from the supplier already formatted, which means you generally don't need to run these utilities unless you want to alter one of the characteristics. So even if you already own a third-party drive, you might never have had occasion to use one of these utilities—until now. System 7 requires certain updates to hard disk *drivers* so it can function properly.

On a genuine Apple drive, you update using the Apple HD SC Setup utility supplied with System 7. This utility will scan all SCSI drives both internal or external. However, it will recognize only drives that have been initialized with a previous or compatible version of the HD SC Setup utility. So if you have a non-Apple drive, you'll need to use a utility that matches the current driver. If you thought you had a genuine Apple drive and the HD SC Setup utility doesn't recognize it, go back to the dealer and ask for the appropriate software. Some dealers might substitute less expensive third-party drives in order to offer a better price. This isn't necessarily bad, because some third-party drives actually out-perform the factory-installed units. The important point is to obtain the appropriate utility—otherwise you'll probably need to reinitialize your hard drive, which will destroy everything stored on it.

A word of caution when running any hard disk utility. *Play it safe!* Backup any critical data from your hard drive before you attempt to run one of these utilities. Make sure you understand the function of each option before you execute it. Most Mac users are comfortable with learning by experimentation—unfortunately, this is one area where "trying it *before* you read the manual" is clearly a bad move. It's very much like Russian roulette, only with five of the six cylinders loaded instead of one. Many of the options in these utilities will destroy everything on your hard drive, so be extremely careful to select the nondestructive option, which only updates the driver software.

What to do with my current Mac?

Early Mac models (128K, 512K, and 512Ke)

These models were introduced in 1984 and 1985. While they are a significant part of the Macintosh heritage, they have limited value today. Most contemporary applications software requires at least a 1Mb system to function. Unfortunately, memory cannot be expanded on these early Mac models, which means your software choices are rather limited.

If you own one of these early models, you might consider upgrading it with a third-party add-in processor. However, you're probably better off replacing it with one of the new low-cost Macs, such as the Classic or LC. You'll end up with a better value for your investment. After 5 or 6 years in service, the power supply and CRT have probably deteriorated in these older Macs. Opening the case to perform upgrade surgery could cause sufficient trauma to result in a hardware failure. If you're considering an add-on processor, it will increase the load on your aging power supply, which could further accelerate the risk.

If you're thinking of selling your old Mac, you're probably in for a disappointment. With the availability of the new low-cost Macs, the used market value of these original models is only a few hundred dollars (see Appendix A) and the trade-in value is even less. You might consider keeping your old Mac for sentimental reasons, or turning it over to the kids. There are some great educational and game packages which will still run with limited memory.

Compact Macs (Plus, SE, and Classic)

All of these Macs can be upgraded to a maximum of 4Mb of RAM, which is a reasonable amount for running two or three applications under System 7. Recall, however, that these are level-1 Macs and cannot use Apple's VM to expand beyond the 4Mb limit. For most Mac Plus, SE, and Classic users, this might not be a problem—two or three concurrently open applications might be all the horsepower you need.

These are good utilitarian units, which can run most of System 7's features and service a basic set of needs for quite some time. There is no fundamental *need* to upgrade to a higher model, unless your work demands it. On the other hand, you might *want* to consider a level-2 or level-3 machine for several reasons:

Processor speed   all of these units use the 68000 processor, which is the slowest in the Mac product line. Upgrading to another level will increase speed by two to four times.

Monitor size   the compact Macs' small screen does impose a limited window size, which can be annoying if you work with spreadsheets or other large documents.

Color   the black-and-white screen has become a larger issue as more applications packages incorporate color features. While such packages could include some basic provisions to colorize your work, it is difficult to visualize the results on a black-and-white monitor.

Additional memory   both increased RAM capacity and VM operation are available on level-2 and level-3 units.

Moving to System 7 is probably not sufficient reason to upgrade from your Mac Plus or SE. However, if you've been wanting to overcome some of its basic limitations, this might be a good time to consider one of the newer units—like the LC or IIsi.

If speed and memory are your primary concerns, you might want to consider upgrading your existing compact Mac. There are two basic options:

Apple upgrade kits

Third-party accelerators

Apple offers an SE/30 upgrade for the Mac SE, which will give you guaranteed Apple compatibility and a 200% performance increase. You'll also be able to upgrade your RAM capacity from 4Mb to 8Mb, or more with MODE32 software.

Accelerators are offered by a dozen manufacturers and come in several different varieties. All accelerator boards include either a 68020 or 68030 CPU, which functionally replaces your existing 68000. These faster processor chips provide the basic performance boost. However, there are several other techniques employed to further increase operating speed:

Clock speed   Apple's SE/30 runs at 16 MHz—twice the rate of the 68000-based Plus and SE. Some third-party boards boost clock speeds to even higher rates from 25 MHz to 33 MHz.

High speed cache   especially fast static-RAM chips (25 ns) which temporarily store data or instructions that would otherwise be accessed from slower main RAM (120 ns).

Math coprocessor   a specialized chip optimized for number crunching can speed up certain types of programs, such as spreadsheets, statistical analysis, and packages that generate complex graphics (e.g., 3-D images).

Accelerators can boost overall performance by 50% to 450%, depending on the brand and options included. At the high end, you can obtain IIci performance from an accelerated Plus or SE.

Mac Portable

Because the Mac Portable utilizes the 68000 CPU chip, it shares some of the same limitations with the Classic, SE and Plus. Unlike its compact cousins, however, the Portable can be upgraded to 9Mb of physical memory. Unfortunately, it requires a special type of RAM, which is significantly more costly ($250 to $500 per Mb) than the memory used in a standard Mac.

Upgrade options are extremely limited until Apple delivers the new notebook portables, expected out before the end of 1991. Reports in industry publications indicate that three new models are planned:

PowerBook 100   16 MHz with a 68000 CPU

PowerBook 140   16 MHz with a 68030 CPU

PowerBook 170   25 MHz with a 68030 CPU

All three models are expected to include 2Mb of RAM and a built-in 20Mb or 40Mb hard drive, which means they are geared to run System 7. The new portables are reported to measure roughly 9.5 by 11 by 2 inches and weigh in the 5 to 7 pound range—making them true notebook computers.

Based on the most recent non-portable Macs, we expect these units will all come with 32-bit clean ROMs, overcoming one of the VM hurdles. However, only the 68030 CPU incorporates the necessary PMMU required for VM operation.

If you own a Mac Portable and are thinking about upgrading to one of the new notebooks, you're likely to be caught in a pricing squeeze. MacWeek reports the target retail prices will range from $2,300 for the entry-level PowerBook up to $4,600 for the top unit. When these new models become available, you can expect the resale value of your current Mac Portable to drop below $2,000.

Mac II and IIx

If you own a Mac II that hasn't yet been upgraded, you might not realize its potential. When Apple introduced the IIfx they also added an upgrade kit, which takes a Mac II or a Mac IIx all the way to the top-of-the-line IIfx model. While the IIfx upgrade is not exactly cheap, for under $3,100 you can have the equivalent of a machine that lists for over $8,000. The blazingly fast IIfx performs at 2 to 3 times that of Mac II, and can utilize all of System 7's features—including 32-bit clean full VM operation.

The IIfx requires faster RAM than your original Mac II, so you'll need to replace all of your memory. However, IIfx RAM prices have dropped along with other grades and can now be obtained for less than $60 per Mb for 1Mb and 4Mb SIMMs. And if you really want to beef up memory, the IIfx can be configured all the way up to 128Mb of physical RAM by using 16Mb SIMMs.

An alternative strategy to Apple's IIfx upgrade is using third-party accelerators. Similar to those described earlier for compact Macs, these add-in boards are designed for Mac II models. They come in various combinations of 68030 CPUs, some with a high-speed static-RAM cache and an optional 68882 math coprocessor chip. Clock speeds on the 68030 CPUs range from a basic 16 MHz up to 50 MHz for a high-end accelerator. You can boost basic Mac II performance anywhere from 20 to 200 percent, depending on which board you install. Accelerators are priced according to the performance improvements they deliver. You can pay as little as a few hundred dollars for low-end units, or over $2,000 for a top-rated model.

Mac SE/30

The SE/30 is already a fast machine, with little room for improvements. Its overall performance nearly equals the IIci, which is second only to the IIfx. Although its 16-MHz 68030 CPU is no match for the 25-MHz clock speed on a IIci, the SE/30 has some offsetting characteristics. The video driver consumes less of the CPU's power because it needs to control only

1 bit per pixel for the monochrome display, versus the 8 bits required for color on the IIci. Also, the video circuitry connects directly to the CPU rather than passing through the slower 10-MHz NuBus to a video card, which is typical on the II, IIx, IIcx, and IIfx models.

If you're still not satisfied with the SE/30's speed, you can squeeze out another 25% with a fast cache enhancement like the 32-MHz Dove Marathon 030/SE30.

In addition to raw speed, the SE/30 also includes 32-bit QuickDraw capability, so it is possible to add an external color monitor connected through a special card, which fits in the single expansion slot.

Mac IIcx

The IIcx has been replaced in Apple's current lineup by the IIsi, which is a little faster but lacks the three-slot expansion flexibility of the IIcx. The IIcx was a very popular Mac in corporate America because it offered a good balance of speed, expansibility, and color at a mid-range price. To many, it remains a good machine for the same reasons. Its primary draw-back is the lack of 32-bit clean ROM. However, even this limitation is overcome with MODE32 software.

Both the IIci and the IIsi offer built-in support for color video. By comparison, the IIcx requires a NuBus video card. On the surface this might seem like a negative, but in fact there are advantages to off-loading video tasks to a separate board. Built-in video steals RAM to store bits that represent the screen image. This reduces memory available for applications (as much as 320K), but more importantly it can slow down application processing. The 68030 CPU must often wait to access RAM, while the video control chips are accessing the same memory to refresh the screen image. However, the net effect still favors the IIsi, because its CPU chip operates at 20 MHz versus 16 MHz on the IIcx. This basic speed advantage of the IIsi tends to offset the added burden of on-board video processing.

Apple offers an upgrade kit that can change your IIcx into a IIci, but again you might need to replace your RAM if it's not rated at the 80ns required by the IIci. At a list price of $1,499, this isn't nearly the performance bargain you'd get by upgrading a Mac II to a IIfx. An alternative is third-party vendors like DayStar, which offers a series of accelerators that can boost your IIcx to 25 MHz, 40 MHz, or 50 MHz.

Mac IIci

The IIci was the first Mac with 32-bit clean ROM chips. It's physically the same size as the IIcx with three NuBus expansion slots, but includes a faster 25-MHz processor. It also offers built-in video capability, which supports up to 256 colors or gray shades on several Apple and third-party monitors.

The Mac IIci is second only to the IIfx in overall performance, running 3.5 times faster than a Mac Classic, but only 50% to 60% as fast as a IIfx. If you'd like to squeeze out another 20% to 50% from your IIci, you can add a cache card from Apple or a third party. A cache card adds 32K to 64K of high speed static RAM, which operates at close to the same rate as the processor. This speeds access to frequently used instructions, so the 68030 CPU doesn't have to wait to retrieve information from the slower main-memory chips.

The IIci includes a special connector for adding the cache card, so installation is simple. Cache cards are available in a range of performance factors, including some that can exceed a IIfx.

Mac IIfx

None of the 68030-based accelerators can beat Apple's stock IIfx. However, new 68040-based accelerators are being introduced that can outpace a IIfx. Apple is expected to introduce their own 68040-based models during 1991, which should easily beat IIfx performance. However, the 68040 models will be beyond the price range of most Mac users, aimed at high-end workstation or server-based applications. Nonetheless, introduction of the next generation of Macs will drive prices down on current models, including the IIfx. Economics dictate a corresponding drop in third-party accelerators and related products.

Performance upgrades—the bottom line

The bottom line for anyone interested in upgrading the performance of their Mac is simple. If you can't afford today's prices, just wait a few months—chances are good that a speed boost will be in your price range before long.

The used Mac market

So you've thought about upgrading your current Mac with add-in boards and memory SIMMs, but you'd really rather avoid the hassles—like which brand of accelerator, who to buy it from, and how to get it installed. Or perhaps you want to trade up from your monochrome compact Mac to a color model. Or maybe you're a first time Mac buyer, and wondering about getting more for your investment if you buy a used model.

You're in luck, because the proliferation of new Mac models introduced by Apple has spawned an active market in used machines. To accomplish a trade-up, there are two parts of the transaction to consider. Disposing of your current Mac (if you have one), and acquiring a new (or used) machine. If you already own a Mac and are looking to upgrade, there are several options to consider:

Sell it yourself

Sell/trade it to a used Mac broker

Trade it in for a new Mac

Selling your Mac directly to another buyer will probably yield the best price. Because a broker or retail dealer is in business to make a profit, you can expect the price they'll offer for your old Mac will be less than the current used market selling price. The difference, or spread between the buying and selling price is the broker's margin—typically 30% to 40%. Market price is influenced by two factors—supply and demand for the particular model you're selling, and the "street" or discounted price of a comparable new Mac. For example, performance of a used Mac SE is nearly comparable to a new Mac Classic. Therefore, the used market price of an SE will be close to the street price of a comparably equipped Classic. Table A-3 in Appendix A provides approximate used selling prices compared to Apple's suggested retail (list) prices.

Many brokers and new Mac dealers who will take a trade-in advertise in the classified sections of major Mac publications, such as MacWorld, MacUser, and MacWeek. You should also check with your local Apple dealers—they might be willing to take a trade-in to sell you a new Mac, and they might also have used Macs available for resale.

While trading in your Mac with a broker or cooperative dealer is probably the easiest path, there are several ways to locate a buyer yourself. Besides running a newspaper ad, consider notifying your local user group—there might be another member looking for a used Mac, or they might know someone who's in the market for your model. Another way to advertise is through one of the on-line services, especially if you already subscribe. If you're a potential used Mac buyer, these same avenues are available to acquire a machine without the middle man.

Caution—buyer beware!

If you elect to buy or trade through a mail-order broker or dealer, select a reputable firm. Ask a knowledgeable friend or contact your local user group to determine which firms have provided honest and reliable services in the past.

Be especially careful of a Mac equipped with add-in components, such as hard drives and extra memory. You might assume that you're getting Apple factory-installed equipment, when in fact they are third-party components. This caution applies to both new and used Macs. It has long been a favorite ploy of some dealers to substitute lower-cost hard drives, and then advertise an attractive discount from Apple's list price. Substituting third-party components isn't necessarily bad—some offer equivalent or better performance than the Apple originals. However, you should know what brand and model is included in the Mac you're considering. Some brands are less reliable than others, and even certain models from reputable manufacturers have problems.

Unfortunately, the only sure way to know what you're getting is to open the case and examine the components. The drive manufacturer's label is typically stamped on the case, along with Apple's designation if it's a factory-installed unit. Opening the case is relatively easy on a Mac II model, but requires special tools for compact models, such as the Plus, SE, SE/30 and Classic.

If you do select a third-party drive, be sure you can obtain a System 7 compatible version of the software used to format the drive. Appendix A includes a list of drive vendors and the utility software needed for S/7.

Which used Macs to consider

If you're upgrading from one of the original 128K or 512K Macs or looking for a good entry level Mac, you should consider a used SE. It includes a single expansion slot, allowing for the addition of a third-party board, such as a video card to power a large external monitor. Also, the SE has a stronger power supply, which reduces the risk of problems when adding accelerators to beef up its speed. Or if you prefer, Apple offers an SE/30 upgrade for less than $1,000—an option that reduces the risk of buying a machine that could become obsolete. An SE performs about the same as the new Mac Classic, but has greater expandibility for approximately the same price. Overall, not a bad alternative to buying a new Mac Classic.

If you're in the market for a good used color Mac with excellent expandability, you should consider a Mac IIcx. It includes three expansion slots as well as an Apple upgrade path to a IIci. The IIcx is a little slower than the IIsi, which took its place in the Apple lineup, but it's faster than an LC. It's a good overall performer for standard Mac applications such as word processing, spreadsheets, and basic graphics. But it's less than ideal if you plan to run some of the high-end color graphics packages that demand a very fast processor. If that's only a future concern and not an immediate need, you could later upgrade or accelerate your IIcx to gain the processor speed. For application space, you can add up to 8Mb of physical RAM, and address up to 14Mb using System 7's VM—even higher with Connectix's MODE32 software.

Finally, if you'd really like to have one of the fastest Macs and full System 7 VM capabilities, then consider a used IIci or IIfx. While these Macs are clearly not budget-class machines, you can probably pick up a used model for about 60% of Apple's list price. Compared to buying a new Mac at 70% to 80% of Apple list, you might find the savings sufficient to allow you to move up a model level.

Alternately, if you run across a used Mac II at a bargain price, you might consider taking advantage of Apple's IIfx upgrade conversion. Another possibility to consider is a used SE/30, especially if you need to transport your Mac between locations—such as between work and home. If the SE/30's small black-and-white screen is a problem, consider a third-party external monitor in either color or monochrome.

Software—compatibility and upgrade issues

Apple knows that people don't buy Macs just because it has an easy-to-learn and use desktop, nor because the latest model can boast impressive performance statistics. Customers buy Macs to solve real problems, and that means applications software that works effectively and reliably.

Most Mac users have a few critical applications that they use almost daily. If any of your core programs won't work reliably with System 7, you're faced with a dilemma, with the following solutions:

> **Postpone installing System 7**   until you obtain updated versions that will work reliably.
>
> **Forego System 7's benefits**   and remain with S/6 where your applications work.

If you're fortunate, all your critical applications will work with System 7. Even so, the versions you have are probably not able to take advantage of System 7's new features, like Publish and Subscribe. In this case, you'll need to upgrade in order to gain the full benefits of System 7.

Compatibility

Determining which applications will run reliably is a high priority for anyone considering an upgrade to System 7. It's so important that Apple includes a *Compatibility Checker*, which is part of the Before You Install procedure. It examines every application program on your hard drive(s), as well as the INITs and CDEVs in your current System Folder. It checks the version numbers against a built-in list and then prepares a report telling you which applications are compatible, mostly compatible, must upgrade, or unknown. Applications that are compatible will run reliably with System 7, while those that are mostly compatible might have some conflicts with specific features like VM. Programs in the must upgrade category are not compatible with System 7 and won't run reliably.

Apple's internal testing indicates that 90% of the mainstream Mac applications will run with System 7, but that doesn't guarantee that one of your critical applications isn't one of those that won't work. More likely, however, one or more of your CDEVs or INITs will be incompatible. When you run the Compatibility Checker, it offers you the option of removing questionable items from your current System Folder and placing them in a separate folder entitled *May Not Work with System 7*. After you

install System 7, you can add these items back to the System Folder one at a time and test compatibility. If your Mac won't boot properly, or you get the dreaded bomb message, it's likely that the last INIT or CDEV you added is the culprit.

Applications

Applications belong to one of several classes on the AMS 7:

Class 0 Not compatible (passage denied)

Class 1 Mostly compatible (steerage class)

Class 2 Compatible (tourist)

Class 3 S/7 dependent (ocean view)

Class 4 S/7 friendly (deck view)

Class 5 Magnificent 7 (Captain's table)

Class 0 Some applications won't work with System 7. Often, these are older versions that have been upgraded at least once in the past couple of years. For example, the original MacWrite series are listed as incompatible, but the newer MacWrite II versions are rated as mostly compatible (MacWrite II 1.0v2) or compatible (MacWrite II 1.1v2). If you're still using some of these early (pre-1989) versions, you're more likely to encounter problems than if you've upgraded to the newer releases. Sorry Clyde—if you've been postponing that upgrade to your favorite application, you might be left standing on Pier 6.

Class 1 The majority of applications that ran under System 6 should be at least class 1, if not fully compatible. They might encounter a few minor problems, or they might not be able to use VM or run in 32-bit mode, but they will get the job done—most of the time. Again, these could be older versions, although not quite as old as the class-0 releases. MacDraw II (release 1.0v4), for example, is listed as mostly compatible, but don't try to run it with virtual memory turned on. By comparison, the newer version of MacDraw II (release 1.1v2) is fully compatible. So if you're only a release or so behind, you might be able to get on the AMS 7—although you'll have to settle for steerage class. Not exactly *first cabin*, but then who spends much time in their stateroom on a cruise?

Class 2 Software that complies with Apple development guidelines should be fully compatible. This generally means that the developers

used Apple's standard toolbox routines and didn't violate any of the guidelines. While most developers do follow Apple's rules, there are occasions that might call for an exception. For example, some arcade style game programs bypass Apple's screen-draw routines in order to improve responsiveness. This might result in incompatibilities when a new version, such as System 7, is released.

Fortunately, most mainstream applications don't require exceptions to Apple's programming guidelines. Moreover, developers have had a pretty good idea of the changes that System 7 would require, because they've had access to it in various forms for over a year. As a result, software developers have had the opportunity to upgrade their System 6 versions with new releases that would overcome some of the more obvious incompatibilities.

Table 2-3. Selected applications—System 7 compatibility

Developer	Application	Fully Compatible	Mostly Compatible	Code
Claris	HyperCard	2.1v1	2.0v2	RI
	FileMaker II	—	1.1	UR
	FileMaker Pro	1.0v2	1.0v1	FR
	MacDraw II	1.1v2	1.0v4	VM
	MacDraw Pro	1.0v1		
	MacPaint	2.1v2	2.0v2	—
	MacProject II	2.5v1	2.1v2	—
	MacWrite	—	—	IN
	MacWrite II	1.1v2	1.0v2	TT
	MacWrite Pro	1.0v1		
Microsoft	Excel	3.0	2.2	AD
	File	2.0		
	Word	4.0		
	Works	2.00b		
	Write	—	—	IN

Notes: AD   Turn off 32-bit addressing
         IN   Incompatible; there are no compatible versions
         TT   Doesn't support TrueType™ fonts larger than 127 points
         VM   Turn off virtual memory
         UR   Upgrade recommended by developer

Class 3   Because System 7 introduces several new capabilities, some applications might be dependent—that is, they really can't function with an earlier version of system software. For example, an application that utilizes the Data Access Manager to communicate with a host computer might not be able to function with System 6, because DAM wasn't available prior to System 7. On the other hand, an application that includes the new Publish and Subscribe functions might be written so that it merely dims the menu options (features that aren't available) when it's running under System 6. If an application is implemented in this fashion, it isn't System 7 dependent, even though it includes a new S/7 feature.

Class 4   An application is deemed to be *System 7 friendly* if it meets a basic set of criteria which includes:

MultiFinder support   because MultiFinder compatibility has been an issue since 1987, most applications already comply.

Standard Apple events support   including interapplication communication (IAC), which is available with System 7.

VM compatibility   some applications are not yet System 7 friendly because they have difficulty with virtual memory.

Allows any font size   because TrueType™ permits the user to select any font size, applications shouldn't impose any limits. Previous applications sometimes counted on the fact that most bit-mapped fonts came in standard sizes (9, 10, 12, 14, 18, etc.) or imposed an upper limit of 127 points.

Class 5   Apple has dubbed applications as *Magnificent 7* if they are both System 7 friendly and:

Are 32-bit clean   which means they will operate properly when 32-bit operation is turned on in the Memory control panel. With this feature *on*, you can address more than 8Mb of physical RAM.

Support the Edition Manager   which shows up in applications as Publish and Subscribe features, allowing you to dynamically link information between programs.

Provide balloon help   Apple has made it easy for developers to either replace or augment their existing help functions with this new S/7 feature. Balloon help makes the most sense when it is applied to items at which you point—like tool palette icons or menu items.

Are AppleShare-aware   allowing you to access programs or documents stored on another computer on your network.

Magnificent 7 applications are the ones we're all looking forward to being released, because they will take full advantage of System 7's new features. Most major developers have announced plans to deliver Magnificent 7 versions before the end of 1991. These folks will have a special place reserved at the Captain's table on the AMS 7.

INITs and CDEVs

Most INITs and CDEVs offer added convenience, but are often not essential to your daily routine. This is fortunate, because these software components are the most likely to experience compatibility problems with System 7. While you might miss some convenience, losing a favorite INIT or CDEV usually won't be as crucial to your daily work as being unable to use one of your core applications—such as a spreadsheet or word processing program.

That's not to say that there aren't some INITs and CDEVs that *are* crucial to your daily routine. For example:

Device drivers   While Apple supplies a basic set of drivers for its own brand of peripheral devices, some third parties either replace or augment Apple's drivers with their own software, including printers, plotters, scanners, and CD-ROM drives.

E-mail   If you use your Mac at work and depend on an E-mail system such as QuickMail or Microsoft Mail, an incompatible INIT could be sufficient reason not to upgrade to System 7 until it becomes available from the software developer.

Desk accessories

Most DAs should work fine with System 7, although you'll need to remove them from their suitcase icons. Double-click on the suitcase, which opens a standard Finder window revealing the programs stored inside. Drag the icons to any folder or location on your desktop. If you'd like them to appear in the menu, drag them into the Apple Menu Items folder.

Work environment

Finally, in determining when to upgrade to System 7 you need to take a look at your work environment. If you use your Mac only in a stand-alone mode, then you can make up your own mind about when to upgrade. However, if you're part of a larger environment, especially one that is networked, there are some other things to consider.

Sharing network printers

System 7 includes new drivers for networked printers, which are different from those used with earlier Systems. If you share a networked printer, everyone should use the same version of the driver software. Otherwise, each time someone prints with a different driver it will reinitialize the printer. This can add minutes to each request, delaying everyone who shares that printer. The result is often called "laser wars."

Fortunately, Apple has allowed for this problem. The printer installer that comes with System 7 can be used to update System 6.0.7 printer drivers. This means that some users can remain with System 6, while others can upgrade to System 7, provided that everyone is using System 7 printer software.

Printer drivers are the icons you see in the Chooser. It's easy to determine which version of printer software is installed in your Mac. Simply open the System Folder (and the Extensions folder if you're using System 7), locate and select the LaserWriter icon, and then choose **Get Info** (⌘-I) as illustrated in Fig. 2-2.


```
▤▤▤▤▤▤  LaserWriter Info  ▤▤▤▤▤
 ┌───┐
 │&│  LaserWriter
 └───┘  System Software v7.0
   Kind: Chooser extension
   Size: 219K on disk (223,782 bytes used)

  Where: External 80SC : System Folder :
         Extensions :

 Created: Thu, Apr 25, 1991, 12:00 PM
Modified: Thu, Apr 25, 1991, 12:00 PM
 Version: 7.0, ©Apple Computer, Inc.  ◄── Version
          1983-1991                        number
```
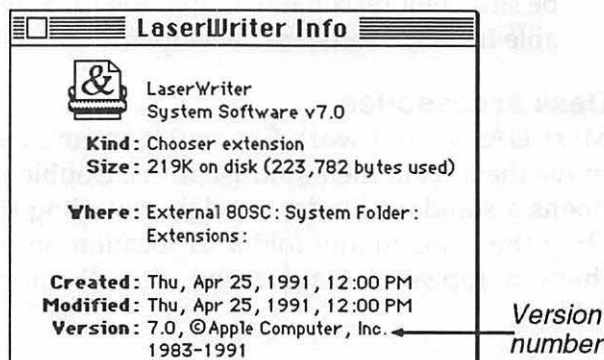
Figure 2-2 . LaserWriter Info window showing the version number

Software

Assess your daily use of the Mac and determine which software packages must be upgraded before you can move to System 7. Don't forget about E-mail and other communications packages such as emulators, which connect you to a host computer. Consult with your resident Mac "guru" or network administrator before you take the plunge, or you could find yourself in icy waters.

If you really must have System 7 on your Mac, even though all your software isn't yet S/7 friendly, you might consider a dual approach. This works best if you have two hard drives. Install System 7 on one drive and keep System 6 on the other. Whenever you need to switch back to S/6, simply select the Startup Disk control panel and click on the appropriate drive, as shown in Fig. 2-3. Reboot your Mac and you're back to System 6.
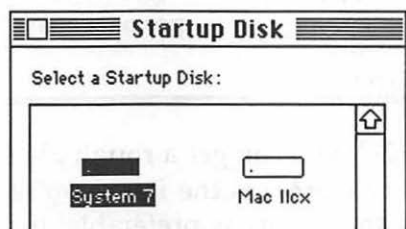
Figure 2-3. Startup Disk control panel with System 7 selected

In chapter 4 we'll describe some other methods that will allow you to upgrade to System 7 and you'll still be able to switch back to System 6 whenever the need arises.

Summary

In this chapter we've taken an in-depth look at what you'll need for the smoothest voyage on the AMS 7. A Mac Plus or higher model with at least 2Mb of RAM and a hard disk drive can install System 7 today.

The decision to upgrade is mostly a matter of budget and timing. System 7 offers a lot of advantages for every Mac user, so we believe it's only a question of when you'll board the AMS 7. If you use a Mac at work, timing will probably be determined by someone else. However, if you control your own destiny then it's likely to be more of a budget issue. To help summarize the cost of upgrading, we've included Table 2-4 on the following page.

Table 2-4. Cost of upgrading to System 7

Needed for System 7	Approximate Cost	Qty Needed	Cost
Hardware			
Memory (RAM)	$40 - $60 per Mb		
Hard disk drive	$250 - $800		
Accelerator or model upgrade	$500 - $3,000		
Software			
System 7	$15 - $100	1	
Application upgrades	$0 - $150 per package		
Utilities and other software	$0 - $100 per package		
TOTAL Required			

Using Table 2-4, you can get a rough idea of the cost to upgrade. Additional memory (RAM) is the item you're most likely to need—2Mb is minimum, 4Mb or more is preferable. If you don't already own a hard drive, you'll need to add one. Consider at least a 40Mb drive, or perhaps an 80Mb or 105Mb unit if your budget can afford it. A model upgrade or accelerator is a requirement if your Mac is one of the early models (128K, 512K, or 512Ke). For any other Mac, it's strictly an optional extra—not a requirement for System 7.

Software upgrade cost will vary, depending on which packages and utilities you currently use. Some compatibility upgrades are free to registered owners, but those that really take advantage of new S/7 features are typically priced in the $50 to $150 range. At a minimum, you'll need to get a copy of System 7—the Personal Upgrade Kit from Apple is $99, including a full set of documentation and the latest version of HyperCard. Alternately, you can get a set of System 7 disks from most user groups for about the cost of the floppies.

Is it worth it?
In our opinion YES, but it's really a personal or corporate decision based on specific considerations that might be unique to your situation.

Chapter 3

Postponing the jump to System 7— Waiting at Pier 6

There's no doubt that System 7 offers some compelling features that will appeal to every Mac user. However, gaining passage on the AMS 7 might be more difficult for some users—either a limited budget or lack of compatible software might postpone your voyage. Fortunately, waiting at Pier 6 until your departure can still be a fun-filled and rewarding experience. Several exciting software packages offer some of System 7's features while remaining on System 6.

There are utilities and control panel devices that will enhance the look of your desktop, and others that approximate System 7's powerful new navigation aids. Apple even offers a way to implement TrueType™ with System 6. And, if you've never been especially fond of the Font/DA Mover, there are utilities that make it easier and faster to access both desk accessories and font suitcases.

If you're longing for virtual memory, Connectix offers a package that will augment your RAM while still running System 6. Even System 7's "AppleShare for everyone" is possible with DataClub™, which works with System 6.

While many of System 7's features can be achieved while remaining on System 6, it requires lashing together a number of software products from various vendors. Consequently, this approach lacks the seamless integration that you'll find only in System 7. Moreover, many of these packages are INITs and control panel devices, which alter Apple's System 6 software. While this is a common practice, it carries with it the usual risk of incompatibilities—some of which could be serious enough to cause the dreaded bomb message!

Nonetheless, you might be interested in some of these utilities to enhance your Mac experience while working under System 6. We've included mini-reviews of several products—some are free or nominally priced shareware, while others are commercial packages that cost a bit more.

▦ Desktop enhancers

On a color Mac one of the first things that strikes you about System 7 is the attractive new look of icons and windows. Even on a gray-scale monitor, there is a 3-D look to window bars and folder icons. Applications that have been upgraded to match System 7's new icon capabilities look really great if you have at least 256 colors available.

Classy icons aren't the only new features that enhance your System 7 desktop. The new Views control panel allows you to customize the font face and size used in icon titles. It also lets you stagger the invisible grid, which automatically arranges icons in a window—very handy when your document titles are long and tend to overlap.
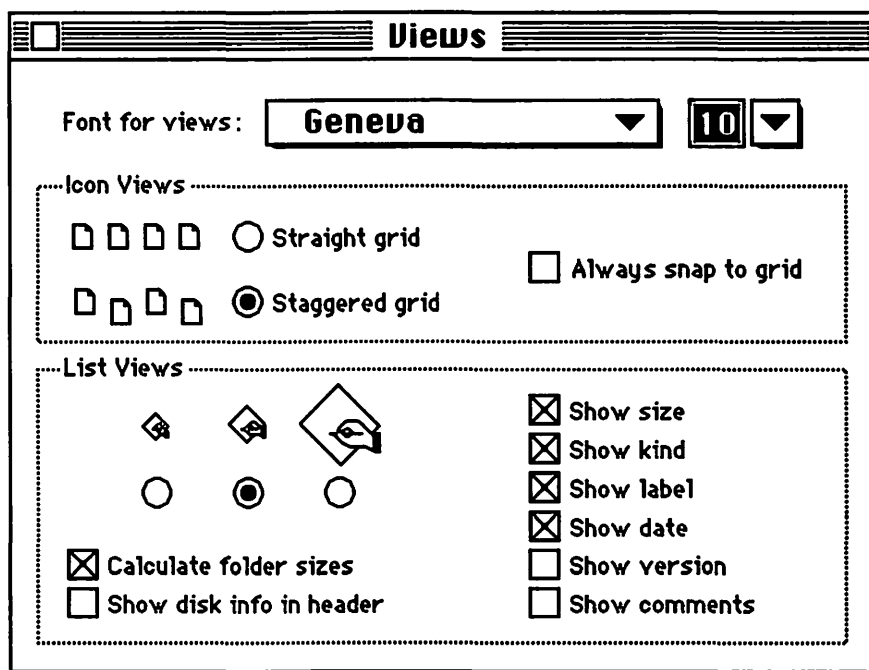
Figure 3-1. Views control panel from System 7

Controlling desktop appearance isn't entirely new. Prior to System 7, there were several utilities that offered similar and in some cases even more capabilities to customize desktop appearance. We'll take a look at three of these—two public-domain and one commercial .

Layout, version 1.9

Michael O'Conner's Layout is a public-domain software package available free (hence public-domain) from computer bulletin boards, user groups, or friends. It offers most of the features found in the new Views control panel, plus some additional user controls not available in System 7. About the only missing Views feature is the ability to calculate and display folder sizes in list view windows.

When you launch Layout, one of the first things to check out is the on-line help function found under the pull-down menu in **About Layout**. There is a full explanation of the numerous functions of the various menu-bar options. We won't try to cover all of these, but we'll highlight a few key features.

The most obvious purpose of Layout is to adjust the alignment and spacing of the icons in windows. There is both a vertical adjustment and a diagonal one. The adjustment of the vertical spacing allows the titles of alternating icons to overlap. In the case of the lower icons, the text has room to extend underneath both of the adjoining icons. Vertical positioning is altered by moving the darkest of the two icons (see Fig. 3-2) as indicated by the directional cursor. Spacing between adjacent icons as well as between rows is controlled by the the lighter icon with the diagonal arrow.
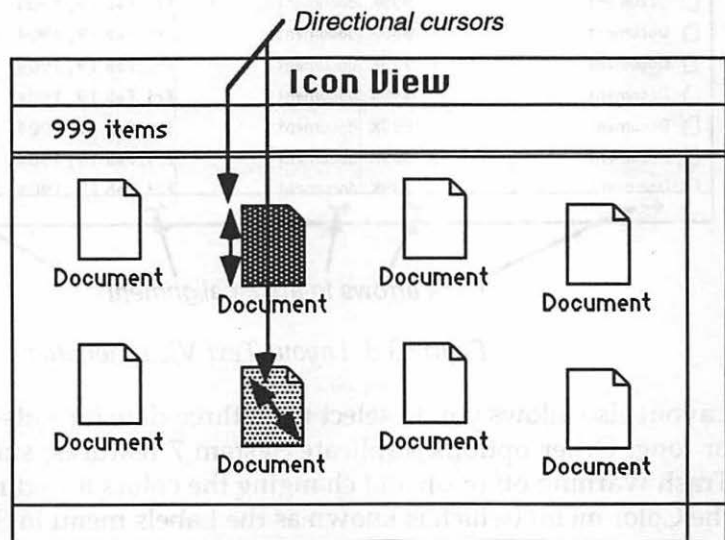
Figure 3-2. Layout Icon View window

Similar spacing adjustments can also be made to View by Small Icon windows. Compared to System 7's new Views control panel, Layout provides more control over icon placement, but might not be quite as simple to operate.

Like the Views control panel, Layout allows you to customize the font and size of type displayed in Finder windows. It also goes a step further allowing you to alter the width of each column in a list view. Simply click and drag the bars between columns, as shown in Fig. 3-3. We wish System 7 had included this handy feature, because long document names can sometimes be truncated, making it impossible to distinguish between several versions of a document when they all begin with the same letters.

Click and drag column widths

Name	Size	Kind	Last Modified	
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM
Document	999K	document	Fri, Feb 19, 1904	2:39 AM

Click arrows to adjust alignment

Figure 3-3. Layout Text Views window

Layout also allows you to select from three date formats—short, medium, or long. Other options duplicate System 7 features, such as turning the Trash Warning off or on and changing the colors found in System 6 under the Color menu (which is known as the Labels menu in System 7).

SunDesk

Another freeware product is SunDesk from nOne corp, an INIT that automatically substitutes colorful icons in place of the normal black-and-white versions. Folders actually look like the standard manila variety with a 3D appearance. SunDesk comes with a file of color icons for some of the most popular applications, utilities, and system folder items. For example, the standard miniature Mac icon used for the System, Finder, etc. is an attractive gray with an aqua-colored screen, including a tiny menu bar across the top.

There are 136 icons included in the SunDesk file, but you don't have to settle for these alone. The instructions that accompany this utility outline a simple procedure using ResEdit (Apple's resource editor) to install your own custom colored icons.
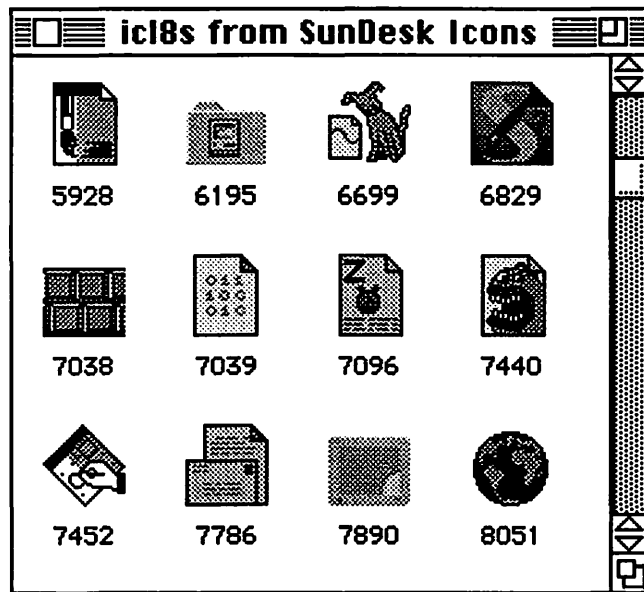
Figure 3-4. ResEdit view of SunDesk color icons

Adding your own icons might be gratifying, but we don't recommend it for the average Mac user, primarily because of the risks inherent in using ResEdit. The resource editor is a powerful utility with the ability to alter (and perhaps corrupt) any file. So if you're tempted to try it, make sure you do it on backup copies of your files.

ClickChange™

While SunDesk provides colorful icons similar to those available in System 7, ClickChange™ can customize the appearance of windows, menus, buttons, and cursors. It can also add custom sounds to various Mac actions, like inserting a disk or emptying the trash.

ClickChange™ is a control panel device offering six basic customizing options, as shown below in Fig. 3-5. Each option opens a list of choices from which you select the appearance or sound that suits your own personal taste. There are a wide variety of options to choose from, including many that provide a 3-D appearance. Some of these even emulate the GUIs of NeXT and Windows. You can also add double arrows to window elevator bars, which can reduce mouse movement.
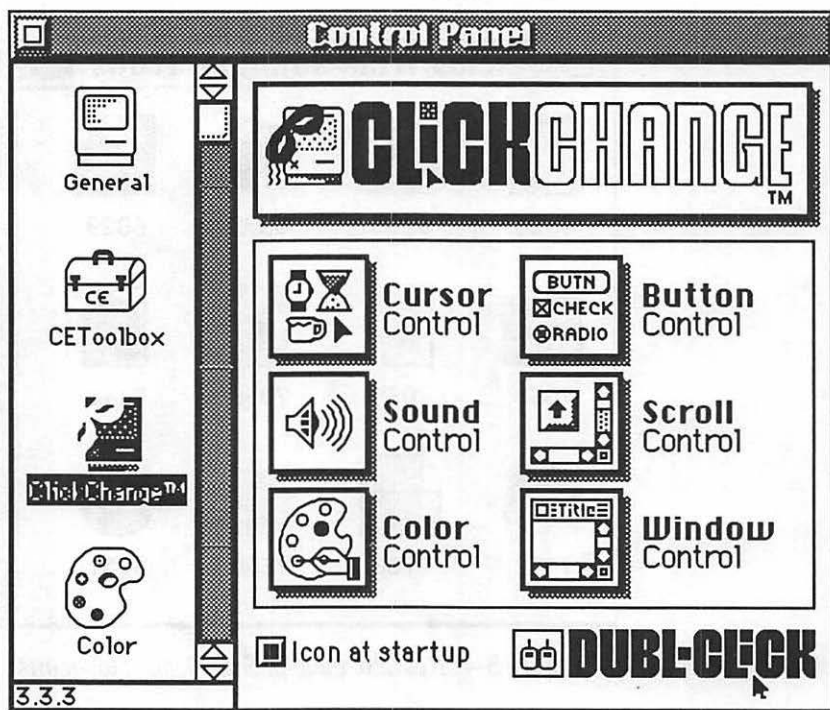
Figure 3-5. ClickChange™ control panel

This is a commercial package published by Dubl-Click, and is typically available for less than $50 through mail-order houses. Version 1.05 is System 7 compatible and actually offers significantly more customizing choices than the new S/7 Finder.

✣ Navigation

Navigating a sea of folders is a pleasure on the AMS 7 with the new **Find** command, aliases, hierarchical list views, and the ability to put any program or document directly into the 🍎 menu. Many of these same advantages can be achieved in System 6 with third-party software—although perhaps not as seamless.
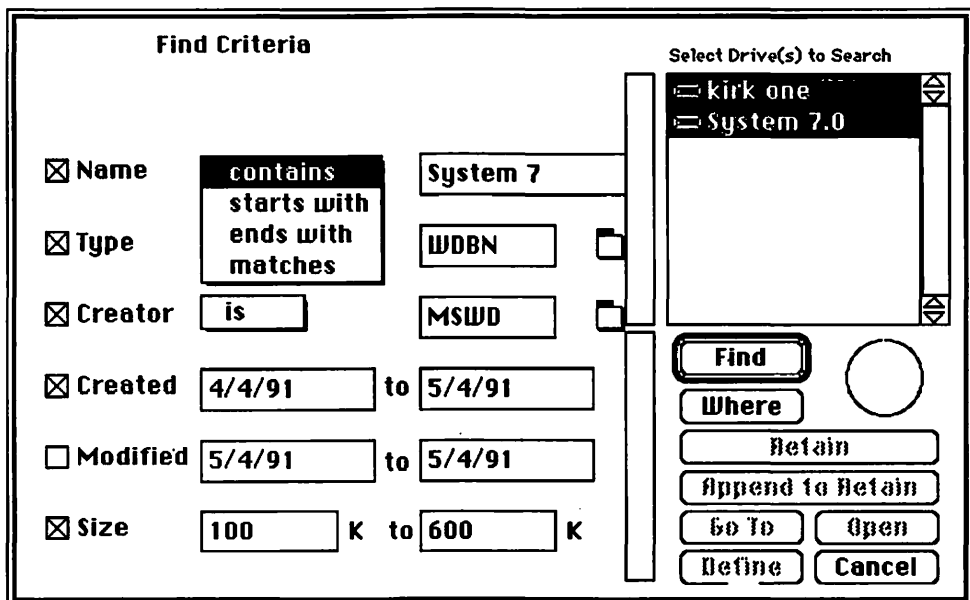
Locating files

Because System 6 and prior versions lacked strong capabilities to locate and access files on a large hard drive, there are several excellent third-party packages available. Two of the best are DiskTop™ and On Location™. Each has certain unique strengths that rival and in some ways even exceed System 7's new **Find** command.

DiskTop™

CE Software's DiskTop™ delivers nearly all of the file-searching features that are new to System 7. You can find files based on their name, size, kind, or date ranges, as illustrated in Fig. 3-6. Parameters can be set individually or in combination to provide an extremely focused quest.

Figure 3-6. DiskTop™ Find criteria window

DiskTop displays a list of files that match the search criteria. To quickly access a file, select the one you want and click the **Go To** button. This automatically opens DiskTop's main window (Fig. 3-7) with the target file highlighted. Opening the file is simple and intuitive—just double-click the selection the same as you would at the desktop. If your goal is to rename, delete, copy, or move the target file, you can do this directly from DiskTop's main window.
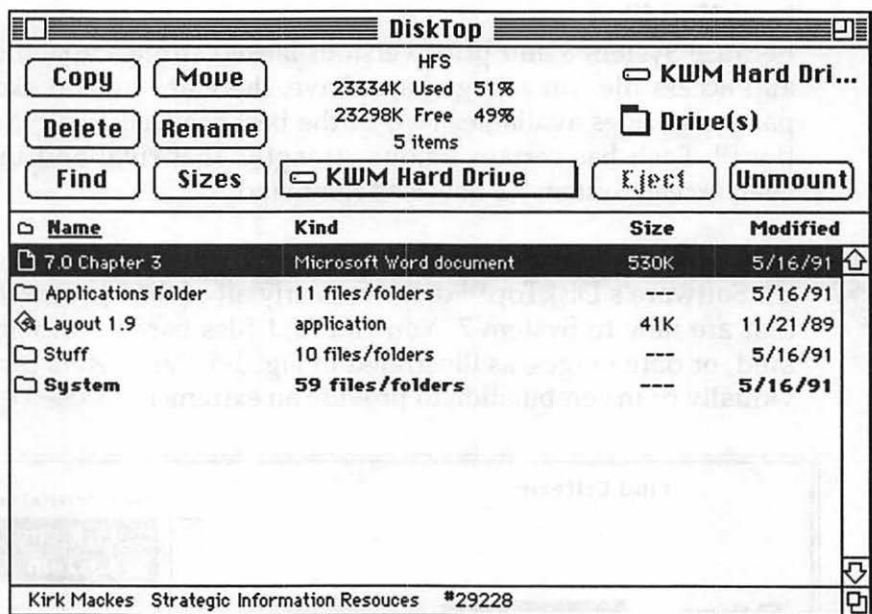
Figure 3-7. DiskTop™ main window

DiskTop is a great tool for searching through a sea of folders, *if* you can remember all or part of a document name. Occasionally, however, you can recall only some tidbit of information that is buried inside the document. Or you might be trying to locate all the documents related to a specific topic. In such situations you need a text search-and-retrieval utility that scans the contents of your files.

Fortunately, CE has included a free copy of Microlytics GOfer 2.0 packaged with DiskTop™. GOfer is a desk accessory that searches through text information *within* documents. It includes a variety of options to narrow your search, as well as several display choices. GOfer offers features not found in System 7, which means you'll continue to benefit from it even after you upgrade from System 6.

On Location™

Another excellent navigational aid that combines text and file name searches is On Location™, published by ON Technology, Inc. This desk accessory is incredibly fast, locating the targets even as you type in the filename or search word. To achieve this speed, On Location goes through an initial process that scans your files and builds an index. The index is used during a search to locate and display files almost instantly.

The initial indexing process can take several minutes if you elect a full text scan of all your documents. Fortunately, this is a one-time investment. Changes to the index are maintained in the background when your Mac isn't busy with other tasks. Nonetheless, On Location allows you to select the type of index you'd like it to maintain, as shown in Fig. 3-8. Choosing **Filenames only** will minimize the indexing tasks, but disables the full text searching capabilities.
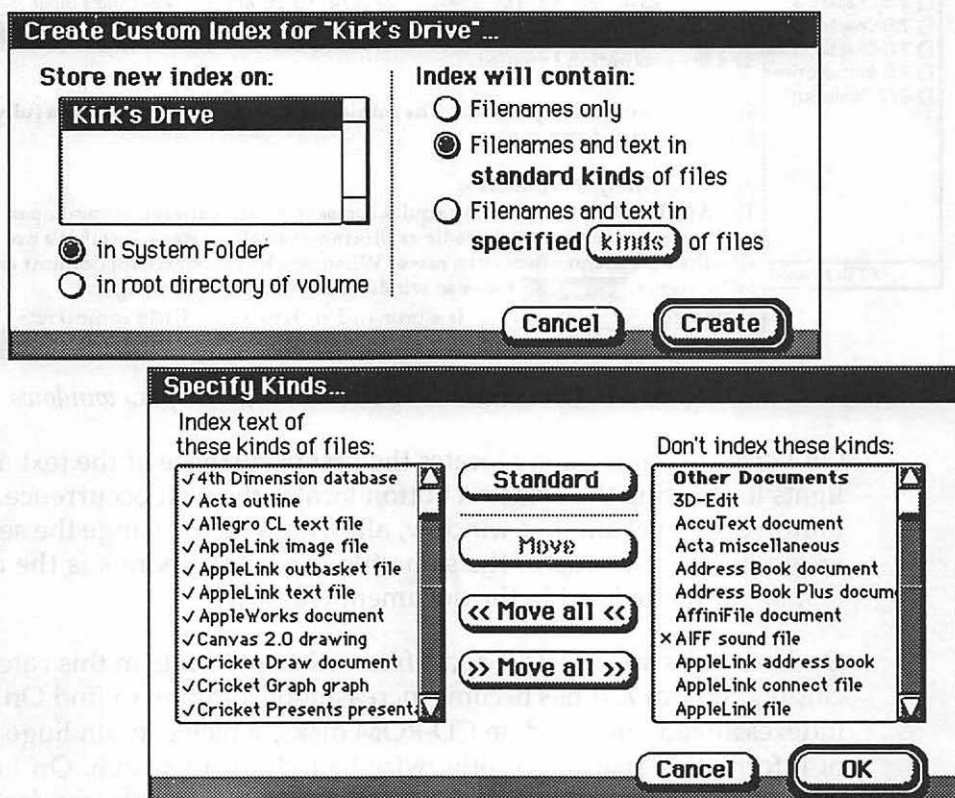
Figure 3-8. On Location™ indexing windows

Searching for a file or text within a document is fast and intuitive. When you launch On Location's desk accessory, it displays a list view (see Fig. 3-9). The small scroll box in the upper left corner allows you to limit your search to a specific disk drive or folder. As you key in the search text, On Location instantly displays all documents that match the criteria. Double-clicking on a particular file opens a second window, which displays the actual text within the document.
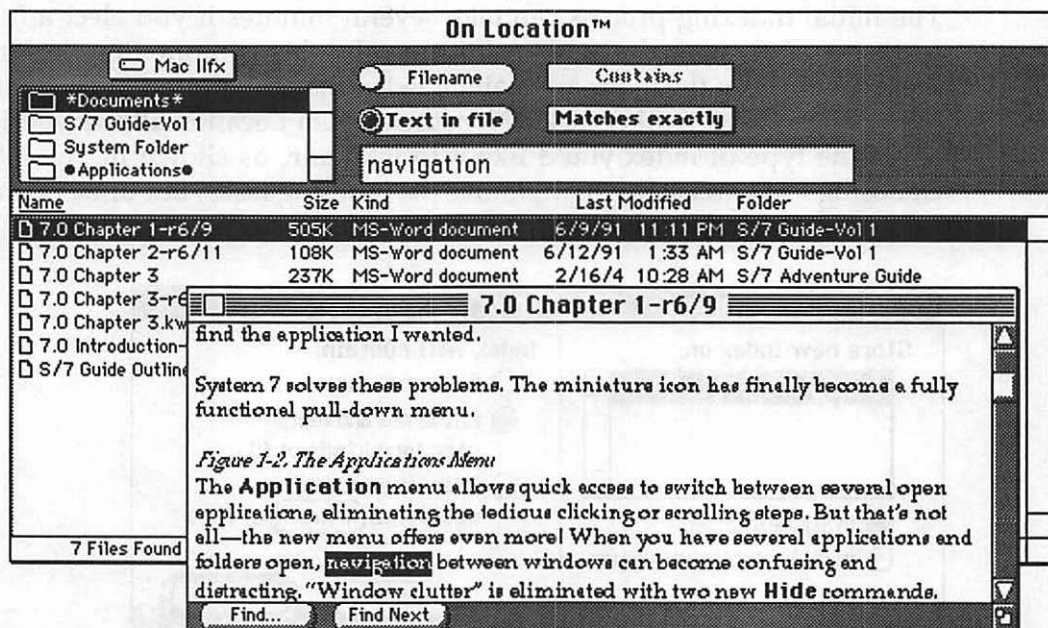
Figure 3-9. On Location™ Search and text display windows

On Location immediately locates the first occurrence of the text and highlights it. Pressing the **Find Next** button locates the next occurrence. The **Find** button opens yet another window, allowing you to change the search and locate different words in the same file. An added bonus is the ability to display formatted text in the document window.

On Location's speed sets it apart from other products in this category, including System 7. It has become increasingly common to find On Location indexes already installed on CD-ROM disks, which contain huge amounts of information that might otherwise be tedious to search. On Location's speed and ability to search for text within documents are features we would like to see in future releases of System 7.

Launch menus

System 7's **Find** command and other search utilities work well in locating lost files. However, a more direct method is better for launching frequently used programs and documents. For quick access, System 7 allows any item to be included in the menu. With System 6, only DAs can be installed in the menu, unless a third-party utility is used. Again, there are several excellent products available that provide capabilities similar to System 7. Two of our favorites are DT Launch™ and HandOff™ II.

DT Launch™

Another bonus included with CE Software's DiskTop™ package is DT Launch. Selecting **DT Launch** from the menu reveals a secondary menu to the right, which can contain any number of applications and documents. Simply drag down and release the mouse button to launch a selected item.

	File Edit View Special
About the Finder...	
DT Launch ▶	***Other...***
DiskTop Find	**Canvas™ 2.1**
	Microsoft Word
Suitcase II ⌘K	***7.0 Chapter 1***
Alarm Clock	***7.0 Chapter 2***
Chooser	
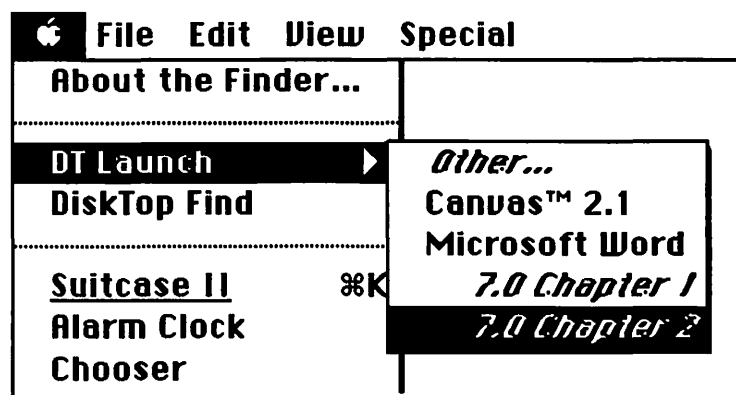
Figure 3-10. DT Launch hierarchical menu

Installing new items in the DT Launch menu is simple and easy. Select **DT Launch** (without highlighting anything in the adjacent menu). This opens a window where any application or document can be added. As with System 7, the change takes effect immediately without the need to reboot.

While DT Launch can install any item under the menu, its hierarchical approach differs slightly from System 7, where items are included directly in the alphabetical listing. For some this might be an advantage, because items can be reached more quickly with less mouse movement.

HandOff™ II

Fred Hollander's HandOff II™ takes a slightly different approach to launching an application or document. Instead of including items under the menu, HandOff adds a separate menu, which can be accessed from a small icon in either corner of the menu bar. You can also open a pop-up version anywhere on the screen by pressing a special combination of keys, which are user defined in HandOff's control panel.

```
 About HandOff™ II...

 Canvas™ 2.1        ⌘1     List of Open
 DA Handler         ⌘2     Applications
 Finder             ⌘3
 ✓Microsoft Word    ⌘4     (Similar to System 7's
                            Application Menu)

 Select Application ...
 Canvas™ 2.1
 Microsoft Word       ▶    7.0 Chapter 1
                           7.0 Chapter 2
       Documents           7.0 Chapter 3
       available for       S/7 Guide Outline
       launching           Other...
```
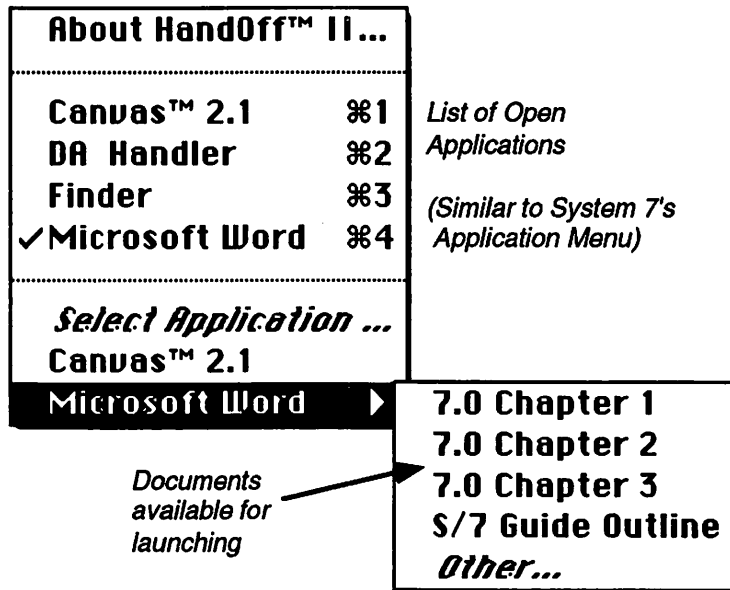
Figure 3-11. HandOff™ II hierarchical menu

The top portion of the HandOff menu is very similar to System 7's new Application menu, allowing quick access to any program currently active under MultiFinder. Frequently used programs and documents can be added to the lower portion of the menu through the HandOff control panel. Selecting an entry from the lower portion launches the program and optionally opens an associated document.

HandOff includes additional features not found in DT Launch or System 7. Adjustments to sound level and monitor characteristics can be attached to any item in the HandOff menu. This feature is especially handy on a color Mac when switching to HyperCard®, which works best in black-and-white mode, or to certain games that require a specific color depth.

The same is true for sound levels, which can vary in intensity between applications.

In Fig. 3-12 you can see how simple it is to modify the speaker volume or color depth when adding an application or document to the menu list.
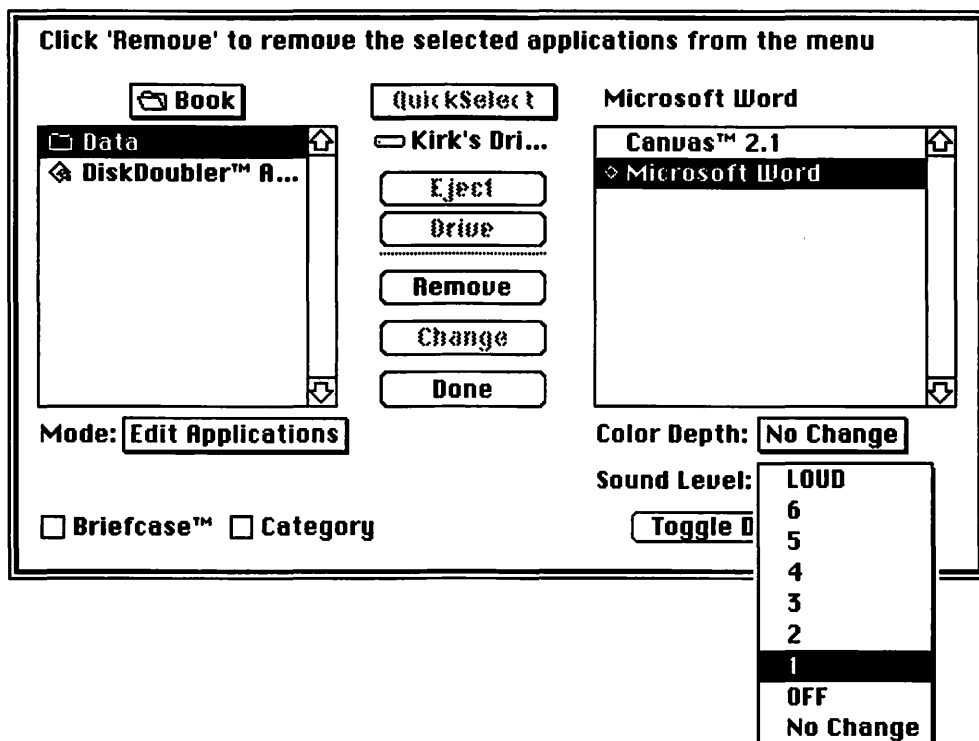
Figure 3-12. HandOff™ II install application window

Another useful HandOff feature is the ability to designate a document to be opened by an application other than the one that created it. Word processors, spreadsheets, and paint and draw programs can generally import documents created by competing products. This can be useful when you receive a document from someone else and don't have the original application to open it. System 7 offers a similar capability as described in chapter 1—dragging a document over an application will automatically open it if the program is able to read the file.

POWERicons™

System 7 introduces the concept of *aliases*, which provide an economical way to access an item from many different locations. While there really are no fully equivalent utilities available to run with System 6, one package does offer some alias-like features.

POWERicons™ by Magic Software creates small 5K files that represent either an application program or groups of documents. Each miniature file is actually an application, which launches the associated program or documents.

Creating a POWERicon file isn't as simple as the **Make Alias** command in System 7, but it does accomplish a similar task. Launching the POWERicons program opens a control window, as illustrated below in Fig. 3-13.
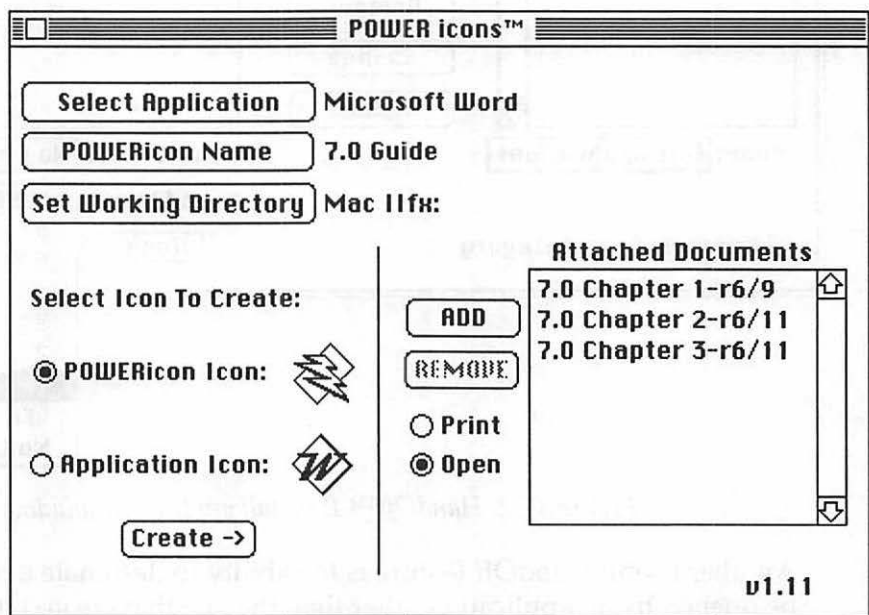
Figure 3-13. POWERicons screen

Creating an alias of an application is a four-step process, following the series of buttons shown in Fig. 3-13. After you've selected the application, given the alias a name, and indicated where you want it saved, clicking the **Create->** button automatically generates a new POWERicon.

To create a POWERicon representing a group of documents, one step is added to the procedure. Before clicking **Create,** use the **ADD** button to include one or more documents.

Application aliases work much the same as in System 7, except they lack *italic* titles, which would make them easier to distinguish from the real thing.
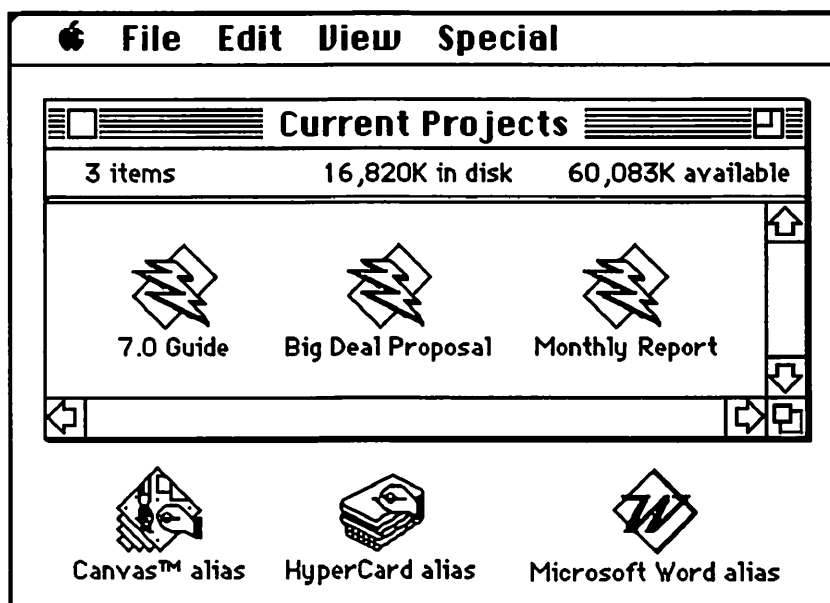
Figure 3-14. POWERicons on the desktop

As with System 7, POWERicons allow you to keep original programs stored inside a folder, while the alias is within easy reach right on the desktop. This is a handy feature for many programs, which need to be kept in the same folder with special items like dictionaries or help files.

POWERicons' ability to group documents is nice when you're working on several related files, such as chapters in a book or multiple exhibits in a proposal. Double-clicking the POWERicon opens all of the specified documents, as long as they are created by the same application. Another possibility is to combine POWERicons with one of the launch utilities covered earlier. Selecting a POWERicon from the DT Launch or HandOff menus would provide rapid access while reducing desktop clutter.

Managing fonts, DAs, and sounds

One of System 7's goals was to make the management of fonts, desk accessories, and sounds much more intuitive. Apple's engineers had learned that many Mac users don't really understand the Font/DA Mover, so it was completely eliminated in System 7. Moreover, the proliferation of fonts, DAs, and sounds available today have far exceeded the expectations of the original Mac design team back in 1984. Because some of the changes introduced in System 7 have been long overdue, there is a wealth of third-party software that has been produced to ease the burdens of managing the Mac's standard resources.

Two traditional favorites are Fifth Generation Systems' Suitcase II and ALSoft's Master Juggler™. Both of these utilities allow you to add or delete access to fonts, DAs, and sounds without altering the system file and without Apple's Font/DA Mover. Changes are easier and faster to accomplish and, because they don't alter the system file, it remains smaller and less prone to corruption. These utilities also provide compression techniques to reduce the amount of disk space consumed by your collection of fonts and sounds.

Both Master Juggler and Suitcase II accomplish much the same thing. Master Juggler's interface is a little more intuitive, but Fifth Generation has upgraded Suitcase II to work with System 7. Because of the similarities in function, we've described only one of these utilities, but both are excellent values.

Suitcase™ II

Steve Brecher's Suitcase™ II is an INIT program you install by dragging its icon into the system folder of your startup disk. After restarting your Mac, the Suitcase II option appears in the menu. Selecting this option opens the main window, which displays a list of currently available DAs, fonts, F-keys, or sounds (Fig. 3-15).

Each list combines items that are installed in the System file along with those loaded through Suitcase II. Additional items can be added through a series of windows (see Fig. 3-16). Once items have been made active, they appear in the main window, where sounds can be played and font samples can be displayed in various sizes and styles.
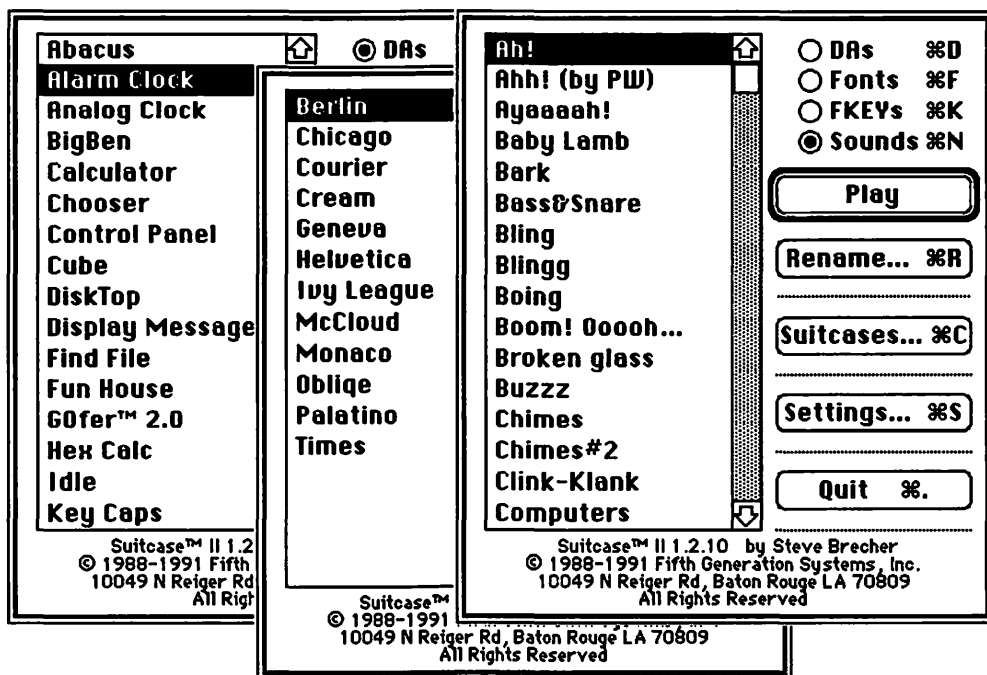
Figure 3-15. Suitcase™ II main windows
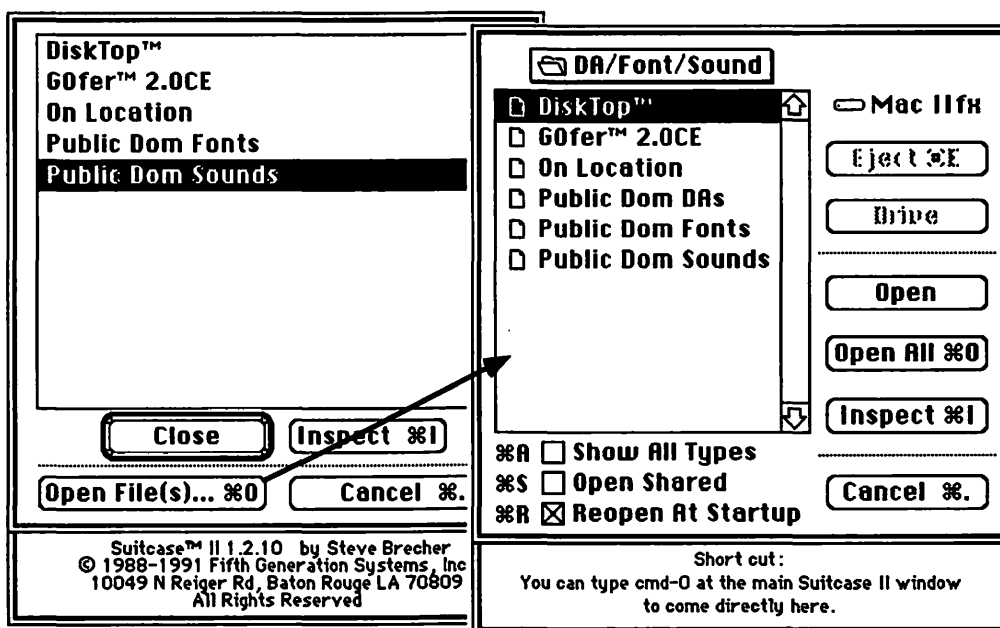
Figure 3-16. Suitcase™ II active items and open file(s) windows

One of the best features of a utility like Suitcase II or Master Juggler is the ability to display font samples, as shown in Fig. 3-17. With the vast number of font faces available today, it's easy to forget exactly what a font looks like.
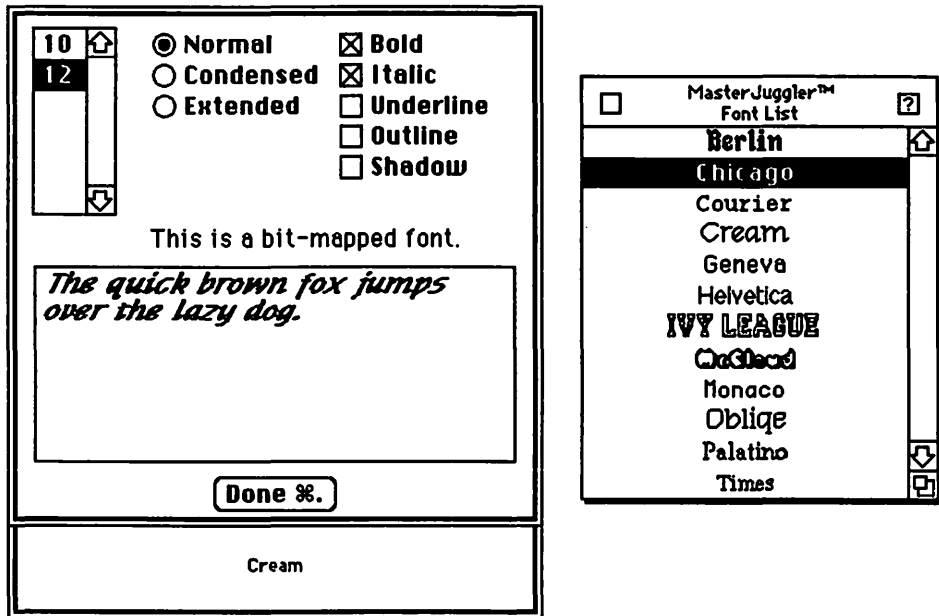
Figure 3-17. Font samples from both Suitcase™ II and Master Juggler™

FontShow™ is a Master Juggler feature that allows you to type in a phrase and display samples of each installed font face, including all its variations (bold, italic, etc.).

By comparison, System 7 offers a more intuitive method of displaying font faces, but it lacks the flexibility of these utilities. Double-clicking on any font icon (bit-mapped or TrueType™) opens a window displaying a sample of the font. TrueType™ fonts are displayed in three standard sizes—9, 12, and 18 point—while bit-mapped fonts are shown in the size of the font file.

TrueType™ allows you to reduce the amount of disk space consumed by fonts, because it eliminates the need to keep multiple sizes of the bit-mapped versions. Suitcase II and Master Juggler offer special utilities that compress bit-mapped fonts, saving from 25 to 60%. When you open a font, the decompressed version is automatically stored in memory.

Outline fonts

With TrueType™ included in System 7, outline fonts have become the new standard of quality for the Macintosh. (See chapter 1 for an overview and comparison with bit-mapped fonts). But before TrueType was introduced, Adobe offered a similar technology, which enhances both screen images and output to non-Postscript printers.

While both TrueType™ and Adobe Type Manager® (ATM) produce similar results, there are differences in how each is implemented. ATM requires two types of files (bit-mapped and outline), while TrueType needs only the outline version to function. Moreover, System 7 includes some TrueType fonts at no additional cost.

TrueType™

System 6 users need not despair over the lack of TrueType™. Apple has introduced an INIT that enables TrueType capabilities with certain versions of System 6—officially supported in 6.0.7 and 6.0.8; unofficially reported to work with 6.0.5 as well.

The principle dilemma in switching to TrueType is the limited number of fonts initially available from Apple. With the first release of System 7, Apple included some, but not all of the usual LaserWriter fonts, as shown below in Table 3-1:

Table 3-1. Fonts included with initial System 7 release

TrueType Fonts included with System 7	Bit-mapped only (TrueType promised)
Chicago	Avant Garde
Courier (plain, bold)	Bookman
Geneva	Helvetica Narrow
Helvetica (plain, bold)	New Century Schoolbook
Monoco	Palatino
New York	Zapf Chancery
Symbol	Zapf Dingbats
Times (plain, bold, italic, bold italic)	

TrueType versions of the remaining LaserWriter font set have been promised for the future, and could be available by the time you're reading this. Of course, fonts other than the basic Apple set will need to be purchased from a third party. Several font publishers have already announced new TrueType versions of their type families, and many more can be expected.

If you already own a set of Postscript outline fonts, there are two utilities that can convert them to TrueType. Altsys' Metamorphosis™ Professional will convert type-1 and type-3 fonts to TrueType. Ares Software also offers a utility called FontMonger™, which will perform similar conversions. A full discussion of these utilities and other TrueType issues is included in chapter 7.

a Adobe Type Manager®

Adobe Type Manager® (ATM) is in the form of an INIT and control panel device that are placed in the System Folder. In addition, ATM requires a set of type-1 outline fonts along with at least one size of the corresponding bit-mapped font file for screen display.
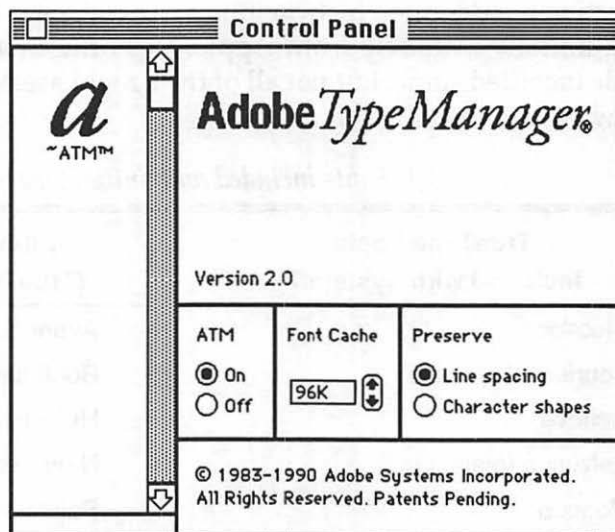
Figure 3-18. Adobe Type Manager control panel

ATM operation is essentially transparent, once you turn it on in the control panel device (see Fig. 3-18) and restart your Mac. The first time a font family is used in an application, you might notice a slight delay while

ATM loads in the outlines and draws the character images. But subsequent use is virtually instantaneous.

The basic ATM package includes four font families—Courier, Times, Helvetica, and Symbol, and typically sells for less than $60. For about $110, you can get the ATM Plus Pack, which includes all of the standard LaserWriter fonts. However, neither of these packages has outline files for some of the Mac's basic system fonts—Chicago, Geneva, Monoco, or New York, which are available with Apple's TrueType.

Both ATM and TrueType use mathematical formulas to create characters. When these formulas are applied to screen images, results are limited by the 72-dpi resolution of the Mac's display. Which means that you'll notice the most improvement in image quality at larger font sizes. At smaller sizes (9, 10, or 12 points), bit-mapped characters might look even better than their outline equivalents, because they've been designed for optimal appearance at that size. For this reason, you might want to keep bit-mapped versions of small type sizes along with the outline files for larger type.

When ATM and TrueType generate output to a printer, the quality is again determined by the resolution of the device. On an ImageWriter, the maximum resolution is 144 x 160 dpi, which means characters won't look quite as good as they do on a 300-dpi laser printer. Nonetheless, you'll still get better looking output on an ImageWriter using ATM or TrueType than if you were using bit-mapped fonts.

Because both of these technologies are available to System 6 users, the choice is mostly a matter of budget and timing. If you already have ATM and a collection of type-1 fonts, you probably won't gain much by switching to TrueType—unless you really need high quality from one of the Mac's heretofore bit-mapped fonts (Chicago, Geneva, Monoco, or New York).

On the other hand, if you're just getting started with outline fonts you might want to seriously consider TrueType. Any investment you make in TrueType fonts is almost certain to be maintained when you finally upgrade to System 7. Moreover, TrueType fonts require less disk space and are therefore somewhat more economical than ATM. In any case, both TrueType and ATM can be used together with System 7, which means you won't lose with either investment.

Virtual memory

When you double-click on an application to launch it, the program is read from your disk into the Mac's main memory, which is called RAM—short for random-access memory. Part of the RAM in your Mac is already in use by the System and Finder, so the amount of main memory available for applications is less than the total RAM installed. To find out how much free memory you have available, pull down the menu and select **About the Finder** (or **About this Macintosh** if you're running under System 7). A window will appear (see Fig. 3-19) showing the Total Memory (amount of RAM installed in your Mac) and the Largest Unused Block of free memory.

```
┌──────────────── About the Macintosh® Finder™ ════════════════┐
│                                                              │
│   Finder:   6.1.7          Larry, John, Steve, and Bruce     │
│   System:   6.0.7          Apple Computer, Inc. 1983-90       │
│                                                              │
│   Total Memory:   2,048K   Largest Unused Block:  1,510K     │
│                                                              │
│   Finder              160K  [▒▒▒▒▒░]                         │
│   System              378K  [▒▒▒▒▒▒▒▒▒░]                     │
│                                                              │
└──────────────────────────────────────────────────────────────┘
```
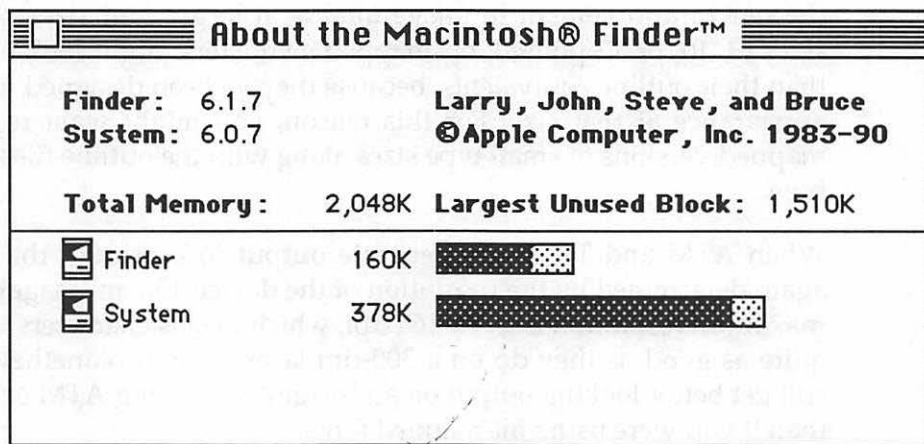
Figure 3-19. About the Finder

The amount of free memory determines how big an application you can launch or how many programs you can run concurrently when using MultiFinder. If you have a basic Macintosh, it probably includes only 1Mb of main memory, which doesn't leave a lot of room for other programs after the System and Finder take their share. When you try to launch a big program or several smaller ones, you're likely to get a message indicating you're out of memory and suggesting you quit some applications or turn off some INITs.

The simple answer to this dilemma is to add more RAM. As we discussed in earlier chapters, RAM has become relatively inexpensive (under $60 per Mb), and is easy to install in Mac II models. However, when System 7 was first being considered, RAM prices were much higher (perhaps $200

per Mb), and using hard disk space as a temporary substitute looked like a great idea. Thus was born the notion of including virtual memory (VM) as a key feature in System 7. The same idea was shared by some folks at Connectix, who thought VM should be available to System 6 users as well.

Virtual memory is the ability to extend the main (RAM) memory of your Mac by using some of your hard disk space as temporary storage. If VM is turned on, parts of programs that aren't in current use are simply written back onto your hard drive. When these program pieces are needed, they are automatically loaded back into main memory. It sounds great and there's only one catch—reading and writing to disk is a lot slower than getting these pieces directly from main memory. In some cases you might not notice much difference, but if you're running a graphics program that's drawing a fancy screen image you might want to take a coffee break while you wait.

That's not to say that VM isn't beneficial when used for an occasional memory shortage, but as we've advised earlier—don't count on VM as a normal part of your daily routine. Invest a few dollars and upgrade to at least 2Mb (or more if your budget can handle it). You'll be prepared for System 7 and you'll enjoy your daily routine more.

Unfortunately, not every Mac can run VM even on an occasional basis—it requires at least a 68020 CPU with a PMMU chip or a 68030-based Mac such as an SE/30, IIx, IIcx, IIci, or IIfx. Other Macs would need a 68030 accelerator to run VM. If your Mac is VM capable and you'd like to add this feature while still running System 6, then you'll be interested in the following software product.

Virtual

Connectix Corporation has offered Virtual since May 1990, and it is widely accepted as a standard add-on for Macintosh acceleration products. In fact, many manufacturers of 68030 accelerators include Virtual with their product.

Virtual has been thoroughly tested, debugged, and enhanced since its introduction. Connectix even suggests that Virtual will perform better than Apple's System 7 implementation of VM.

Installing Virtual is simply a matter of copying the control panel device into the System Folder of your startup disk and rebooting your Mac. Open the Virtual control panel and select the amount of VM using the horizontal scroll bar as shown in Fig. 3-20. If your Mac has 32-bit dirty ROMs, you'll be subject to the same limitations described earlier in chapter 2 (14Mb or less).
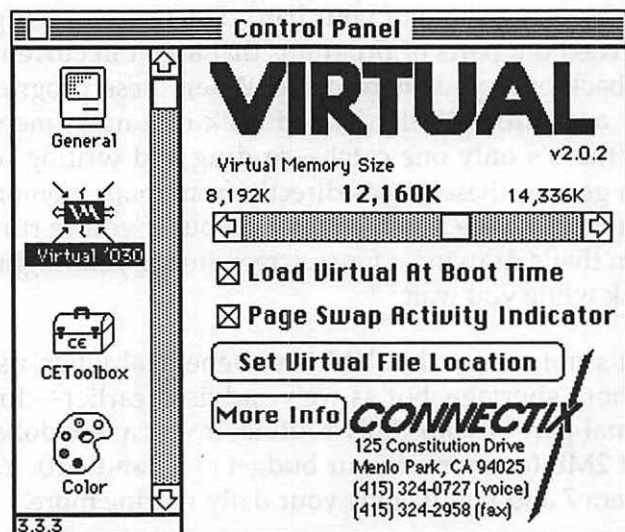
Figure 3-20. Virtual control panel window

Perhaps more important, however, is the condition of your hard drive. As files are written and deleted from your hard drive, the unused portions become scattered over the disk and are no longer contiguous—that is, in one continuous chunk. This condition is called fragmentation, and must be corrected for Virtual to function properly. Virtual warns you of this condition and suggests that you utilize a disk defragmentation utility to eliminate this problem. Several good tune-up programs are available and are often included with utility packages such as Symantec's SUM II or Norton Utilities.

When the disk is ready, simply indicate the amount of virtual memory you want by adjusting the horizontal elevator bar to the appropriate level. A restart later and you're in the land of virtual memory. When used for the occasional "out of memory" condition, VM can be a real benefit, but don't forget the limitations of slower operation, disk space requirements, and disk condition.

File sharing on a network

With System 7, network file sharing becomes an integral part of the Mac's operating system and is therefore available to everyone. You could call it AppleShare for the masses. Widespread availability of network file sharing opens a whole new realm of possibilities, many of which are centered on the concept of work group computing.

The idea in its simplest form is based on the observation that people tend to work together in relatively small groups, often sharing tasks on one or more projects. Work groups are formed for a specific project, like designing a new product or producing a marketing campaign. While a particular work group might be centered in one department, it could also require participation from selected people outside the core department. During the course of the project many documents are often generated by individuals and passed around for review, comment, and change until agreement is reached.

The traditional business approach produces paper copies of these documents, often generated from personal or mainframe computers. Paper is circulated throughout the process, resulting in frequent delays and sometimes lost documents. For many years, computers have been touted as a solution to this paper chase, with extravagant claims of a "paperless" office. And for years, this claim has remained an empty promise. In fact, the proliferation of personal computers has undoubtedly added more to the volume of paper flow than it has contributed to reducing it—until now.

The missing ingredient in the "paperless" office has been the ability to collaborate *electronically*. That is, for the work group to actively share individual contributions without the need to first convert everything to paper. Consider how much paper could be eliminated if all drafts were electronic and only final documents were printed. Electronic mail helps by transmitting documents quickly and without paper. But the primary benefits come with the ability for everyone to work on the same documents concurrently.

Universal file sharing is the foundation component needed to make this vision a reality. Prior to System 7, file sharing typically required a Mac or some other computer dedicated to the task—an expensive and somewhat technically challenging approach.

However, two third-party products offer file sharing that does not require a dedicated computer (file server). TOPS is a software product that enables both Macs and DOS PCs to share files over a network. While TOPS has been available for several years, DataClub is a more recently introduced product and closely approximates System 7's file sharing interface. Both of these products also operate under System 6.

DataClub™

On the surface, DataClub™, from International Business Software, looks very similar to System 7's universal AppleShare, but operates a little different under the covers. DataClub requires a network administrator, who registers users and establishes certain security practices. Once a user is registered with the DataClub Admin function, access is achieved by a simple three-step process.

First open the Chooser from the menu, select the **AppleShare** icon, and highlight a file server from the upper right scroll box (Fig. 3-21). Clicking the **OK** button confirms your selection and moves on to the server connect window.
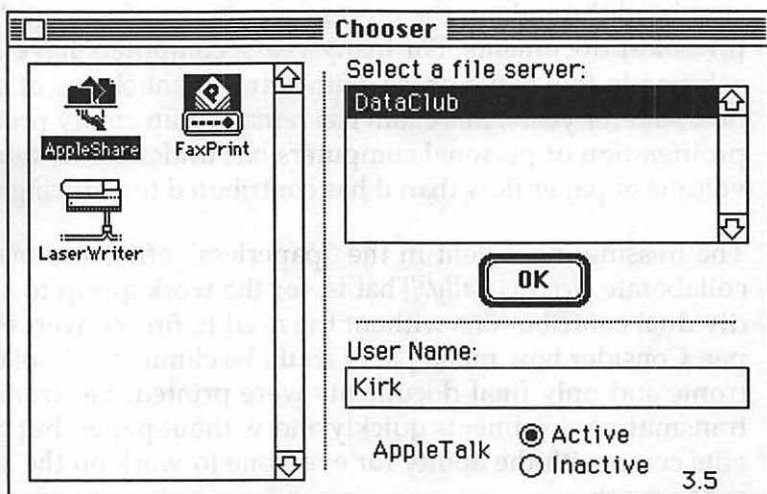
Figure 3-21. Selecting a file server from the Chooser window

In traditional computer terms this is the *logon* window shown in Fig. 3-22, where a user enters his name and secret password. This process determines which files a user is authorized to access and what privileges are available—such as viewing folders or files, and making changes. The user

who creates a folder or file is designated as the owner and determines who is allowed to view and change his files.
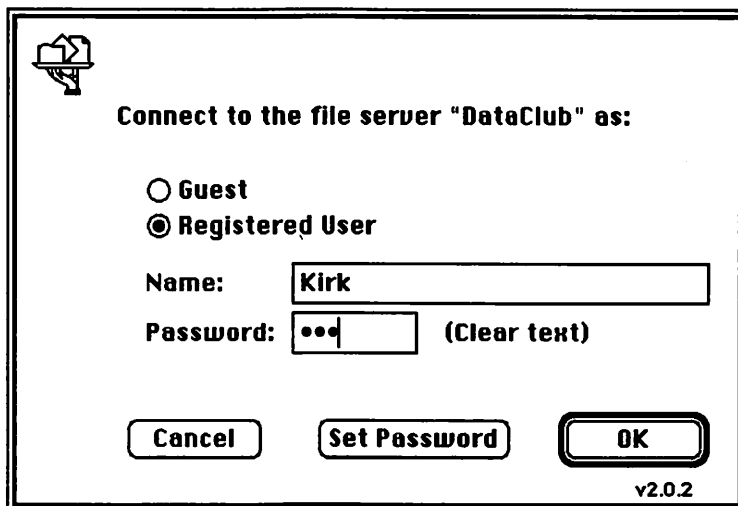
Figure 3-22. DataClub server access or logon window

Once the password is validated and access is granted, a list of server volumes is displayed, as shown in Fig. 3-23. Each volume represents a portion of another user's disk files—typically a folder containing related files.
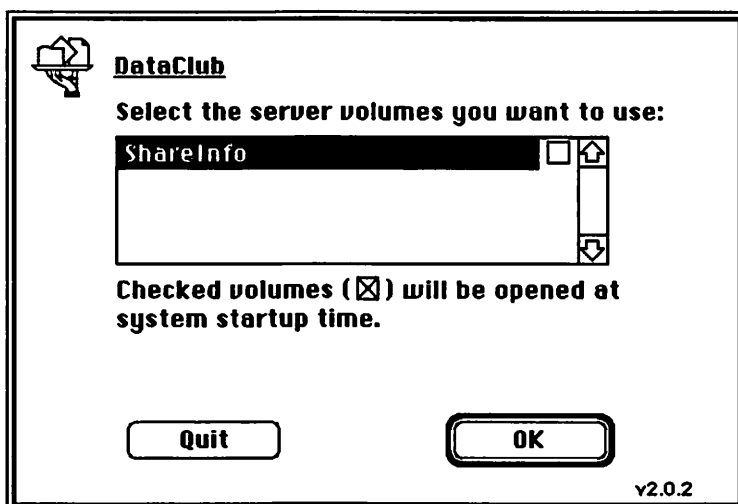
Figure 3-23. Volume selection window

Consistent with the concept of work groups and in order to make it easier to grant access privileges, DataClub includes the ability to set up groups and populate them with registered users (see Fig. 3-24).
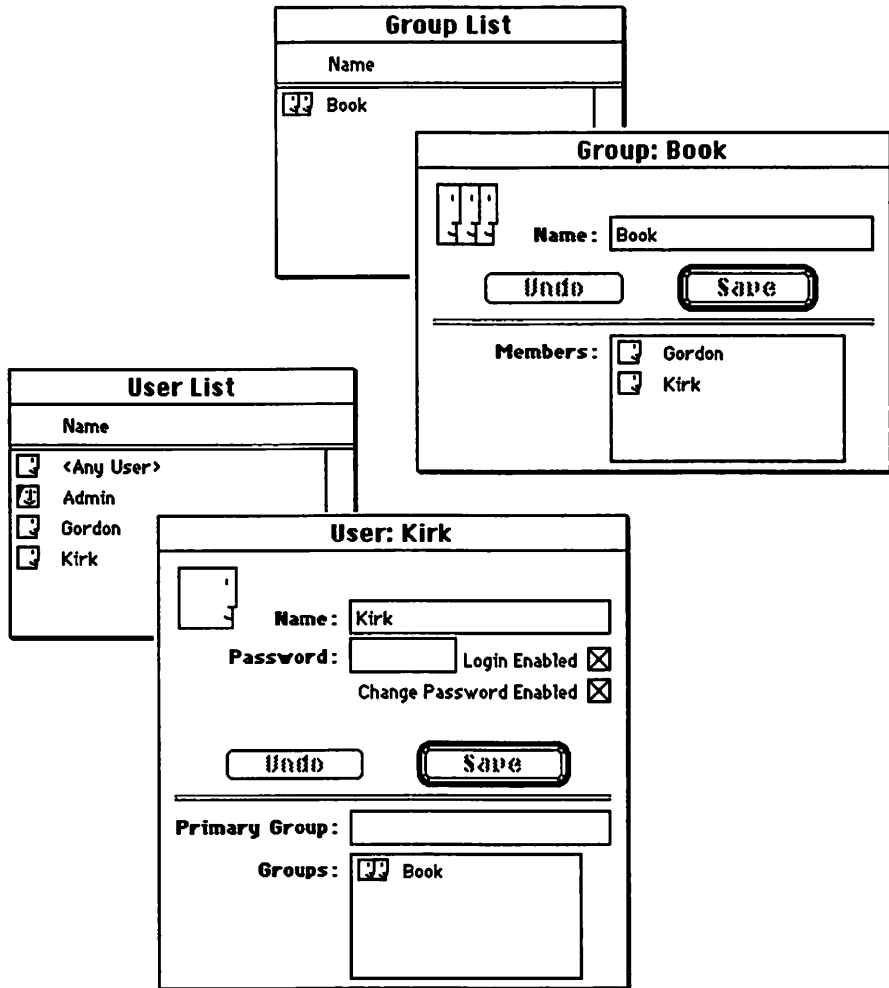
Figure 3-24. Setting up DataClub groups

This process is virtually identical to System 7's, except that DataClub groups are set up by the network administrator. In contrast, Apple's philosophy of personal computing emphasizes empowering individuals rather than dependency on a central authority. Consequently System 7's file sharing allows each user to create his own groups and to determine who belongs to them.

Summary

In chapter 3 we've examined a number of software packages and utilities that offer many of System 7's capabilities, but do not require a change from System 6. In fact, some of these packages provide additional features not found in AMS 7, which suggests they could continue to live on in some System 7 compatible version.

What's missing?
If all of these features can be achieved in System 6, then what's not available that System 7 delivers? The simple answer is seamless integration at a bargain price. Even though some of the packages we've reviewed are public-domain or shareware, many are commercial products with a price.

Table 3-2. Products reviewed in chapter 3

Product category	Product name	Publisher	Approx. street price
Desktop enhancers	Layout 1.9	Michael O'Conner	Free
	SunDesk	nOne corp.	Free
	ClickChange	Dubl-Click	$41
File locators	DiskTop (Incl: - DT Launch - GOfer 2.0)	CE Software	$70
	On Location	ON Technology	$75
Menu launchers	DT Launch	CE Software	Incl. above
	HandOff II	Connectix	$50
Aliases	POWERicons	Magic Software	$40
Font/DA/sound managers	Suitcase II	Fifth Generation Systems	$50
	Master Juggler	ALSoft	$57
Outline fonts	TrueType	Apple	
	ATM	Adobe	$55
Virtual memory	Virtual	Connectix	$115
Network file sharing	DataClub	International Business Software	$175 for 3-user pkg

The combined street price of these packages is over $500, compared to Apple's System 7, which lists for under $100. To be fair, however, that doesn't include what you might have to add to upgrade your hardware and software to run S/ 7.

But beyond the products we've reviewed, some System 7 features simply aren't available in any other form. Apple's new Edition Manager, which supports Publish and Subscribe, is the most obvious. As software publishers begin to release System 7 savvy versions, some new features probably won't be available if you're still running System 6. Initially, this could be just a few features that perhaps aren't essential to your daily routine. However, as creative programmers find more and more ways to incorporate System 7 features, the desire and need to upgrade will become stronger. Which leads to the bottom line.

The bottom line—postponing the inevitable?

A decision to delay boarding the AMS 7 might be a reasonable approach for some Mac users who are facing software compatibility or budget hurdles. Eventually, however, the benefits will likely outweigh the risks and costs—even for the most conservative Mac users.

Software development on the Macintosh is highly competitive and frequently characterized as a "features race." System 7 opens up a whole new playing field for software publishers, most of whom will undoubtedly race to market with System 7 savvy programs. As we discussed in the Introduction, one of Apple's key goals for System 7 was to deliver new programming capabilities so that software developers could enhance and expand the utility of their products. Some of these enhancements are bound to appeal to a wide audience, especially when they deliver real value to the user. So at some point you'll probably covet a new software product or feature and discover it's available only when you upgrade to System 7. That's when you'll be joining your friends on the AMS 7.

Welcome aboard!

Section II

Smooth Sailing
on the AMS 7

In section I we looked through a travel brochure of System 7's new features and examined what you'll need to outfit your Mac in preparation for a 7 seas cruise. We even shared some tips on how to make the most of your stay with System 6 until you're ready for boarding the AMS 7.

Now it's time for final departure and the trip you've been waiting for. In chapter 4 we'll cover boarding basics—where to get a copy of System 7 and how to install it on your Mac. We'll also conduct a lifeboat drill, so you'll be able to go back to System 6 if the need arises. Once on board the AMS 7 you're ready for a firsthand tour of the ship. Chapter 5 takes a look at the new desktop navigation gear with some savvy tips on steering a safe course through uncharted waters. When you're comfortable with the view from the bridge, we'll go below decks in chapter 6 for a close look at the System Folder. System 7 mechanics are easier than ever, but there's some more tips you'll want to know to keep everything running smoothly. Finally, in chapter 7 we'll share some of the ship's secrets about TrueType™ and how it makes this a "fontastic" voyage.

Welcome aboard!

Installation cram course—
A suitcase packed with cruiseware

The System file has a new icon—no longer a miniature "compact" Mac, it's been transformed into a suitcase packed with the latest cruiseware.

Version 6
and earlier ⟶ Version 7
System   System
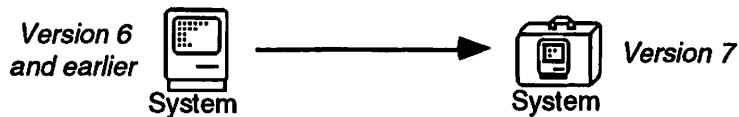
As you've seen in chapter 1's travel brochure, there's a lot of new features packed in this suitcase. In this chapter we'll help you plan a smooth transition to System 7 and show you how to install it on your Mac. We'll begin with some basics on system software and the role it plays in making the Mac a friendly and easy place to work.

Basics

Until System 7 came along, most Mac users probably didn't pay much attention to system software—they just took it for granted. If your Mac has a hard disk, the system software could have been already installed when you got it. And it's quite possible that you've never upgraded from the version that was initially installed. So this might be your first experience in upgrading or installing new system software.

Although system software can be ignored most of the time, it's one of the essential ingredients needed for your Mac to operate. Without a valid system folder on your hard drive or on a startup floppy disk, your Mac won't boot at all. Instead of the "Happy Mac" face you normally see when you first turn on your Mac, you'll see a disk icon with a blinking "?" asking you to insert a startup disk.

Happy Mac   *Insert Startup Disk*

System software—what does it do?
The Mac's operating system is like a traffic cop. It directs and coordinates all basic Mac operations so that application programs (word processors, spreadsheets, and the like) are able to work with the hardware.

The operating system is really composed of two parts—system software and ROM (read-only memory). ROM is a special chip installed on the motherboard inside your Mac, which includes a basic set of operating instructions. Unlike RAM, which forgets everything when the power is switched off, ROM instructions are permanently etched into the chip and remain intact, even with the power off.
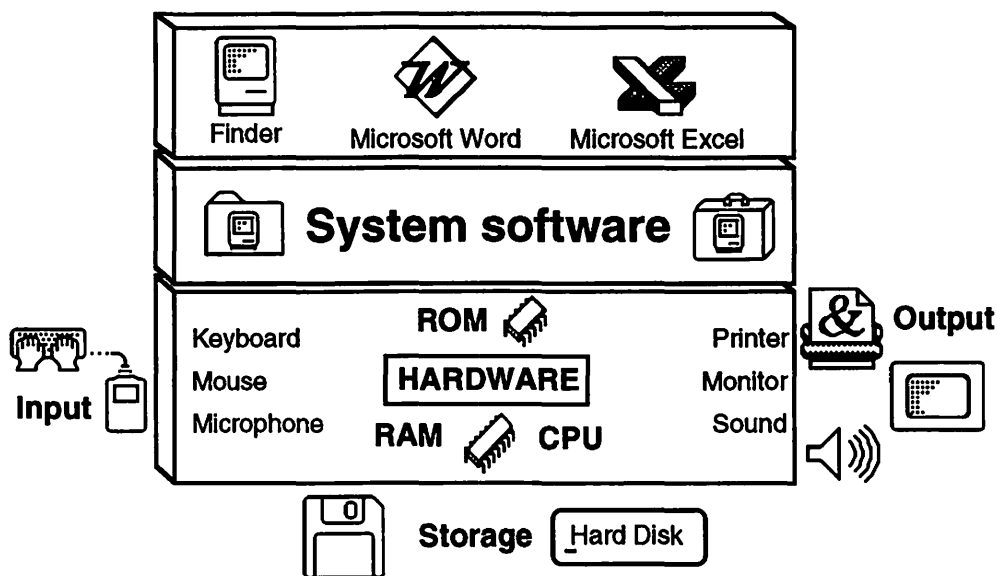
Figure 4-1. Macintosh architecture and the role of system software

ROM instructions come to life as soon as you turn on your Mac, telling it what to do during startup. Among its many functions, ROM tells the Mac to look for a file named "System" located on a floppy disk or hard drive and read it into memory (RAM). System software works with ROM instructions and together they provide the platform on which application programs perform useful tasks.

For example, when you key in text or click the mouse button, ROM instructions interpret the actions and relay the information to your word processing program. Using fonts from the System file along with more di-

rections from ROM, the Mac displays an image of the characters on the screen. ROM also provides instructions for how the Mac works with other peripheral devices for input, storage, and output.

System software, ROM, and application programs must work in concert to achieve a satisfactory result. When everything meshes smoothly, it's termed *compatible*. Of course, when things don't quite mesh you have an *incompatible* situation, usually producing the infamous bomb message. Apple's engineers have worked hard to ensure that System 7 works smoothly with ROM instructions, but it's up to applications developers to make their programs compatible with the new Mac operating system.

Most Mac users are probably unaware that the Finder is actually an application program. After the Mac loads the System file, it automatically launches the Finder. The Finder produces the Mac's friendly desktop metaphor including the pull-down menu commands, folders, disk icons, and Trash Can, which you see at the conclusion of the startup process. The Finder awaits instructions from the user, such as a double mouse click to open a folder or launch an application program.

In earlier System versions, there were two basic startup choices—Finder only and MultiFinder. Apple's research indicates most Mac users chose Finder only. When an application was launched, the Finder was replaced in RAM by the new program, which remained in control until **Quit** was selected. At that point, the Finder was again loaded into RAM and, after a delay of several seconds, the desktop reappeared on the screen.

With System 7, MultiFinder is the only choice. The Finder is always available at a moment's notice, with just the click of a mouse. When an application is launched, the Finder passes primary control to the new program, but remains loaded in RAM waiting until it's called upon again. Depending on the amount of RAM available, several programs can be launched simultaneously. As illustrated in Fig. 4-1, these applications rely on the foundation provided by system software and the Mac's ROM.

The Mac operating system is also responsible for the common "look and feel" shared by most Mac applications. Dialog boxes, pull-down menus, and the use of fonts are based on a toolbox of standard routines. Application developers call on these toolbox routines to perform many of their basic tasks.

System software—variations and extensions

As described in chapter 2, ROMs are typically upgraded each time a new Mac model is introduced. Consequently, system software must be written to accommodate all of the various models (ROM versions) on which it will operate. For example, System 7 is designed to work with every Mac from the Plus to the latest models. As you'll see later on in this chapter, the Installer allows you to select system software specifically designed for your model, or to load a generic version that will operate any Mac.

System software sometimes modifies ROM instructions to make the Mac behave a little differently than it did with previous system versions. In fact, that's how System 7 has been able to add new features that will work on all Macs, from the Plus up to the latest models.

Fortunately, not all of the Mac's operating system is built into the System file. If this were the case, the System file would become excessively large and unwieldy. As with prior versions, AMS 7 is constructed in a modular fashion, so that it's easy to plug in or remove components that might not be needed by everyone. For example, System 7 software includes network extensions for AppleTalk, EtherTalk, and TokenTalk. If you're not attached to a network, you won't need any of these add-ins. Even if you are on a network, chances are you'll need only one of them. This modular approach also allows third parties to create specialized extensions for their own products, such as a CD-ROM drive, which can be added when needed.

As the name *extensions* implies, these files contain additional instructions that *extend* or modify information contained in the basic operating system. Modifying the system is temporary and determined by which extensions are in the system folder at startup. As a result, it's easy to add or remove extensions as needed, with changes taking effect the next time the Mac is booted.

There are other files included in System 7's Extensions folder that are not loaded at startup, but can be opened during a session on the Mac. Typically, these are Chooser extensions such as the LaserWriter driver, which provides instructions on how to format a page for printing.

Operating system instructions can come from ROM, the System file, or one of many extension files. Regardless of the source, these instructions are a vital link between application programs and the Mac's hardware.

Where to get System 7

System 7 software is available from Apple dealers or user groups, on-line services, and fellow Mac users. As with prior versions, Apple has allowed System 7 to be freely distributed. However, because System 7 represents such a major change in how the Mac operates, Apple is encouraging users to acquire one of the official upgrade kits, which includes a full set of documentation plus 90 days of telephone assistance through the toll-free Upgrade Answerline.

The official Apple editions come in two varieties—the Personal Upgrade Kit and the Group Upgrade Kit. The Personal edition includes 12 disks and 5 manuals:

Table 4-1. System 7 manuals and related disks

Manuals	Related Disks
How to Install System 7	Before you Install System 7
	• Compatibility Checker
What's New in System 7	• Guided Tour
Macintosh Reference	None
Macintosh Networking Reference	Macintosh Networking Basics
HyperCard Basics	HyperCard 2.1 Program
	HyperCard 2.1 Stacks

Actual system software consists of 8 disks (800K format) or 6 disks (1.4Mb format), as shown in Table 4-2. 800K disks are included in the Personal Upgrade Kit, but high-density 1.4Mb versions are available from other sources.

Table 4-2. System 7 installation disks

	800K Version	1.4Mb Version
Installer Disks	3	2
Printing	1	1
Fonts	1	1
Tidbits	2	1
Disk Tools	1	1

The Group Upgrade Kit is recommended when upgrading six or more systems. In addition to the contents of the Personal Upgrade Kit, it includes a CD-ROM disk as well as a Group Upgrade manual. This version is aimed at small work groups or large corporate settings, where upgrading might take place over the network. The Group Upgrade Kit lists for $349 and includes 180 days of Answerline support. Additional manuals can be acquired in five packs for $249.

When all factors are considered, both of the Apple upgrade packages are reasonably priced. If you're an individual user, you should give serious consideration to acquiring the Personal Upgrade Kit, especially if you're relatively new to the Mac and lack contacts with more experienced users. The Apple Upgrade Answerline provides unlimited free support for 90 days, and the clock doesn't start until you make the first call. As usual, the manuals are well written, easy to read, and include numerous pictures and illustrations to guide you through the basics.

If you're a more experienced Mac user, you might opt for one of the unofficial methods of acquiring System 7—from a friend or user group. You'll need a minimum of 9 and preferably 12 blank 800K disks. Don't forget the *Before You Install System 7* disk. It's essential, unless you really enjoy a lot of detective work trying to figure out what went wrong. Get it and *use it*—you won't regret it!

There's one method we don't recommend—that's attempting to download System 7 from an on-line service. The 8 system software disks alone contain over 6Mb of information. Some quick arithmetic will show that you're looking at several hours of download time and connect charges well in excess of the $99.00 price of the Personal Upgrade Kit.

If you're running a Mac in an office and it's attached to a network, you might be able to install System 7 directly from an AppleShare file server or from a CD-ROM drive. This is the first version of the Installer that allows updating over a network. Previous versions required you to boot from an Installer disk. While this is a great convenience for networked Macs, it doesn't eliminate the need for a little up-front planning. You should follow all the same pre-installation steps recommended for any user. In addition, please contact your network administrator before you install and follow any special procedures recommended for your site.

Planning your installation

Some people are planners and others are spontaneous and prefer the adventurous route of trial, discovery, and recovery. If you're the adventurous sort, you might want to reconsider your normal mode and read through this section *before* you press the **Install** button. If that's too great an adjustment, you can return here to find out what went wrong and how to correct it. We promise not to say "We told you so."

Before you install

While it's possible to dive right in and install System 7 without any preparation, we don't recommend it. The Installer performs major surgery on your system software and there's always the possibility something could go wrong during installation, such as a power or hardware failure. Therefor, we recommend the following steps:

1. Back-up your hard drive—especially any critical documents or programs you couldn't recover from existing floppies.

2. Run the Compatibility Checker. It works with pre-System 7 software and will identify potential incompatibilities.

3. Check your current hardware configuration and determine if you really want to install System 7 now. Make necessary adjustments.

4. Select an installation strategy from the methods we've outlined in this chapter, and prepare accordingly.

5. Contingency plan (lifeboat drill)—select one of the methods we've outlined to return to System 6 if the need arises, and prepare for it.

6. Install System 7 according to your plan. Use the Apple Installer— no shortcuts please!

7. Tune your installation by checking questionable INITs, CDEVs, and application software for compatibility with System 7.

8. Experiment and enjoy System 7's new features. Check out some of the tips we've included in chapters 5 and 6.

If this all sounds a little overwhelming, don't despair. It's not as difficult as it might seem, and we'll guide you through the steps at a comfortable pace. Besides, getting to System 7 is worth it! Once you're there, you won't want to come back unless it's absolutely necessary. But we'll make the passage as easy and painless as possible.

Compatibility Checker

The Compatibility Checker is a HyperCard stack developed by Apple to help identify and deal with software that might not run properly with System 7. If you've acquired the complete set of Apple disks, one of them will be labeled *Before You Install System 7*.
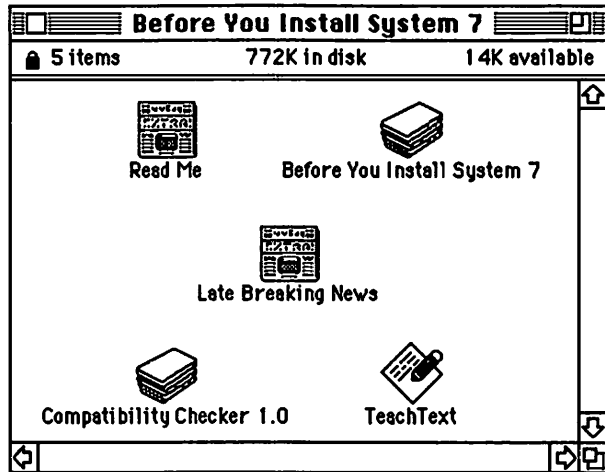
Figure 4-2. Before You Install System 7 disk contents

There are two stacks on this disk that require HyperCard version 1.2.2 or later. Copy the stacks to your hard drive (they won't run from a locked floppy) and double-click **Before You Install System 7**.
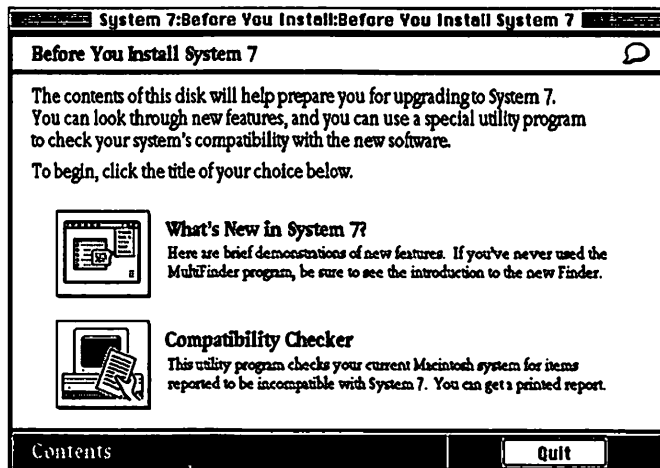
Figure 4-3. First card from Before You Install System 7 stack

From the opening window (Fig. 4-3) select either **What's New in System 7?** or go directly to the Compatibility Checker. The What's New option provides a nice animated tour of several System 7 features, as illustrated below in Fig. 4-4.
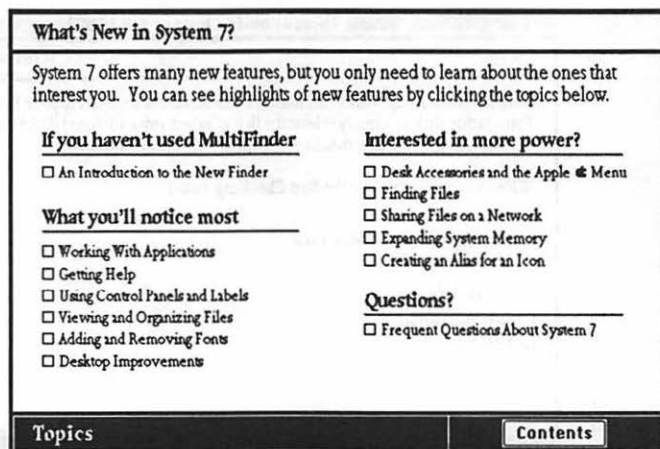
Figure 4-4. Topics covered by What's New in System 7? stack

When you've completed your tour of System 7's new features, click the **Contents** button to return to the opening card (Fig. 4-3). From here you can launch the Compatibility Checker, or it can be opened directly from the Finder. The Introduction is the first card in the stack, as shown in Fig. 4-5.
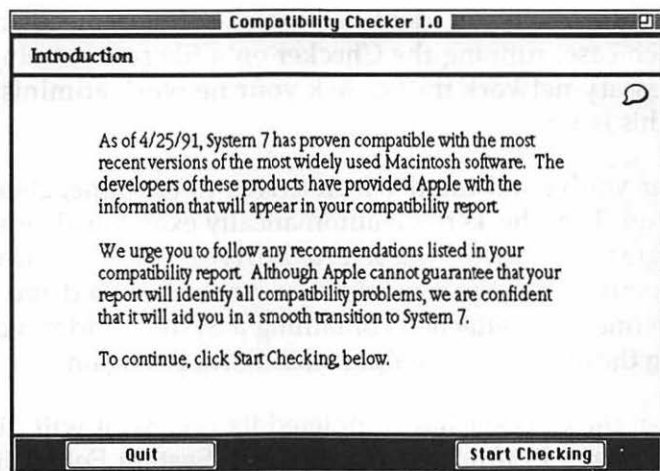
Figure 4-5. Introduction card in Compatibility Checker stack

If you have only one hard drive attached to your Mac, click the **Start Checking** button (Fig. 4-5) to begin the process. However, if you have more than one hard drive, the **Start Checking** button is replaced by a **Set Up** button, which switches to the card illustrated in Fig. 4-6.

```
╔═════════════ Compatibility Checker 1.0 ═════════════╗
║ Set Up                                [ Introduction ] ║
║                                                        ║
║ Here is a list of all the disks and network file servers connected to your Macintosh.  ║
║ Your startup disk is already selected; click to select any additional disks you want to ║
║ check. (An X in the box means you want the disk to be checked.)  ║
║                                                        ║
║ When you're ready, click the Start Checking button.    ║
║                                                        ║
║ Your startup disk is: ☒ Mac IIcx                       ║
║                                                        ║
║ Other available disks:                                 ║
║   ☐ External 80SC                                      ║
║   ☐ System 7.0                                         ║
║                                                        ║
║                                    [ Start Checking ]  ║
╚════════════════════════════════════════════════════════╝
```

Figure 4-6. Set Up card in Compatibility Checker stack

Click in the boxes to indicate which drives you want the Checker to examine. You'll probably want to check all drives, with the possible exception of network file servers, which could appear if your Mac is connected to a network. Typically, the network administrator will have reviewed file servers and already identified which software needs to be upgraded—in which case, running the Checker on a file server volume would add unnecessary network traffic. Ask your network administrator for guidance on this issue.

After you've indicated which drives to examine, click the **Start Checking** button. The Checker will automatically examine all application and utility programs on any of the selected drives. However, it will check only the contents of the System folder on your startup drive. If you have more than one drive attached containing a System folder, you'll need to restart from the alternate disk and run the Checker again.

When the Checker has completed its review, it will display the Warning card (Fig. 4-7) if it has identified any System Folder items that might be incompatible with System 7. It will also offer to remove these items from

your System Folder and place them into a folder labeled *May Not Work With System 7.*
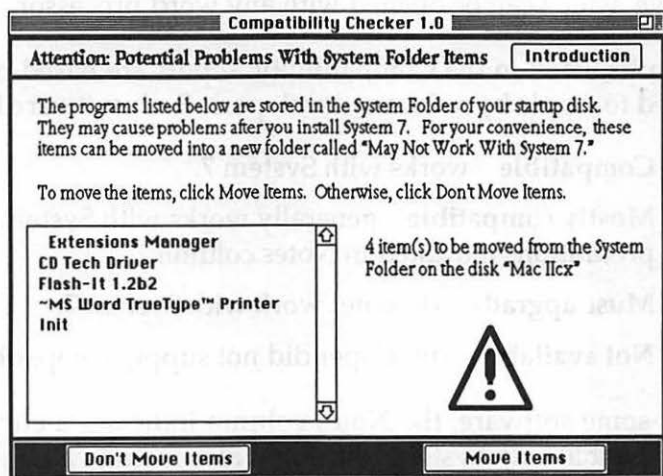
Figure 4-7. Compatibility Checker Warning card

Unless you've already reviewed the installation strategies we've outlined later in this chapter and are sure you're ready to begin the Installer procedure, select the **Don't Move Items** option. This will keep all your current INITs and CDEVs in place until you're ready to begin installing System 7.

The next step is to review the Compatibility Report, which is displayed in a scrolling window, as illustrated below in Fig. 4-8.
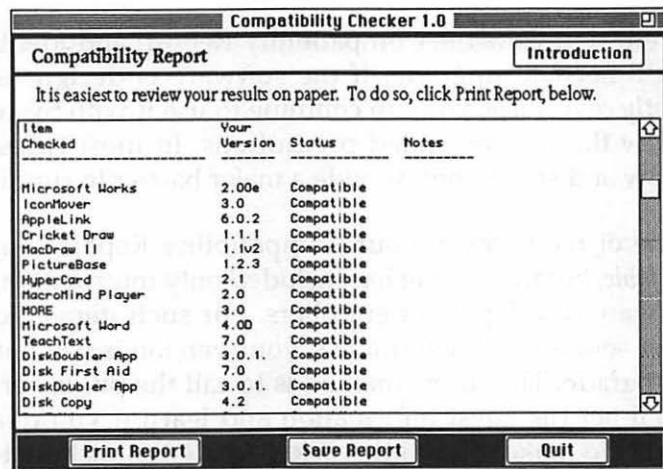
Figure 4-8. Compatibility Report

It's a good idea to print a copy of this report and to save it for future reference. Clicking the **Save Report** button will create a text file on your hard drive, which can be opened with any word processor.

Results listed in the Compatibility Report are based on information supplied to Apple by software developers. Each software item is classified as:

Compatible　works with System 7.

Mostly compatible　generally works with System 7; exceptions and precautions indicated in Notes column.

Must upgrade　does not work with System 7.

Not available　developer did not supply compatibility information.

For some software, the Notes column indicates a current version that is compatible with System 7. It might also include a two-letter code indicating upgrade or compatibility information, such as:

AD　does not work with 32-bit addressing; turn off 32-bit mode.

FS　does not work with file sharing; do not run with file sharing.

TT　does not support TrueType fonts larger than 127 points.

UR　mostly compatible, but developer encourages upgrade to latest version.

VM　does not work with virtual memory; turn off VM.

Carefully review the Compatibility Report, and identify which software you'll need to upgrade. If the software is designated as *Compatible* or *Mostly compatible,* you can continue to use it with System 7, provided you follow the recommended precautions. In most cases, these are easy to follow and should not provide a major barrier to running System 7.

Some of the items in your Compatibility Report could be listed as *Not available,* because Apple has included only information they received from software developers or suppliers. For such items, you'll need to check other sources and determine if your version is compatible or if you need to upgrade. The surest method is to call the publisher directly. That way you'll get the latest information and learn if you qualify for a free upgrade. To make this a little easier, Apple has included phone numbers of many software publishers at the end of the Report.

You might also check with your local user group or consult one of the leading Mac publications, such as MacUser, MacWorld, or MacWeek. If you belong to an on-line service such as CompuServe or America Online, they might have a special segment dedicated to System 7 issues.

If you're still unable to locate the latest compatibility information, you can simply try the unknown software with System 7. However, make sure you've backed up your critical data and can recover if the software bombs. Applications could fail during some phases of operation, or might not print properly. Recovery is typically a simple matter—reboot your Mac and discontinue using the software until you receive an upgrade. System extensions (INITs), on the other hand, are more likely to cause serious problems, especially if they attempt to alter the System file or the Finder. Later in this chapter, we'll describe methods for testing this type of software and tell you what to do if it fails.

Software checklist

Based on the results of your Compatibility Report, you should identify which software is crucial to your daily operation. Because the Compatibility Checker looks at everything on your hard drive, you might discover some long forgotten items along with those you use almost everyday. Items that aren't used often might not pose a serious barrier. However, frequently used software should be at least *mostly compatible* to ensure a smooth daily operation with System 7. Examples might include:

> **Applications**   word processor, spreadsheet, paint and draw programs, communications or e-mail package, etc.
>
> **Utilities**   disk tools (copiers, backup/recovery, file compressors), resource managers (for fonts, DAs, sounds), etc.
>
> **INITs and CDEVs**   virus checkers, device drivers, etc.

If any of your critical software requires an upgrade, you could still make the move to System 7, but you'll definitely want a System 6 lifeboat available.

Also consider some of System 7's new features when evaluating the INITs and CDEVs that are part of your current routine. You might find equivalent or better features already built in to System 7. For example, the new **Find** command rivals the capabilities of most third-party alternatives, and System 7's Finder offers several enhanced navigational methods.

Hardware checklist

Although we've covered hardware issues in depth in chapter 2, its time for a final check. To launch the AMS 7 on your Mac you'll need:

Model   Mac Plus or better

Hard drive   with at least 4Mb of free space for System 7

Memory   a minimum of 2Mb and preferably 4Mb of RAM

Because System 7 software is customized for each Mac, the amount of memory left for running applications will vary by model. Table 4-3 shows the amount of memory required with the basic installation options.

Table 4-3. System 7 memory utilization by model

	Minimum installed RAM	Memory used by System 7†	Memory free for applications
Mac Plus	2,048K	1,056K	992K
Mac SE	2,048K	1,125K	923K
Mac Classic	2,048K	1,123K	925K
Mac Portable	2,048K	1,085K	963K
Mac LC	2,048K	1,298K*	750K
Mac II	2,048K	1,275K	773K
Mac SE/30	2,048K	1,271K	777K
Mac IIx	2,048K	1,268K	780K
Mac IIcx	2,048K	1,298K	750K
Mac IIsi	3,072K	1,216K*	1,805K
Mac IIci	2,048K	1,202K*	796K
Mac IIfx	4,096K	1,185K	2,911K

Notes: †File sharing requires additional 260K
*Built-in 8-bit color video uses additional 280K

Keep in mind that Table 4-3 reflects bare minimums. Using third-party extensions (INITs) will also add to system memory and therefore reduce the amount available for applications. In most cases, you won't be able to run more than one application at a time with these configurations, and you could encounter *Out of Memory* error messages for certain programs.

Installation strategies

There are two basic approaches to installing System 7:

Standard   replaces System 6 files in your current System Folder.

Safety net   creates a brand new System 7 folder without altering your existing System 6 files.

The standard method is the easiest and quickest, but it is also the most risky. Apple's Installer program is designed to examine each file in your current System Folder and update them to System 7 versions. This includes preserving all of the fonts, desk accessories,and sounds currently installed in your System file, as well as keeping any INITs and CDEVs not removed with the Compatibility Checker (see Fig. 4-7). It sounds great, but there are two significant disadvantages:

No return   because System 6 is history, there's no easy way to get back to it without reinstalling from a set of System 6 disks.

Potential conflicts   any "leftovers" from System 6 including INITs, CDEVs, fonts, sounds, or DAs could be incompatible or corrupt, and it won't be easy to identify the offending parties.

We recommend the standard method only if you have a very clean System Folder (essentially Apple factory issue), and you have selected one of the alternate "lifeboat" techniques described in the next section. If you decide to use this approach, be sure to re-run the Compatibility Checker and click **Move Items** in the Warning card (see Fig. 4-7).

Creating a safety net is not difficult once you understand how the Mac recognizes the "official" System Folder—the place ROM looks for the System file and Finder when you startup your Mac. Surprisingly, the name of the folder has nothing to do with its official status. In Apple terms, a folder is officially "blessed" if it contains both the System and Finder files. It doesn't matter what it's named. The "blessed" folder is easy to recognize, because it includes a tiny Mac icon, as shown below in Fig. 4-9.

System Folder   System   Finder   "Blessed" Folder
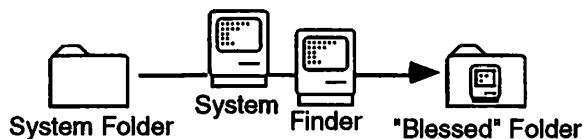
Figure 4-9. Blessing a folder with the System and Finder

This is an important concept, because it will allow you to disguise the identity of your current System Folder and trick the System 7 Installer into creating a fresh version without disturbing any of your System 6 files. To accomplish the disguise you need to rename the System Folder and hide either the System or the Finder file.

⚠️ CAUTION: Before you begin this process, make sure you have a startup floppy disk handy with a working System Folder—the *Disk Tools* disk that comes with System 7 will work. The following steps will make your current hard drive non-bootable, and you'll need a startup floppy to recover if anything goes wrong.

1. Rename the System Folder to something like *6-System Folder*. This will avoid a conflict when the System 7 Installer attempts to create a new folder named *System Folder*.

2. Open the 6-System Folder and create a new folder inside named *S/6 Hiding Place*, as illustrated in Fig. 4-10.

3. Drag the Finder icon into the S/6 Hiding Place folder.
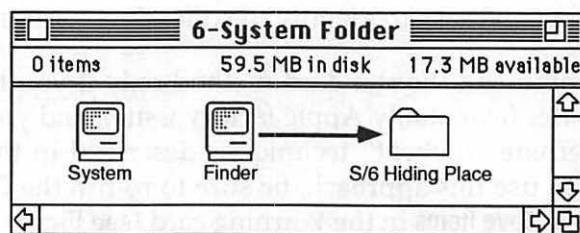
Figure 4-10. Disguising the current System Folder

When you close the window, the 6-System Folder won't include the tiny Mac icon, indicating it's no longer blessed. Your hard drive is now ready to receive a new System Folder created by the System 7 Installer.

After installing System 7, you'll be able to transfer selected INITs, CDEVs, sounds, DAs, and fonts one at a time and test compatibility with System 7. You'll also maintain a complete set of System 6 files on your hard drive, so you can revert back if needed—we'll explain how to do this in the next section. The safety net method requires a little more effort than the standard approach, but we believe it's worth it in the long run.

There's one other approach worth mentioning—the *purist method*. If you have several hours available and a working knowledge of how to back up and restore everything on your hard drive, you might want to consider this method. The primary benefit of this approach is that it assures a spotless platform on which to install System 7.

Before you begin, you'll need:

Backup and recovery software such as Retrospect from Dantz Development. Version 1.3 is System 7 compatible.

External storage media a supply of floppies sufficient to store everything on your hard drive, or a tape backup unit.

Hard disk utility to re-initialize and format your hard drive. Make sure you have a version that includes System 7 compatible drivers (see appendix A, Table A-2).

The purist method can be combined with either the standard or the safety net approach, because it's essentially a way of preparing your hard drive for installing System 7. Use the following steps:

1. Determine which installation strategy you intend to follow. The safety net method requires you to perform the three-step process outlined earlier before you begin the backup.

2. Back up everything on your hard drive, including System files, application programs, utilities, and data. To be extra safe, you might want to make two backup copies—just in case.

3. Reformat your hard drive using the utility software from the drive vendor or a third-party product such as Silverlining. This process will completely erase everything on your drive, so don't begin until you have a complete backup.

4. Standard approach—restore your System files first, then install System 7 on your newly refurbished hard drive. Follow by restoring all remaining files (applications, utilities, and data).

5. Safety net method—install System 7 and test out some of its new Finder features on a clean drive. After you're sure System 7 is working, you can restore your old files to the hard drive.

Contingency plan—lifeboat drill

Being able to easily return to System 6 instills a warm feeling in most of us, even if we never need to do it. If you're fortunate, all of your software will work with System 7. Or you might be so pleased with System 7's new features that you'll develop "work arounds" to avoid incompatibilities that could occur. In any case, it's a good idea to have a System 6 lifeboat waiting, if all else fails.

There are several lifeboat styles available, depending on how your Mac is equipped:

First class   with dual hard drives you can install System 7 on one and keep System 6 on the other. Switching back to System 6 is a simple matter of changing the startup device from the Startup Disk control panel (see Fig. 2-4 in chapter 2).

Business class   with a single hard drive and at least 4Mb of free space, you can keep a disguised System 6 folder on board.

Tourist class   if your hard disk space is really tight, you can create a System 6 floppy disk and boot from it.

The business class method is consistent with the safety net strategy outlined previously. Switching back to System 6 is a little more trouble than first class, but it can be done with a few steps:

1. Open your new System Folder and create a folder called *S/7 Hiding Place* inside, similar to the steps outlined with Fig. 4-10.

2. When you want to revert to System 6, drag the System 7 Finder into the S/7 Hiding Place folder, as illustrated in Fig. 4-11, and close the window.
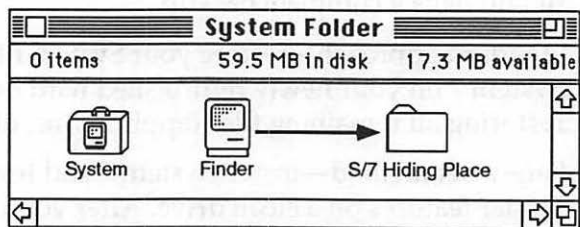
Figure 4-11. "Unblessing" the S/7 System Folder

3. Open the 6-System Folder window, and drag the System 6 Finder from its "hiding place" back to where it's visible.
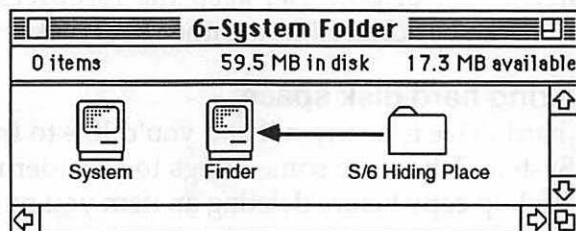
Figure 4-12. "Re-blessing" the S/6 System Folder

4. Close the 6-System Folder window, which should now be the "blessed" folder. There's no need to change the name, because the Mac ignores it and looks for whichever folder is blessed.

The "blessed" S/6 Folder   "Unblessed" S/7 Folder

6-System Folder   System Folder
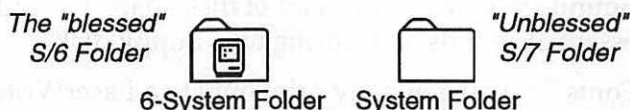
Figure 4-13. System Folders after "blessing" change

5. Restart your Mac, and it should launch with System 6 in charge. If it fails to boot and you get the flashing ?, simply insert a floppy startup disk and re-trace steps 2 – 5.

To change back to System 7, follow a similar procedure, beginning with hiding the System 6 Finder. Make sure you "unbless" the current startup folder before "reblessing" the alternate, otherwise the Mac could get confused.

At some point, you might find it unnecessary to continue maintaining the disguised 6-System Folder on your hard drive. When all of your critical software runs smoothly with System 7 and you rarely need to revert to System 6, it's probably safe to trash the 6-System Folder. Before you trash it, however, make sure you have a back up copy of any fonts, DAs, sounds, or INITs that you haven't installed in System 7.

The tourist class method is probably the least desirable lifeboat because there isn't much space for extra fonts, DAs, sounds, or extensions on a floppy disk. The best way to counter this limitation is to use a resource manager such as MasterJuggler or Suitcase II (see descriptions in chapter 3). You can keep all of the extra resources stored on your hard drive and

access them with one of these managers, as long as you include its INIT on your System 6 floppy disk. If you have a System 7 compatible version of MasterJuggler or Suitcase, keep the resources in a common folder where they can be accessed from either boot disk.

Recovering hard disk space

If your hard drive is nearly full and you'd like to free up enough space to install System 7, here are some things to consider removing. Be sure you have a backup copy before deleting an item you might need in the future.

Device drivers for printers or other devices you don't use, such as an AppleTalk ImageWriter or Personal LaserWriter SC.

Network drivers if you're not on a network you won't need any; if you are on a network, ask your administrator which ones you'll need.

Sound files consume a lot of disk space. Consider removing all non essential sounds and storing on a floppy disk.

Fonts if you generally print only to a LaserWriter, you can remove most bit-mapped fonts. Typically, these have names of cities, such as Athens, London, New York, Venice, etc. Don't try to remove Chicago, Geneva, or Monoco; they're required by the System.

Desk accessories infrequently used DAs can be removed or accessed from a floppy with MasterJuggler or Suitcase II.

INITs and CDEVs review the list provided by the Compatibility Checker and consider removing nonessential or incompatible items.

Applications the Compatibility Report lists every program on your hard drive, which is a good place to look for applications you seldom use. If you want to keep the actual program on your hard drive, consider removing some of the extra files that often accompany a package. For example, tutorial files and templates often consume extra space, and the program will work without these files. However, be careful not to remove preference or startup files typically found in the System folder, which could be required for the program to function.

Utilities if you have multiple programs that perform the same or similar functions, this is a good opportunity to "clean house." Pick your favorite and remove the others.

Installation

The big moment has arrived. You've backed up your critical data, checked out your hardware and software to determine S/7 compatibility, selected an installation strategy, and arranged for a System 6 lifeboat. Everything is ready for launching AMS 7 on your Mac, so let's begin. There are two primary methods to install System 7 on your hard drive:

Local   from a set of System 7 installer diskettes or from a CD-ROM attached to your Mac.

File Server   from another Mac or file server that has been loaded with the System 7 Installer and is accessible on your network.

Installing from a file server or a CD-ROM drive is a little easier because you don't have to swap floppy disks, but both methods perform exactly the same steps.

Local installation setup

Before launching the System 7 Installer, make sure you have all eight diskettes available, as illustrated in Fig. 4-14. Actually, the Installer requires only seven disks—Disk Tools is a System 6 startup disk containing the HD SC Setup and Disk First Aid utilities.
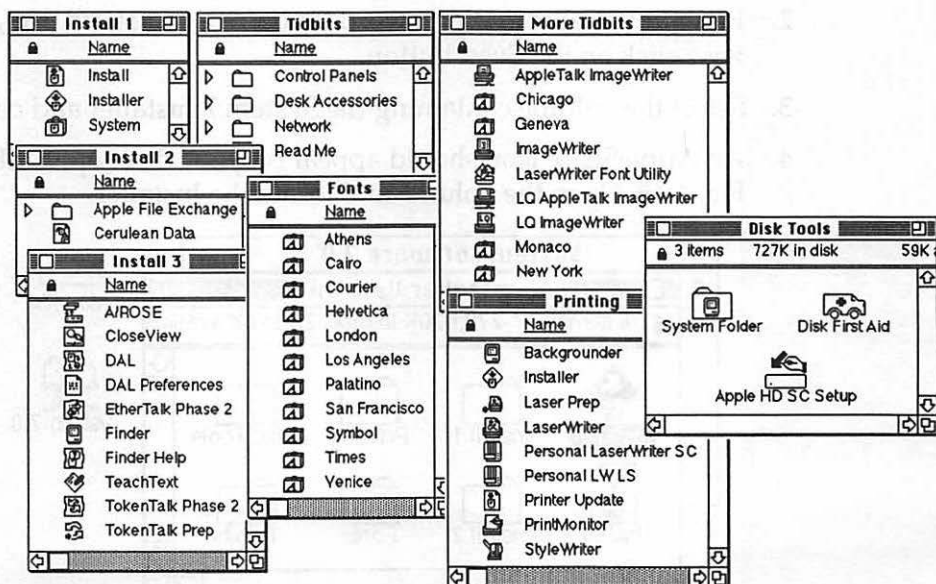
Figure 4-14. System 7 Installer disk set (800K version)

File server—locating the System 7 Installer

If you're installing from a file server, you'll need to locate the appropriate volume that contains the System 7 Installer. Your network administrator should let you know where to find it.
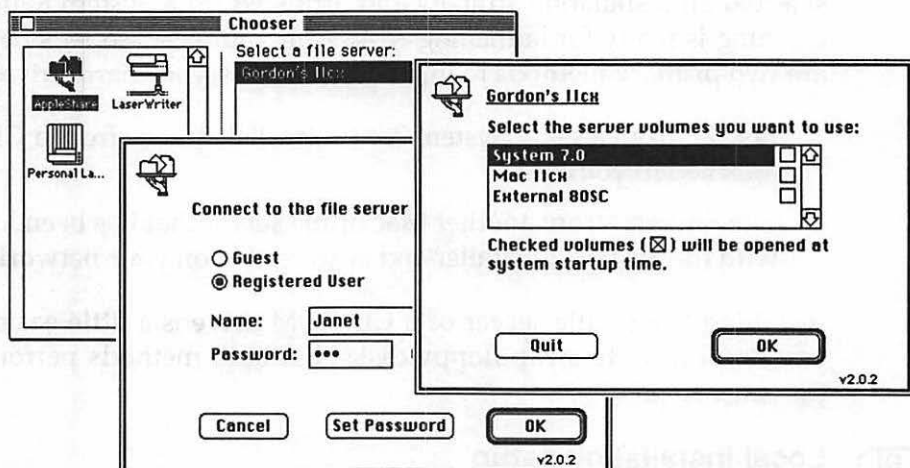
Figure 4-15. File server log-on steps

1. Select the **Chooser** from the menu and click on the **AppleShare** icon, as illustrated above in Fig. 4-15.

2. Enter your name and password if you're a **Registered User,** otherwise click on the **Guest** button.

3. Select the volume containing the System 7 Installer and click **OK**.

4. An AppleShare icon should appear on your desktop, as shown in Fig. 4-16. Open the volume and locate the Installer.
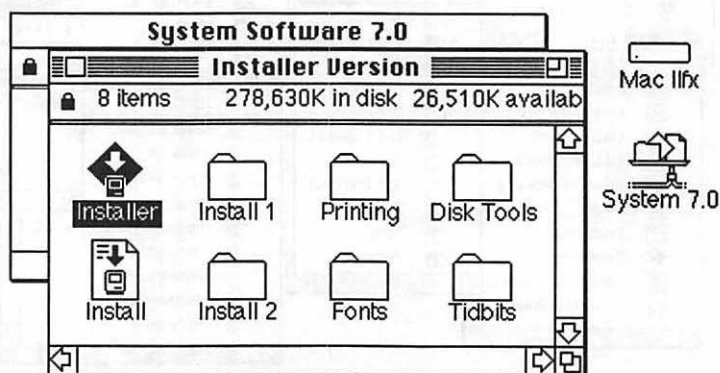
Figure 4-16. AppleShare server containing System 7 Installer

Launching the System 7 Installer

If you're installing from floppy disks, you'll need to restart your Mac and boot from the *Install 1* disk. On the other hand, installing from a file server doesn't require restarting your Mac. In either case, locate the **Installer** icon and double-click to launch it.

The Welcome to the Apple Installer window (Fig. 4-17) describes the Installer and outlines the Easy Install versus Customize methods.

Welcome to the Apple Installer

Your Macintosh needs certain software to start up.

The Installer places this software on your disk in the System Folder.

System Folder

"Easy Install" chooses the software Apple recommends and creates a disk which can be used to start up your Macintosh.

("Customize" if you are sure you want to override those recommendations.)

OK
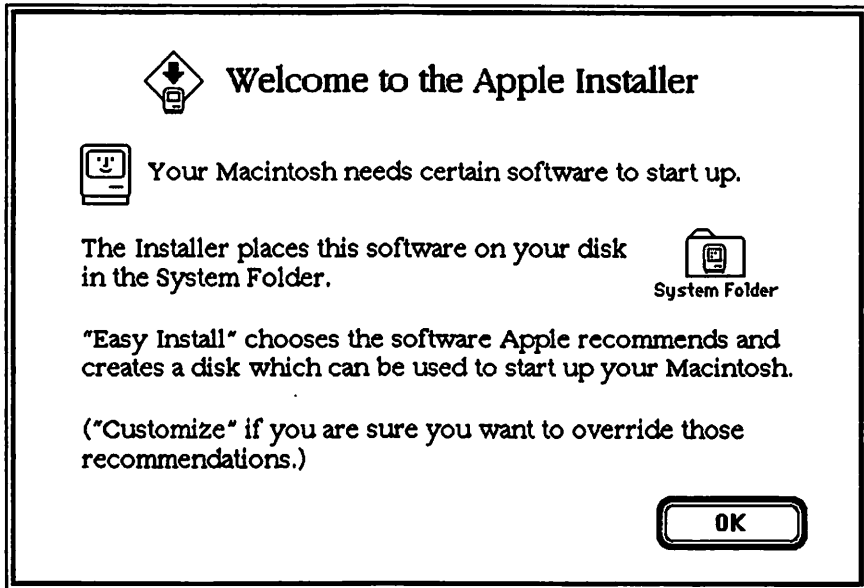
Figure 4-17. System 7 Installer

Footnote—for macho Macophiles

In the early days of the Mac, some of us used to ignore the Installer and drag files from the system disks onto our startup volume. We felt this method was faster and gave us more control over what ended up on our system disks. If you've got any fantasies along these lines—forget it fast.

Bypassing the Installer hasn't been in vogue for the last several versions of system software, and with System 7 it's virtually impossible. Take a close look at the *Install 2* disk. It contains a funny little ResEdit file called *Cerulean Data*. Who knows what's inside? Whatever is in there, the Installer uses to augment the bare bones System file found on the Install 1 disk. The result, which ends up on your hard drive, is too big to fit on a single floppy—even a 1.4Mb version.

Installer choices

After clicking the **OK** button in Fig. 4-17, the Easy Install window appears (Fig. 4-18). There are two choices:

One-button Install   clicking the **Install** button will automatically select the appropriate software for your Mac and begin the process.

Customize   opens another window (Fig. 4-19), allowing you to select from a list of choices before beginning the installation procedure.

```
┌─────────────────────────────────────────────────────────────┐
│  Easy Install                                                │
│  ┌─────────────────────────────────────────────────────┐    │
│  │  Click Install to place Version 7.0 of              │    │
│  │    • Macintosh System Software                      │    │
│  │    • All Printing Software           ┌──────────┐   │    │
│  │    • File Sharing Software           │ Install  │   │    │
│  │                                      └──────────┘   │    │
│  │  on the hard disk named                             │    │
│  │    ⊂⊃ External 80SC                                  │    │
│  └─────────────────────────────────────────────────────┘    │
│                                                              │
│    Customize will let you override the recommended  ┌────────────┐
│    software by choosing exactly what will be        │ Eject Disk │
│    installed. Use this only if you are sure that you└────────────┘
│    want other than the recommended software.        ┌────────────┐
│                                                     │ Switch Disk│
│                                                     └────────────┘
│                                    Page 3 of 4      ┌────────────┐
│                                                     │ Customize  │
│            ┌──────────────┐                         └────────────┘
│  3.2       │  More Help   │                         ┌────────────┐
│            └──────────────┘                         │   Quit     │
│                                                     └────────────┘
└─────────────────────────────────────────────────────────────┘
```
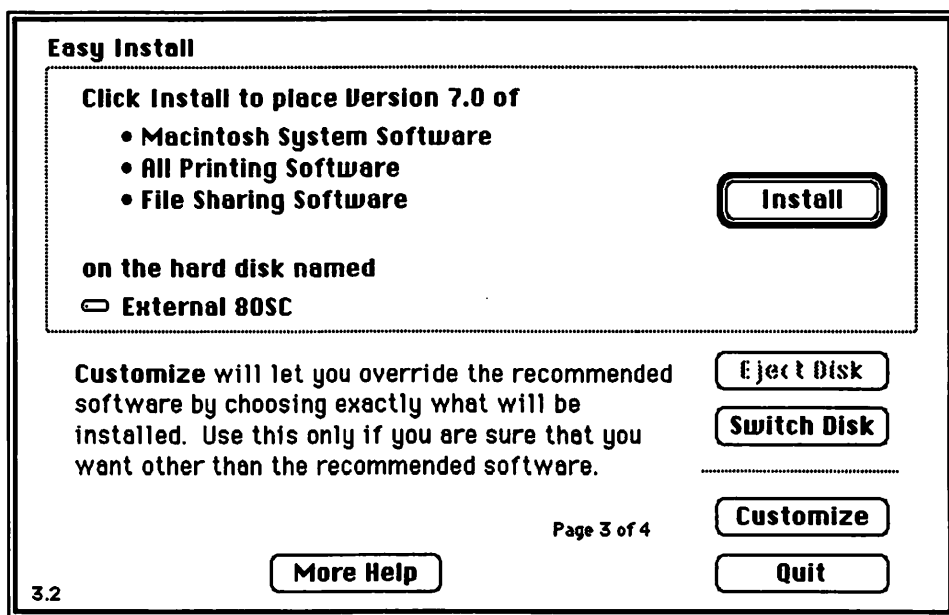
Figure 4-18. "One button" Installer window

The one-button Install option doesn't require any further decisions and is therefore the easiest method. If you're installing on an internal hard drive, it will select the software needed for your particular Macintosh model. As described earlier in Table 4-3, System 7 software has been customized to optimize memory utilization on each model. For example, a Mac Plus will receive a slightly different version than a Mac LC or an SE/30.

If you're installing on an external hard drive, the Installer will select a generic version of the system software as described in Fig. 4-19. This version might not be quite as memory efficient, but it will run on any Mac

model. If you transport your hard drive between different Macs, this is the version to install.

The **Customize** option provides a little more control over which software is installed on your Mac. If you're a little short on hard disk space, you can select software specific to your environment and save up to 1.1Mb. To get a preview of how much disk space is required for each option, simply click on an item in the scroll box of the Customize window (Fig. 4-19). The lower portion of the window will display information about the option you've selected.
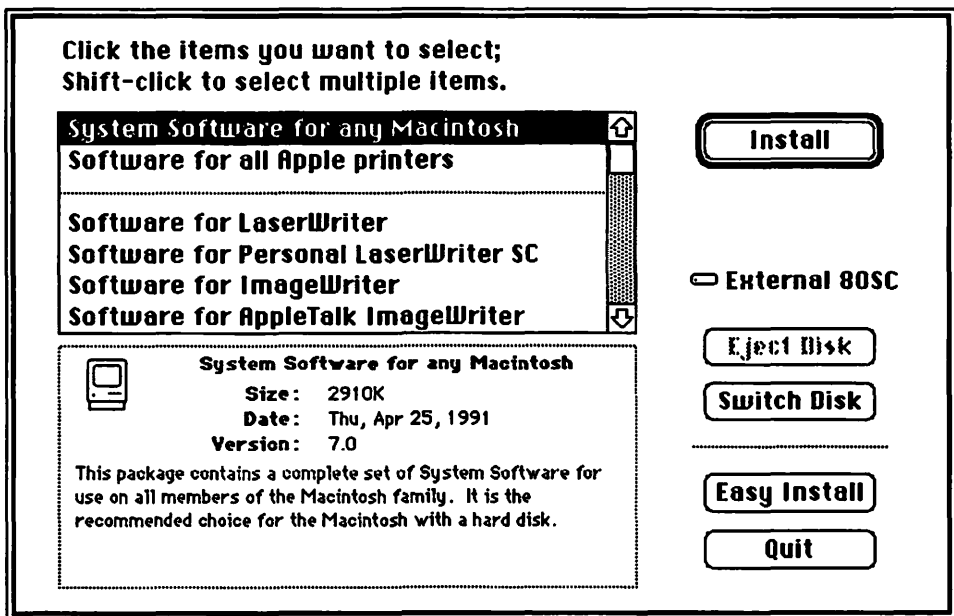
```
┌─────────────────────────────────────────────────────────────┐
│  Click the items you want to select;                         │
│  Shift-click to select multiple items.                       │
│  ┌──────────────────────────────────────┐ ⬆  ┌───────────┐   │
│  │ System Software for any Macintosh    │    │  Install  │   │
│  │ Software for all Apple printers      │    └───────────┘   │
│  │ ·········································│                  │
│  │ Software for LaserWriter             │                    │
│  │ Software for Personal LaserWriter SC │    ▭ External 80SC │
│  │ Software for ImageWriter             │                    │
│  │ Software for AppleTalk ImageWriter   │ ⬇  ┌───────────┐   │
│  └──────────────────────────────────────┘    │ Eject Disk│   │
│  ┌─────────────────────────────────────┐      └───────────┘   │
│  │ 🖥  System Software for any Macintosh │     ┌───────────┐  │
│  │       Size:    2910K                 │     │Switch Disk│  │
│  │       Date:    Thu, Apr 25, 1991     │     └───────────┘  │
│  │       Version: 7.0                   │                    │
│  │ This package contains a complete set of System Software for│
│  │ use on all members of the Macintosh family. It is the      │
│  │ recommended choice for the Macintosh with a hard disk.│  ┌───────────┐│
│  │                                      │     │Easy Install││
│  └─────────────────────────────────────┘     └───────────┘  │
│                                               ┌───────────┐  │
│                                               │   Quit    │  │
│                                               └───────────┘  │
└─────────────────────────────────────────────────────────────┘
```

Figure 4-19. Custom install option—software for any Macintosh model

To customize software for your particular environment, hold down the Shift key and click on the choices you need. Each time you add an item, your selection will be listed below the scroll box, as shown in Fig. 4-20. Some of the choices to consider:

System software   select the version for your model of Macintosh.

Printers   select only those printers that you normally access. For example, select **Software for ImageWriter** if it's the only printer your use. If you later decide to add another printer, you can install the appropriate driver without changing anything else.

File Sharing Software   select this option if you're connected to a network; otherwise ignore it.

EtherTalk/TokenTalk Software   you probably don't need these options unless your Mac has a special network card installed. Check with your network administrator.

Minimal Software   these options are intended for creating a startup disk on a high-density floppy, and aren't really useful on a hard drive.

When you've completed your selection of customizing options, click the **Install** button to begin the process. Or, if you change your mind, simply click the **Easy Install** button to return to the one-button method.
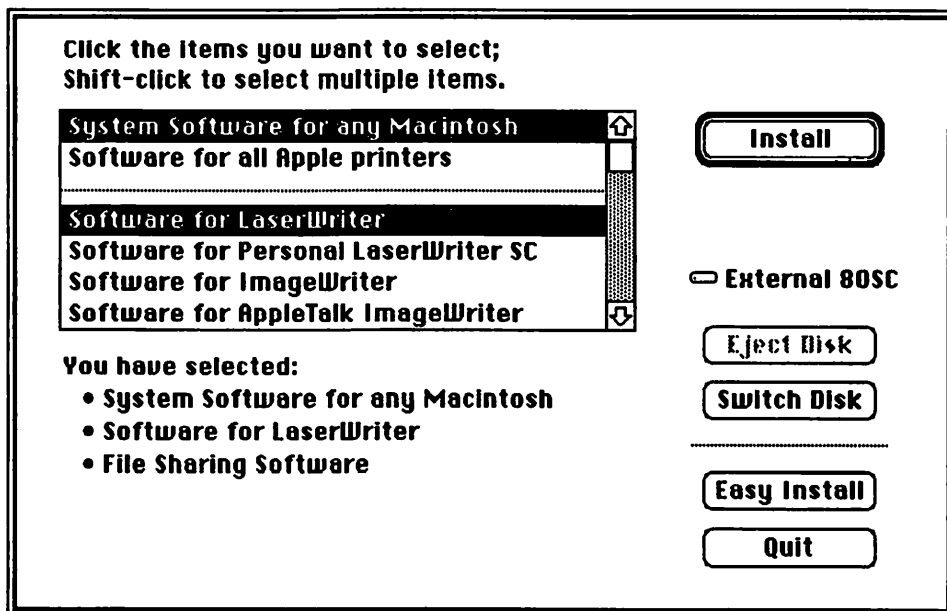
Figure 4-20. Custom install—selecting just the software you need

If you've chosen the standard installation strategy, the easy install method will automatically customize the new software to match printer and network drivers in your existing System Folder. On the other hand, if you're following the safety net strategy (which disguises System 6 software), the Installer won't recognize any of the old drivers. Consequently, it will install *all* printer and network drivers into your new System (7) Folder. You can avoid this by using the custom options, or trash the unnecessary software after you've completed System 7 installation.

Installer in action

As soon as you click the **Install** button, the Installer begins to update your existing System Folder or create a new one for System 7. The Installer will keep you advised of its progress with a window similar to Fig. 4-21.
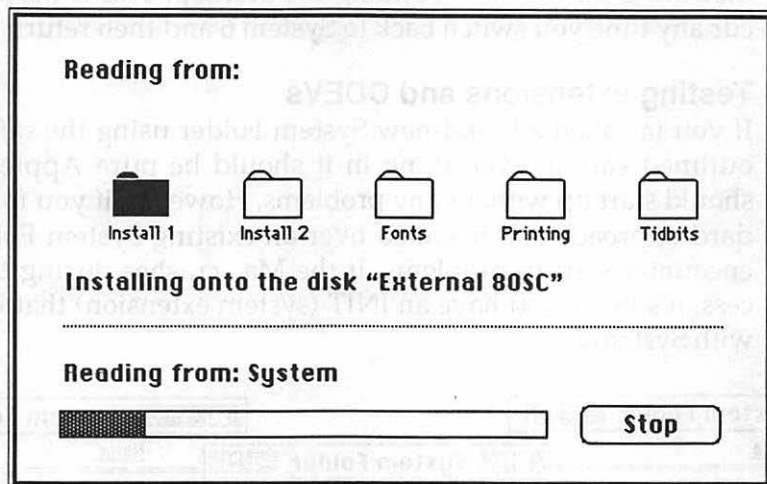

Figure 4-21. Installer progress window

If you're installing from a network file server or from a CD-ROM drive, you can take a short coffee break—the rest of the process is automatic. However, if you're using a set of Installer disks, stay close to your Mac so you can swap floppies when the dialog box instructs you to do so.

When the Installer has completed the process, you should see a screen similar to the one shown in Fig. 4-22. In the unlikely event the installation fails, you should re-start the process from the beginning.
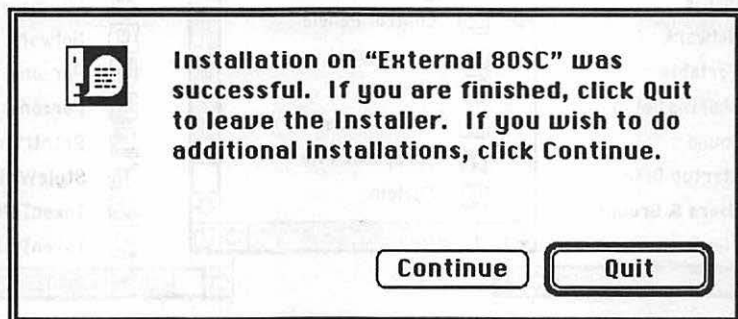
Figure 4-22. Successful installation completed

Post-installation tips

Now that you've got System 7 installed, you'll need to restart your Mac to begin using it. When you first start up System 7, a dialog box will appear indicating the Mac is rebuilding the desktop. This is normal, and will occur any time you switch back to System 6 and then return to System 7.

Testing extensions and CDEVs

If you installed a brand-new System Folder using the safety net method outlined earlier, everything in it should be pure Apple, and System 7 should start up without any problems. However, if you followed the standard approach and installed over an existing System Folder, you might encounter startup problems. If the Mac crashes during the startup process, it's likely you have an INIT (system extension) that isn't compatible with System 7.

System Folder		System Folder		System Folder	
Name		**Name**		**Name**	
▽ 📁 Control Panels		▽ 🍎 Apple Menu Items	⇧	📁 Extensions	⇧
☀ Brightness		⏰ Alarm Clock		A/ROSE	
🎨 Color		🔋 Battery		AppleShare	
⚖ Easy Access		🖩 Calculator		AppleTalk ImageWriter	
📇 File Sharing Monitor		📞 Chooser		DAL	
🖥 General Controls		*Control Panels*		EtherTalk Phase 2	
⌨ Keyboard		🖵 Key Caps		File Sharing Extension	
🏷 Labels		📝 Note Pad		Finder Help	
🌐 Map		🧩 Puzzle		ImageWriter	
📊 Memory		📖 Scrapbook		LaserWriter	
💾 Monitors	▷ 📁 Control Panels		LQ AppleTalk ImageWriter	
🖱 Mouse	▷ 📁 Extensions		LQ ImageWriter	
🖧 Network	📁 Finder		Network Extension	
🔌 Portable	▷ 📁 Preferences		Personal LaserWriter SC	
🖨 Sharing Setup	📖 Scrapbook File		Personal LW LS	
🔊 Sound	🗄 System		PrintMonitor	
💿 Startup Disk			StyleWriter	
👥 Users & Groups			TokenTalk Phase 2	
▦ Views			TokenTalk Prep	⇩

Figure 4-23. System 7 standard control panels, extensions, and desk accessories

Restart your Mac and hold down the Shift key during startup. This will turn off all INITs. Open your System Folder and compare the contents with Fig. 4-23. You might not have everything illustrated, but if you have any extra items, one or more of them could be the culprits.

Create a new folder titled *May Not Work With System 7* (if it doesn't already exist—this is the name of the folder created by the Compatibility Checker for suspect items). Drag any item not shown in Fig. 4-23 to this folder and restart your Mac. If it boots without a problem, you've isolated the cause.

Testing each item one at a time is the best method of determining which items are System 7 compatible. Select any item from the May Not Work folder and drag it into the System Folder. Restart the Mac. If it boots without crashing, you're past the first hurdle. If the item is a control panel device, double-click to open it and try out some of the options. If everything works as it should, the questionable item is probably compatible with System 7. We say *probably* because some software bugs appear only under certain circumstances, and you might not encounter them right away.

If you selected the recommended safety net strategy for installing System 7, the testing procedure is similar. Open the 6-System Folder and select **View by Kind**, which will group extensions and CDEVs in a list. Ignore any item that has the same name as one in Fig. 4-23. These are System 6 versions of Apple's system software—they won't work with S/7.

Look for items that don't already appear. Select all of the items you want to test by holding down the Shift key and clicking on each one. When your selection is complete, hold down the Option key and drag the it to the May Not Work folder. This will create a copy and leave the original inside the 6-System Folder. There are two benefits to this approach—working with a copy protects the original from corruption, and the System 6 folder remains intact so you can easily switch back using the folder "blessing" trick we described earlier.

Continue testing each item (one at a time) from the May Not Work folder. If an item causes a crash, remove it from the S/7 System Folder and make a note to contact the publisher for upgrade information. Remember that you must reboot after dragging an item into the System Folder—otherwise it won't be loaded and the test will be invalid.

Installing and testing desk accessories

If your desk accessories worked with System 6, it's likely they'll work with System 7. Installing DAs with S/7 is much easier than with earlier versions, which required the Font/DA Mover. Simply double-click a file containing desk accessories and it will open a Finder window, revealing the DAs stored inside.
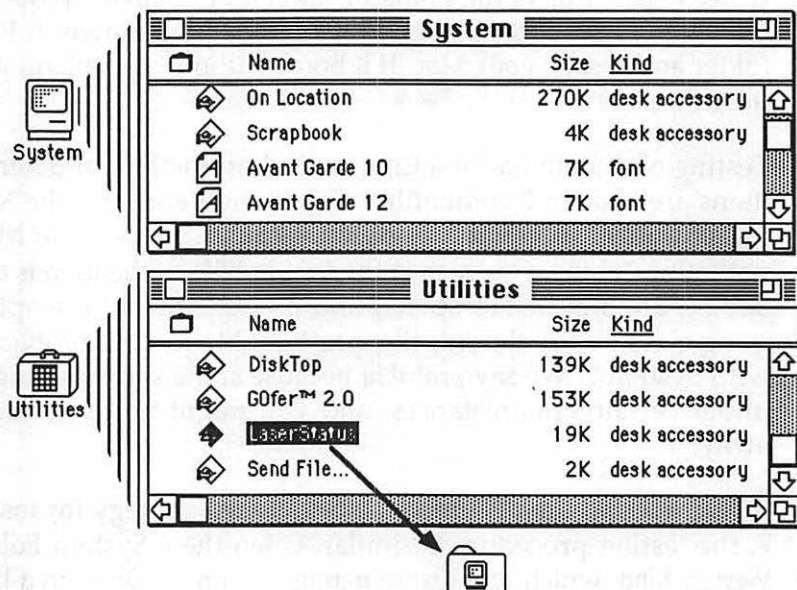

Figure 4-24. Opening a suitcase or the System file to move DAs

This technique works for both a suitcase file as well as your old S/6 System file (Fig. 4-24). To move the DA, click on its icon and drag it into the new S/7 System Folder. A dialog box (Fig. 4-25) will ask if you want to store it in the Apple Menu Items folder, so it will appear in the menu. Click **OK**, because you can always move it later if you want.

Desk accessories need to be stored in the Apple Menu Items folder in order to appear in the Apple menu. Put "LaserStatus" into the Apple Menu Items folder?

Cancel   OK
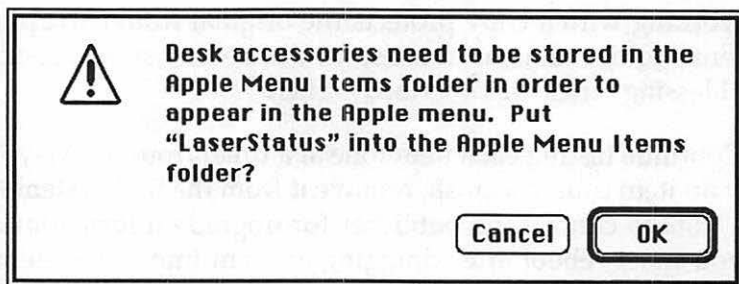
Figure 4-25. DA storage option dialog window

If you want to keep your old System or suitcase file intact, hold down the Option key before dragging an item to the new S/7 System Folder. This will keep the original in your S/6 folder, so you can revert if necessary.

Testing a desk accessory is simply a matter of opening it and trying its features. If you stored the DA in the Apple Menu Items folder, select it from the menu. Or, if it's stored in another folder, locate the icon and double-click to open it.

Testing application software

Neither the System 7 Installer nor the Compatibility Checker do anything to alter the location of your application programs, so they remain wherever you normally keep them. Testing is primarily a matter of trying out each program to see if it works with System 7. It's probably not practical to test every feature of your favorite applications, but there are a few key areas to consider:

Memory options before testing any application, make sure that System 7's new memory options are turned OFF. Open the Memory control panel and confirm that virtual memory and 32-bit addressing are **Off** (see Fig. 4-26). You can test with these features later, once you determine the program is "mostly" System 7 compatible.
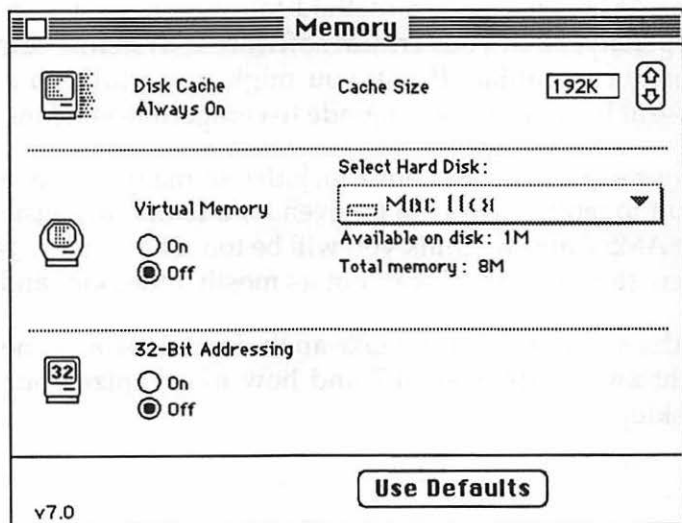
Figure 4-26. Memory control panel options turned off

Launch double-click the application to open it. If it launches without crashing or quitting unexpectedly, it passes the first test.

Printing   open a document that you previously saved while running System 6. If possible, select a document for which you have the print-out, so you can compare results with System 7. Select **Print** from the File menu and check the output against your previous version. You might notice some slight differences in page layout if your document includes fonts that are now TrueType. If your document doesn't include any TrueType fonts, it's a good idea to change a portion and try printing again. See Table 3-1 in chapter 3 for a list of TrueType fonts included with S/7.

These are only a few key areas to test with System 7. There could be some particular features in an application that won't work properly with S/7. You might not encounter these right away, or they could be features you never use. To play it safe, however, you should save your work often—which is a good idea no matter which version of system software you're using. That way, you won't lose much if you need to reboot.

Summary

In this chapter we've examined the role of system software and steps leading to a successful installation of System 7. If you've followed one of the recommended approaches, you should be ready to begin using the new AMS 7 and have a method to revert to System 6 if the need arises. Hopefully, all of your critical software is System 7 compatible, or at least mostly compatible. If not, you might need to keep a System 6 lifeboat close at hand until you upgrade to compatible versions.

In our experience, System 7 includes so many improvements that it's difficult to return to System 6—even for a temporary visit. We're addicted to the AMS 7 and we think you will be too. That's not to say that there aren't a few storms on the 7 seas, but its mostly blue skies and smooth sailing.

In the next chapter, we'll take an in-depth look at some things you can do right away with System 7 and how to organize your work on the new desktop.

Desktop navigation — A view from the bridge

Even if you don't yet have any System 7 savvy applications, there are many new features available as soon as you board the AMS 7. After installing System 7 and restarting your Mac, you'll feel right at home. Designers of the AMS 7 have taken great pains to preserve the familiar desktop metaphors. At first glance, disk icons, Finder windows, menus, and the trash all look much the same as before. On closer inspection, however, you'll begin to notice some subtle improvements.

In this chapter, we'll guide you through many of the new features available right out of the box. As we tour the AMS 7 desktop, you'll discover some of the clever innovations and learn new techniques for applying them. When you've completed this chapter, you'll be well prepared to tailor your own desktop for efficient navigation and even more of the famous Macintosh ease of use.

Finder 7.0—welcome to the bridge

As with prior versions, System 7's Finder provides the Mac's friendly desktop environment. Like the bridge on a luxury liner, the Finder includes a comprehensive array of navigational gear to keep the AMS 7 on course through all kinds of weather.

Empowering users with intuitive and flexible choices are key components of the Macintosh philosophy. As recent Apple television ads point out, computer power that can't be used is power you don't really have. The Finder's job is to deliver the Mac's power to the user, and System 7 fulfills that role in a simple and elegant fashion.

The new Finder augments the existing array of choices with a series of new tools that help you navigate the desktop in a swift and comfortable fashion. Enhancements include:

> **Finder windows**   enhanced list views, keyboard navigation, and
> subtle changes to actions such as clicking and dragging an icon.

The Find command faster, more powerful, and convenient; even pops open a Finder window with the targeted item selected.

Aliases a powerful new feature offering more convenient ways to access and launch items no matter where the original is located.

The new ⬢ menu immediate access to anything—programs, documents, and folders are added to the usual list of DAs.

The Macintosh has always been a model of flexibility, accommodating a wide range of personal styles. However you might want your desktop structured (or unstructured), the Mac can accommodate your taste. Finder 7 expands this tradition with additional features for organizing and customizing the desktop. New features include:

Customizing the desktop add color, labels, and custom icons to personalize your environment.

Startup folder automatically launches documents, programs, or opens a windows on startup.

Organization schemes are plentiful and made easier with the enhanced list views, aliases, and other new Finder features.

While added flexibility might appeal to an experienced user, it can sometimes be a dilemma for a Mac novice. The lack of a preordained structure can cause anxiety for some people who expect there to be a "right" way for things to work. At the end of this chapter, we've included some strategies for organizing a hard drive that provide a starting point for creating your own custom work environment. System 7 offers a wealth of new features for novice and expert alike—features that make navigation a breeze.

▦ Finder windows—the main deck

System 7 introduces significant improvements and alternate navigational routes, but the basic Finder window remains a common element and link to previous versions of system software.

Window components

System 7's windows look much the same as previous versions, but some new features have been added to the *title bar* and *zoom box*. Figure 5-1 illustrates the elements of a standard Finder window.

Title bar   Window title

Close
box   Zoom
                                                       box

⌷ Clip Art
5 items   🗂 Graphics   5 MB available
      Name   ⌷ Documents   e Label
                 ⌷ External 80SC k —   ⇧
  ⌷ Arrows
  ⌷ Borders   Scroll   14K —
  ⌷ Cars   bars   14K —
  ⌷ Cartoons   11K —   ⇩   Resize
                                                 box
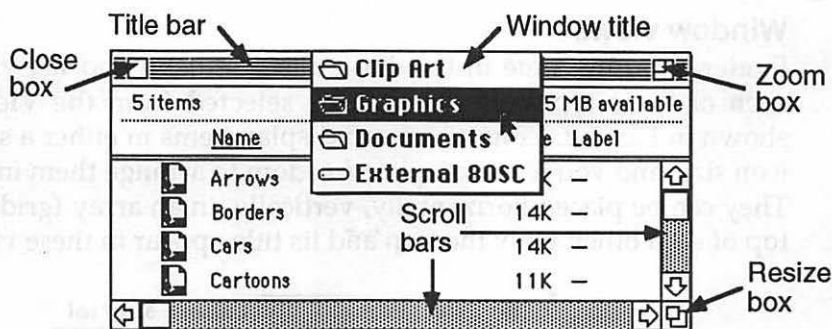
Figure 5-1. Finder window elements

Scroll bars haven't changed, but there are now three additional methods of scrolling an active window.

Alphabetic selection pressing an alpha key selects the first filename in the active window that begins with the character. If the selected item isn't visible, the window scrolls automatically to reveal it.

Directional selection arrow keys move the currently selected item in the direction of the arrow, automatically scrolling the window if the next item is hidden from view.

Auto-scroll when dragging a selected item or a marquee surrounding a group of items, the screen will also scroll automatically when the pointer reaches the edge of the window.

The *resize box* remains the same, but will not be required as often because of improvements to the zoom box. Built-in intelligence resizes the window only as large as necessary to fit all of the items, replacing the previous practice of zooming to full screen size. Holding the Option key down while clicking the zoom box forces a full screen view.

While the title bar appears the same, the *window title* is now an active element. Holding down the command key (⌘) and clicking on the title reveals a folder list similar to those found in Open and Save dialog boxes. The list displays the parental hierarchy of the window, as shown Fig. 5-1. Dragging to any folder name and releasing the mouse button will open a new window. Holding down both the Option and command keys will close the current window, while opening the new folder. Incidentally, holding down the command key while dragging a nonactive window by its title bar moves the window without activating it.

Window views

Finder window come in two basic flavors—icon and list views. Within each of these types, choices can be selected from the View menu, as shown in Fig. 5-2. Icons views can display items in either a small or large icon size, and you have complete freedom to arrange them in any fashion. They can be placed horizontally, vertically, in an array (grid), or even on top of each other. Only the icon and its title appear in these views.
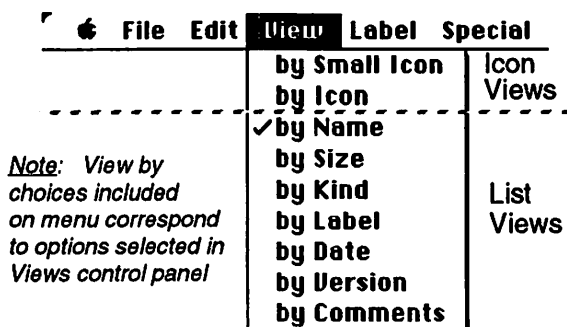
Figure 5-2. View menu options for Finder windows

On the other hand, list views show file details, such as size, kind, date, etc. In a list view, icons always appear to the left of their title and items are arranged vertically. The number of list view choices available in the View menu changes according to which options are selected in the Views control panel, as described below.

The Views control panel

The Views control panel (Fig. 5-3) is used in conjuction with the View menu to tailor the appearance of icon and list views. Various choices are available to match personal preferences or to suit a particular task. Changes take effect immediately for all Finder windows.

The Font for views section allows you to set the font and type size used for all icon names, file details, list view column headings, and window header information. Any font from the System file can be selected in sizes from 6 to 36 points. Standard sizes are listed in the pop-up menu (Fig. 5-3), but any whole number can be typed into the size box. System 7's TrueType font scaling makes any size look smooth on screen.

In addition to changing font characteristics, icon placement can be controlled with two other options in the Views control panel. Selecting the

Straight/Staggered grid option takes effect when one of the Clean Up commands is used or if the **Always snap to grid** option is on. Holding the command key (⌘) while dragging an icon will temporarily reverse the **Always snap to grid** setting.
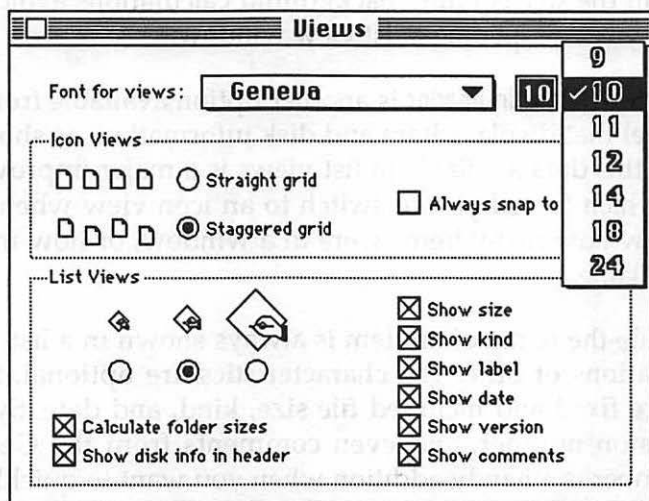
Figure 5-3. The Views control panel

The range of choices available for list views is much broader than those for icon windows. You can select from three different icon sizes (Fig. 5-4), as well as determine which file characteristics are displayed.
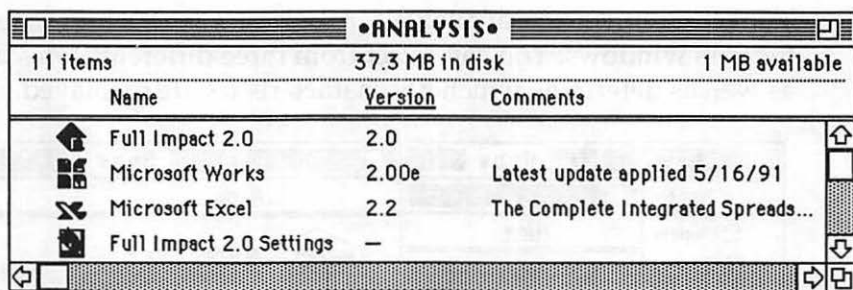
Figure 5-4. List view icon sizes

Calculate folder size is an option that wasn't available with System 6, and now enhances the value of list views. Computing folder sizes is performed in the background and updated while you continue to work on the desktop. As each folder size is calculated, it replaces the familiar dash (–) in the size column. Background calculations avoid a prolonged initial delay when opening a list view window.

Show disk info in header is another option available from the Views control panel that displays item and disk information, as shown in Fig. 5-5. Having this data available in list views is a major improvement over System 6, which forced you to switch to an icon view whenever you wanted to know how many items were in a window, or how much disk space was available.

While the name of an item is always shown in a list view window, combinations of other file characteristics are optional. System 6 list views were fixed and included file size, kind, and date. System 7 adds labels, version number, and even comments from the Get Info box. Version number is a handy addition when you want to quickly verify which software updates you have (see Fig. 5-5). This avoids the need to select each application individually and open its Get Info box.

▤□	•ANALYSIS•	⊞
11 items	37.3 MB in disk	1 MB available
Name	Version	Comments
🏠 Full Impact 2.0	2.0	
📑 Microsoft Works	2.00e	Latest update applied 5/16/91
✖ Microsoft Excel	2.2	The Complete Integrated Spreads...
🗒 Full Impact 2.0 Settings	—	

Figure 5-5. List view with version and comments turned on
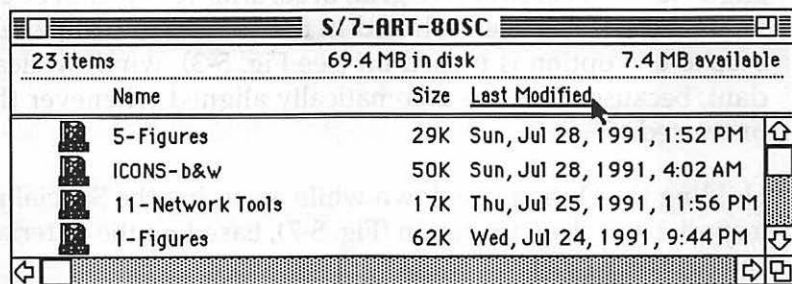
Customizing a list view with specific characteristics is a nice addition. For example, you might want to compare the dates of several documents. Simply turn off everything except the date field, and it will appear adjacent to the title. This technique reduces the risk of reading from the wrong line when the date appears at the opposite end of the window. Actually, it would be even better if you could control the order of the columns by clicking and dragging to reposition them. Another enhancement we'd like to see is the ability to alter the column widths, ideally by

clicking and dragging. Layout (see chapter 3) includes these features, so perhaps Apple's engineers will incorporate them in a future release.

List view windows

The ability to customize which columns appear in a list view has necessitated the addition of a horizontal scroll bar, as shown in Fig. 5-5. With all options turned on, the window width exceeds the capacity of all but the largest monitors. System 6 users will be pleased with this addition, because the lack of horizontal scrolling was a source of aggravation that diminished the value of list views.

With a list view window selected, there are two ways to alter the sort sequence. The most direct method is to simply click the column title, as shown in Fig. 5-6. After a brief delay, the window will be redrawn with items sorted by the column criteria.

S/7-ART-80SC		
23 items	69.4 MB in disk	7.4 MB available
Name	Size	Last Modified
5-Figures	29K	Sun, Jul 28, 1991, 1:52 PM
ICONS-b&w	50K	Sun, Jul 28, 1991, 4:02 AM
11-Network Tools	17K	Thu, Jul 25, 1991, 11:56 PM
1-Figures	62K	Wed, Jul 24, 1991, 9:44 PM

Figure 5-6. List view sorted by date

The alternate method is to select an option from the choices displayed in the pull-down View menu (Fig. 5-2). Because the View menu reflects characteristics activated in the Views control panel, it can also serve as a quick reference to which options are turned on.

Both the Label and Comments columns can be used to create a customized sort list. Label names are changed with the Labels control panel, and are limited to eight choices. Labels affect icons in every window, so it's generally better to use this feature when assigning universal values.

On the other hand, Comments provide an almost unlimited number of choices, and the impact can be limited to a single window. To create your own custom sort list, simply open the Get Info window for each icon and type a phrase, letter, or number in the Comments box. Results will be displayed alphabetically in a window sorted on the Comments field. The

only drawback is that Comments are lost whenever the desktop is rebuilt; a System 6 "feature" that unfortunately remains in System 7.

Under the heading of changes we'd like to see in future versions is a re-work of the View menu. Because list windows are more easily and directly changed by clicking on the column heading, why not alter the function of the View menu? Make it a quick-access method for toggling on and off each of the list view characteristics. A checkmark could signify an option is on. With the added power of list views, we often want to change options. In fact, to make access more convenient, we've installed an alias of the Views control panel directly in the ⚫ menu.

Clean up

The **Clean Up** command from the Special menu has been greatly improved and is more intuitive in System 7. The default **Clean Up Window** option aligns icons to an invisible grid, according to whichever choice (straight or staggered) has been selected in the Views control panel. If the **Always snap to grid** option is turned on (see Fig. 5-3), window cleanup is redundant, because icons are automatically aligned whenever they are moved or created.

Holding the Option key down while accessing the Special menu provides a specialized clean up action (Fig. 5-7), based on the criteria most recently selected in list view.

```
┌─────────────────┐
│ Special         │
├─────────────────┴──────────┐
│ Clean Up Window │          ┄ ┄ ┄ ┄ ┄ ┄ ┄ ┄ ┄
├─────────────────┴──────┐
│  Clean Up by Name │     │   Hold down the
│   Clean Up by Size │    │   option key while
│    Clean Up by Kind │   │   selecting the
│ Eje│ Clean Up by Label │ │   Special menu
│ Erase│  Clean Up by Date │
│      │   Clean Up by Version │
│ Restart│  Empty Trash │
│ Shut Down│
```
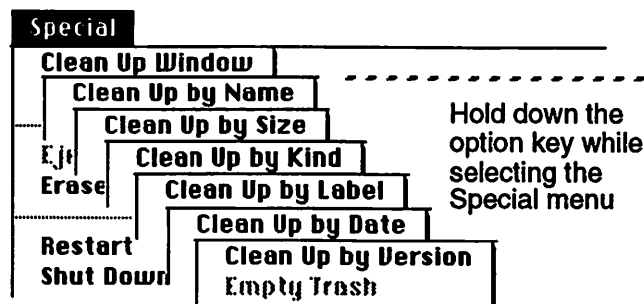
Figure 5-7. Clean Up by... commands

Clean Up by Name arranges icons in alphabetical order, left to right and top to bottom. To organize an icon view window according to one of the other choices, first select the corresponding list view and then revert to an icon view. With the icon window selected, hold down the Option key,

open the Special menu, and choose the **Clean Up by...** command. Icons will be arranged by name, size, kind, etc.

Clean up operations are now "smarter" than they were in System 6. File-name lengths are automatically taken into account in any of the clean up commands. Whenever a filename might overlap an adjacent item, a spot on the invisible grid is skipped so that all filenames are easily readable. The new function is even clever enough to fill in gaps with items that have short titles, as illustrated below in Fig. 5-8.
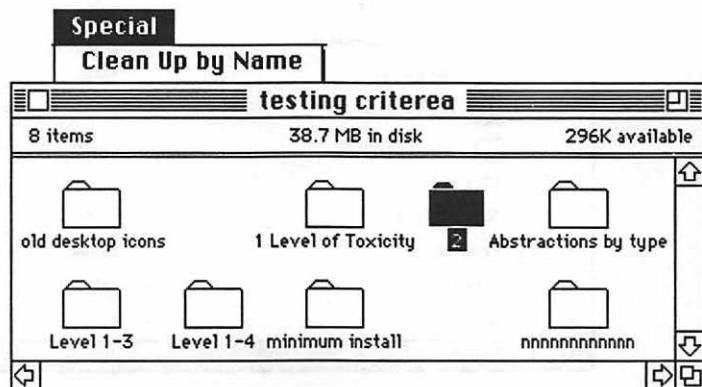
Figure 5-8. 'Smart' clean up

Clean up commands also adjust for the size of the window. Icons are arranged according to the width of the window. This feature can be combined with "smart" zoom to make window and icon arrangement nearly trouble-free. Size the window horizontally, choose **Clean up** from the Special menu, and then click the zoom box to conveniently show as many icons as possible.

Cleaning up a selected group of icons (rather than the entire window) is now available by holding down the Shift key while accessing the Special menu. It functions the same as it did with prior versions of the Finder.

Outline views

The outline feature is the most powerful addition to list views. Although this feature is referred to as "outline views," it is not a separate view at all, just a different way of using list views. Rather than opening up new windows to display the contents of folders, you can expand the outline in

list view, as shown below in Fig. 5-9. With this feature, you can even view the entire contents of a disk in a single window.
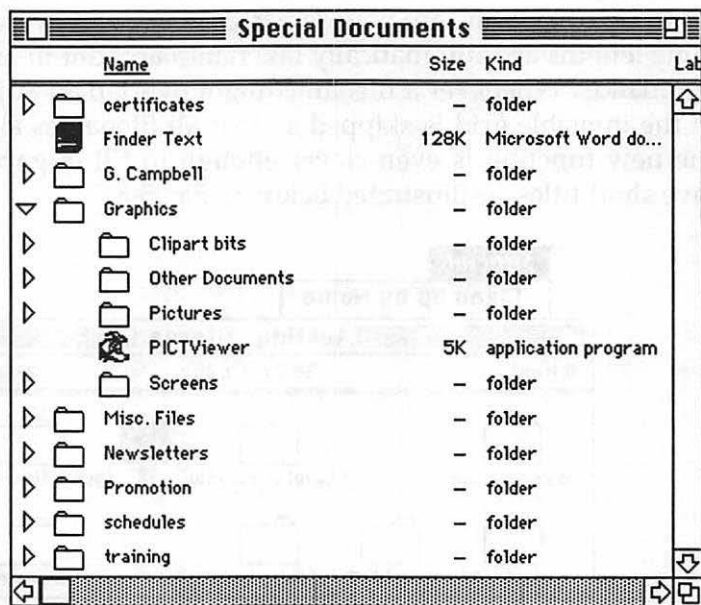
Figure 5-9. Outline list view

Each folder in a list view has a small triangle to the left of the icon. Clicking on a triangle displays the contents of the folder in an indented format, and flips the triangle so it points down. Clicking a downward-pointing triangle will close the folder, hiding its contents from view.

Outline views provide a simple mechanism for selecting multiple items from different folders, using the standard Shift-click technique. Selected items can be opened or moved in a single action. This feature combined with the auto-scroll capability makes it easy to move a file or folder between disparate sections of the window. Simply drag the selection to the top or bottom edge of the window toward the destination folder. The window will automatically scroll until the target folder is in view. Release the mouse button with the pointer *over the folder icon*—not inside an open folder. This is especially important because dropping a selection among items inside the folder does *not* produce the expected result. Rather, items will end up at the root level of the main window.

Holding down the Option key when clicking a folder arrow will expand the entire branch—not just the folder itself, but all of the folders inside down to the lowest level, as illustrated below in Fig. 5-10.
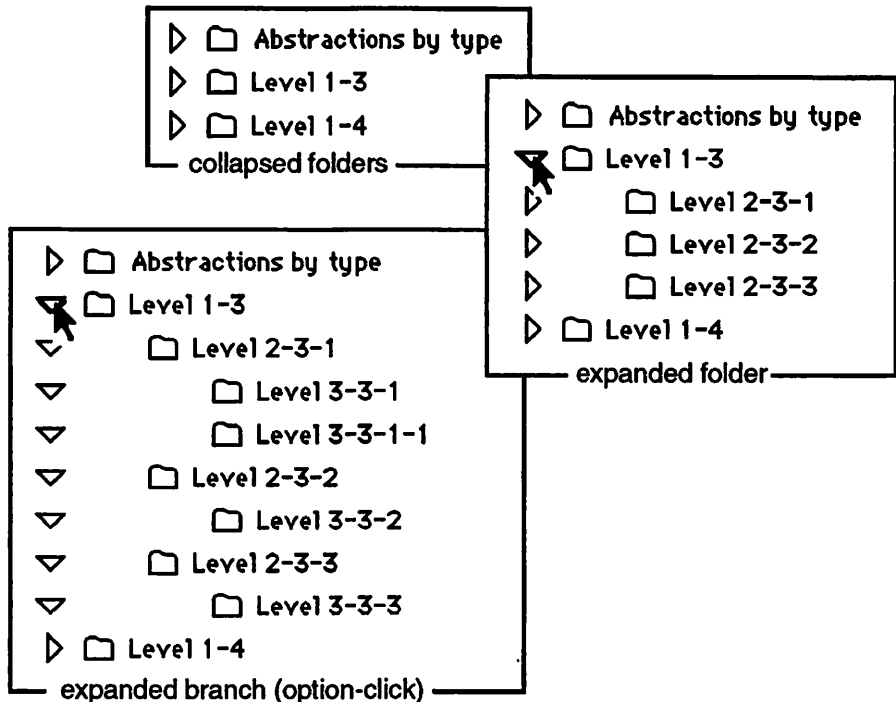
Figure 5-10. Expanding folders with the mouse

You can also use the keyboard to expand and collapse folders, as indicated in Table 5-1.

Table 5-1. Keyboard control of folders in outline view

Key	Action
⌘-right arrow	expand folder
⌘-left arrow	collapse folder
⌘-Option-right arrow	expands the selected folder and all folders contained inside it
⌘-Option-left arrow	collapses the selected folder and all folders contained inside it

When multiple folders are selected, keyboard commands will affect all of them. In contrast, clicking on an expansion triangle affects only that specific folder, regardless of how many folders are selected at the time.

Tips for using outline views

Occasionally, an outline view will contain too many open folders. A quick method for returning to a top-level view is to select one of the icon options from the View menu, and then reselect the list view. All folders will be collapsed to the same level displayed in the icon view. However, if you then open a previously expanded subfolder, you'll notice that lower levels remain expanded.

A quick method for expanding all folders at once is to **Select All (⌘-A)** and then ⌘-right arrow. The process could take several minutes for a large hard disk with many files, but it can be cancelled at any point with ⌘-period. The result is a complete directory of your hard drive, which can then be printed using the **Print Window** command from the File menu. When printing the directory, you might want to change the list view to display only the name, size, and date fields, which typically will fit on a portrait page layout. **Select All (⌘-A)**, followed by ⌘-Option-left arrow will collapse the listing when you've finished printing.

Outline views offer many more possibilities, especially when used in conjunction with aliases, labels, and the Find command. Later in this chapter, we'll review some additional techniques using outline views.

Window memory in list views

Icon views have always "remembered" the location of items, so that when a closed window is reopened its contents remain in the same position. System 7 extends this "memory" to list views, including the ability to display outlines to the same level set when the window is closed. List memory also returns to the same vertical location, which overcomes another source of frustration with earlier versions. In System 6, each time a list view was reopened, it was reset to the top of the list. System 7 remembers the location of the vertical scroll bar, but will reset the horizontal position to the left margin of the window.

There is one more automatic feature of outline views that might surprise you the first time you notice it. The Finder will not permit two simultaneous views of the same folder. For example, suppose a folder is expanded in an outline view, and you double-click to open it. The outline view will

automatically collapse as the folder window zooms open. This is necessary to prevent a possible paradox, such as attempting to select and act on an icon in an active window, while the same item is displayed in a different view.

Keyboard navigation
System 7 adds the ability to select icons, open windows, and access the desktop from the keyboard. Table 5-2 lists the various keyboard navigation methods available with System 7.

Table 5-2. Keyboard navigation commands

Key	Action	Notes
Up arrow	Select item above	
Down arrow	Select item below	
Left arrow	Select item to left	Icon view and desktop only
Right arrow	Select item to right	Icon view and desktop only
Tab key	Select (alphabetically) next item in active window	
Shift-tab	Select (alphabetically) previous item in active window	
Character key (a, b, c, etc.)	Select (alphabetically) first item in active window	Letters, numbers, or special characters
⌘-up arrow	Open/activate select parent window/icon	Option closes current window; selecting an icon makes the desktop active
⌘-down arrow	open/activate selected item's window	Option closes current window
⌘-Shift-up arrow	select startup disk	

As with any Finder navigation method, holding down the Option key while opening a new window will close the current window. Note also that the Shift key will not extend the selection while using keyboard navigation.

Marquee selection

Although marquee dragging is not a new method, it has been modified in two ways to make it much more functional.

The first change is readily apparent the first time you use a selection marquee. Items are highlighted as soon as they are touched by the marquee, which makes it much easier to discern which icons are included in the group. With a set of items already selected, dragging with the Shift key down will remove icons from the selection. This "reverse marquee" technique was available in System 6, but is now more obvious because deselected icons lose their highlight as they are included within the marquee.

The marquee now works in a list view window, as well as with icons. This causes some other changes in list views; notably that you can no longer click, double-click, or drag anywhere on the line of an item. White space around icons and file details is reserved for the marquee.

Window activation

One of the subtle improvements in System 7 is the way windows behave when dragging an icon between them. With System 6, holding down the mouse button immediately activated the item's window. Unfortunately, this action could conceal the destination window (see Fig. 5-11), making it impossible to complete the move without rearranging the windows.
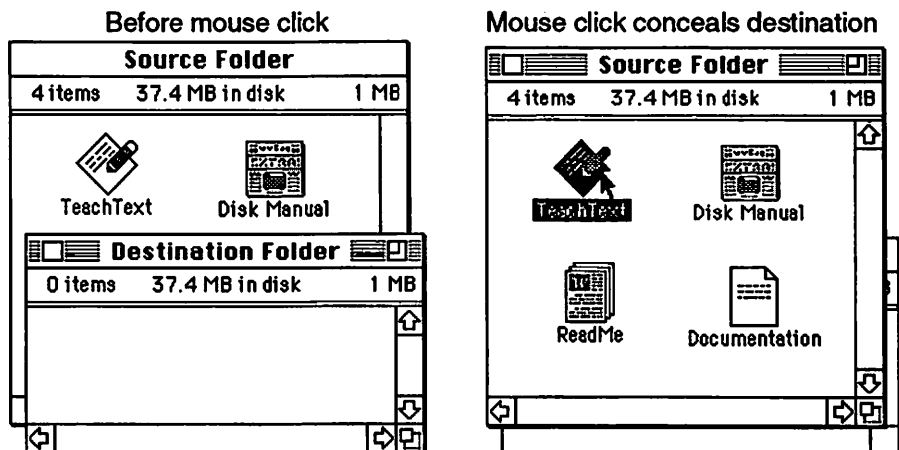
Figure 5-11. System 6 click and drag between windows

System 7 overcomes this problem in a simple yet subtle way. When dragging an icon, the active window remains unchanged until the mouse but-

ton is released. This allows you to select an item from an inactive window and drag it to another window, as illustrated below in Fig. 5-12. Because the source window is no longer activated when the mouse button is pressed, it remains inactive and doesn't conceal the destination window. Incidentally, if you need to reposition an inactive window, simply hold down the command key (⌘) before dragging and it will remain inactive.
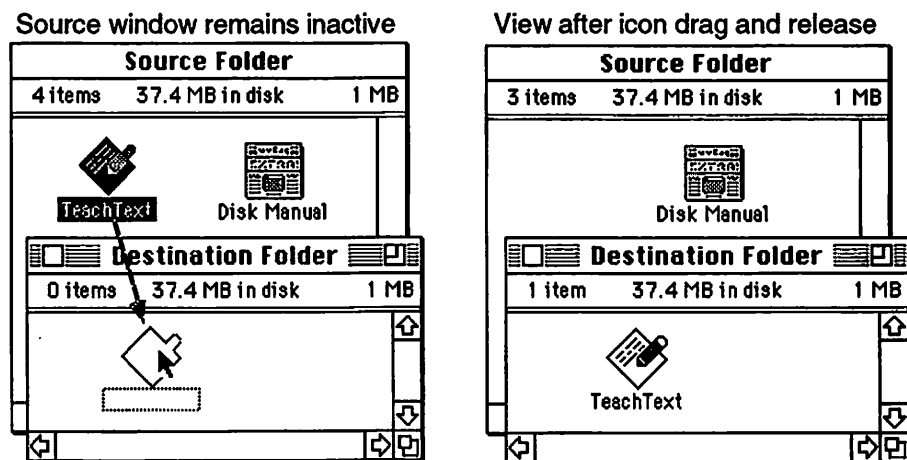
Figure 5-12. System 7 dragging an icon between windows

Editing an icon title

Clicking directly on an icon title will open the filename for editing, which overcomes another System 6 problem. Previously, it was too easy to accidentally rename an item because the title was "live" whenever the item was selected. No longer true with System 7, you must specifically click the title area to activate editing. An active title is surrounded with a box. When the box is missing, only the icon is selected.

After clicking the title area, there is a slight delay while the Finder waits to see if a second click occurs, signifying you want to open the item. A quicker way to select the title is from the keyboard by pressing Return or Enter, and then begin to type. Another method for overcoming the delay is to move the mouse slightly, which tips off the Finder that you don't intend to double-click. Incidentally, these changes were also required to enable selecting an icon from the keyboard by keying the first character in the title.

Activating the desktop

With MultiFinder operating in System 6, it was possible to switch from an application to the desktop by clicking on a Finder window or disk icon, but not the desktop itself. System 7 makes the desktop background a "live" element, so that clicking anywhere on it will activate the Finder.

The Find command

System 7's new **Find** command comes in two flavors—simple and *more choices*. A simple **Find** (⌘-F) searches all mounted disks for a filename containing text matching the criteria entered in the dialog box, shown in Fig. 5-13. Text can be entered from the keyboard or pasted from the clipboard. The search will display the first item it encounters where the the text matches any portion of the name.

```
┌─────────────────── Find ───────────────────┐
│                                             │
│  Find:  │System 7                        │  │
│                                             │
│  ┌───────────────┐     ┌────────┐ ┌───────┐ │
│  │ More Choices  │     │ Cancel │ │ Find  │ │
│  └───────────────┘     └────────┘ └───────┘ │
└─────────────────────────────────────────────┘
```

```
┌─────────────────── Find ───────────────────┐
│                                             │
│  Searching on "External 80SC"...            │
│                                             │
│  ▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨      ┌────────┐         │
│                          │  Stop  │         │
│                          └────────┘         │
└─────────────────────────────────────────────┘
```

```
┌═════════════ File Sharing ═════════════┐
│  2 items     37.7 MB in disk     745K  │
│                                        │
│    ♉              ♉                    │
│  System 7.0 PDF   AdvUser Techs PDF    │
└────────────────────────────────────────┘
```
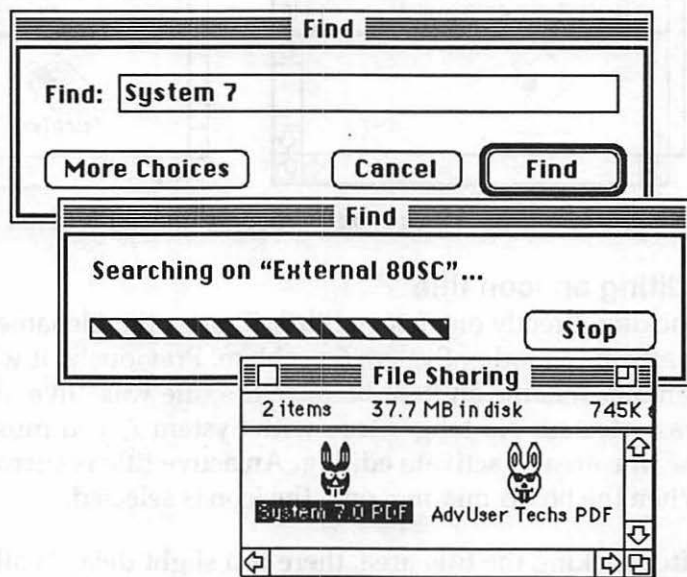
Figure 5-13. Simple Find dialog box and result

A window containing the "found" item automatically pops open on the desktop, with the matching file selected (Fig. 5-13). Because there could be many filenames that include the same text, you might need to continue the search. Simply select **Find Again** (⌘-G) from the File menu to locate the next match. The Finder assumes its first try wasn't the one you were seeking and closes the first window (unless of course, the next match is

also in the same window). **Find Again** will continue to locate items until all possibilities are exhausted, which is signalled by a beep.

The simple **Find** command is most useful when you know enough of the filename to locate it within a few tries. If it takes more than 3 or 4 passes, you might consider using the **More Choices** option to narrow your search.

Find with more choices

Clicking **More Choices** in the simple Find dialog box opens up a whole universe of possibilities to narrow a search. One these is to limit searching to a specific disk or selected group of folders, as shown in Fig. 5-14.
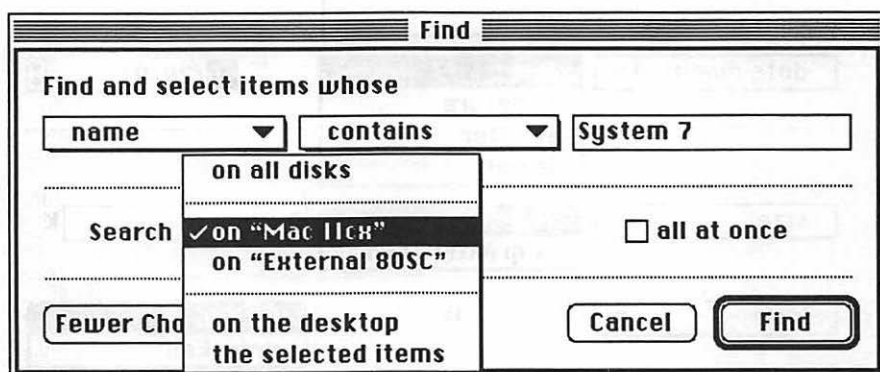
Figure 5-14. More Choices dialog box showing pop-up menu of where to search

Pop-up menus make it easy to determine the range of choices available for each of the fields (Fig. 5-15). Options in the second and third column will change, depending upon which item is selected from the first menu on the left.
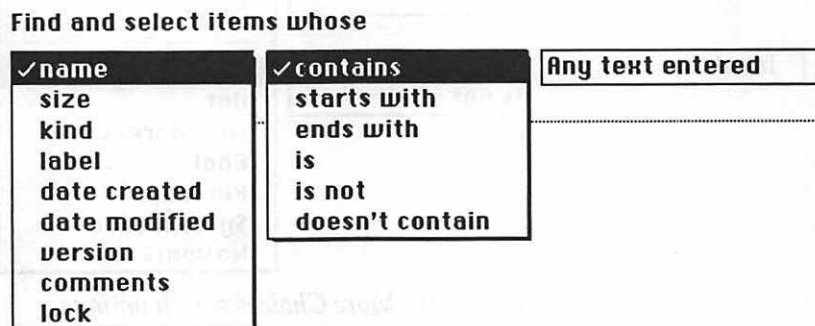
Figure 5-15. Range of choices available with simple text match

Each search criteria offers a different range of choices, as illustrated below in Fig. 5-16. To construct a search, simply select the menu choice and enter the appropriate text or values in the third column.

Find and select items whose

| kind ▼ | ✓contains | document | alias application ✓document folder stationery |
| | doesn't contain | | |

| date created ▼ | ✓is
is before
is after
is not | 6/29/91 ⬍ |

| date modified ▼ | ✓is
is before
is after
is not | 6/29/91 ⬍ |

| size ▼ | ✓is less than
is greater than | 0 ___ K |

| lock ▼ | is | ✓locked
unlocked |

| comments ▼ | ✓contain
do not contain | Enter search text |

| version ▼ | ✓is
is before
is after
is not | Enter version no. |

| label ▼ | ✓is
is not | None
✓Essential
Hot
In Progress
Cool
Personal
System CDEU
Network CDEU |

Figure 5-16. More Choices search options

Many of the options outlined in Fig. 5-16 can be used to locate a group of items. For example, finding all documents modified in the last few days, could be used to identify which files on a hard drive need to be backed up. When a search is expected to produce a group of items, it's faster and easier to use the **all at once** option.

All at once searches

Selecting the **all at once** option will simultaneously locate all items matching the search criteria. If the items are contained in more than one folder, the Finder will automatically open an expanded outline window with each file selected, as shown below in Fig. 5-17.
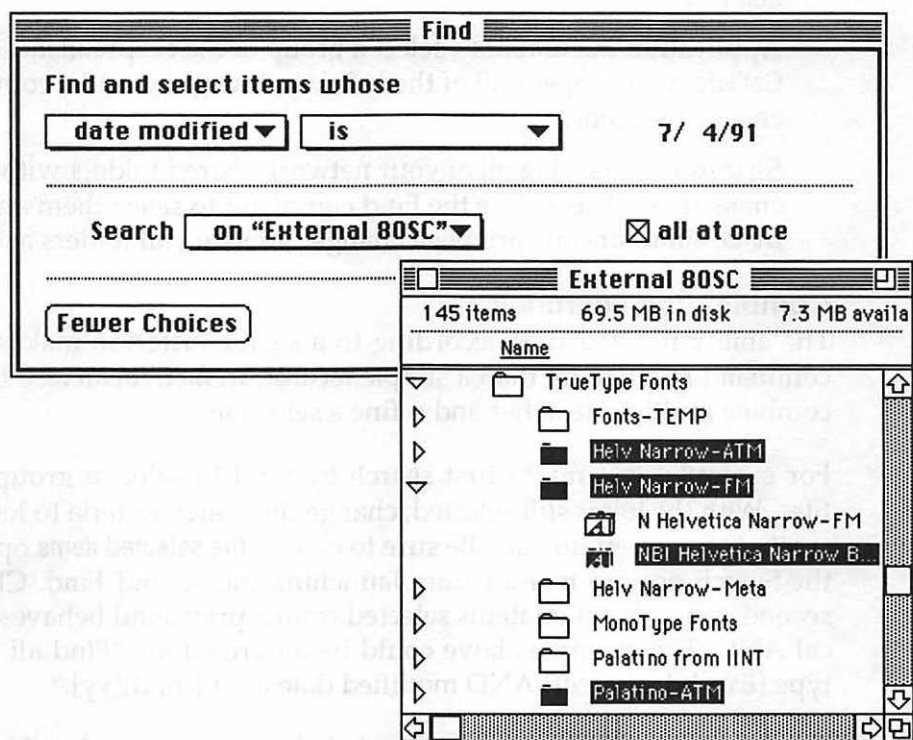
Figure 5-17. Results of an "all at once" search

When the **all at once** option is selected, the search is limited to a single disk or group of items. Nonetheless, this is an extremely powerful and useful option.

Tips for using all at once searches

Using the **all at once** search capability, you can:

Archive old documents   find all documents modified before a certain date, back them up to a floppy, and remove them from your hard drive.

Application aliases   choose **kind contains application program,** make an alias of all selected items, and drag them to an Applications folder or to the desktop for quick launching.

Labels   apply a "hot" label to all the documents you've created in the last week.

Application documents   select a group of Excel spreadsheets, choose **Get Info** (which opens all of the Info windows) and add a comment or change the icons.

Shared folders   tag all of your network shared folders with a special character such as ~. Use the Find command to select them and then make simultaneous privilege changes affecting all folders at once.

Combination searches

The ability to *select* files according to a search criterion makes the Find command much more than a simple locator. In fact, it can also be used to combine multiple searches and refine a selection.

For example, you might first search by kind to select a group of Excel files. With the items still selected, change the search criteria to locate those created after a certain date. Be sure to choose **the selected items** option from the Search pop-up menu before launching the second Find. Choosing a second search to act on items selected from a prior Find behaves as a logical AND. The example above could be described as: "Find all files with type [Excel document] AND modified date after [m/d/yy]."

The Find command can be immensely helpful in locating lost files or even selecting groups of files with shared characteristics. But its real strength is its ability to work with other new Finder features, such as aliases, labels, and the menu.

Aliases

An alias is a small file (1K to 3K) that substitutes for an original item. You can create an alias for virtually any Mac icon—an application, a document, a folder, a control panel, and even a disk. Aliases retain many of the characteristics of the item they represent, but are indeed separate files. For example, double-clicking an alias opens the original file. On the other hand, changing the name of an alias does not alter the name of the original, and trashing an alias does not destroy its parent.

Aliases are easily distinguished because their titles always appear in *italic* typeface. Otherwise, they appear identical to their original, sharing the same icon and behaving much the same. For example, dragging an item into a folder alias will place it in the original folder, as shown in Fig.5-18. Double-clicking a folder alias will open the original; you can't actually open the alias because there's nothing inside.
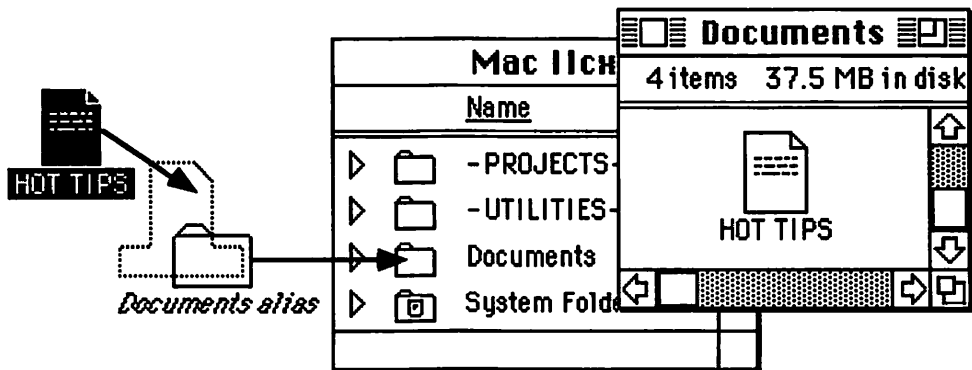
Figure 5-18. Dragging an item into a folder alias stores it in the original

How an alias works

The alias file is actually a pointer to its original. The new System 7 Finder automatically updates the alias pointer whenever the original item is re-named or moved. About the only way to break the link between an alias and its parent is to trash the original.

When you double-click an alias, the Finder checks the pointer information, locates the original, and then opens it. Similarly, dropping an icon on a folder alias causes the Finder to search out the original and place the item inside (Fig. 5-18). Fortunately, the Finder is able to rapidly locate an original so there is no perceptible delay.

The pointer information stored in an alias can perform some rather remarkable feats. For example, opening an alias of an item stored on a floppy disk will cause the Finder to prompt you to insert the disk. The alias actually "remembers" the title of the disk and asks for it by name. Perhaps even more remarkable is the ability to mount a file server volume using an alias—a very handy trick that eliminates the need to use the Chooser. Simply make an alias of the file server and store it on a disk. Whenever you double-click the alias, the Finder will locate the server and prompt you for the logon procedure (assuming of course, that your Mac is connected to the network).

Locating the original of an alias is easy. Simply open its Info window with **Get Info** (⌘-I) and click the button labeled **Find Original**. The Finder tracks down the original from the pointer information and opens a window to reveal its location, as illustrated below in Fig. 5-19.
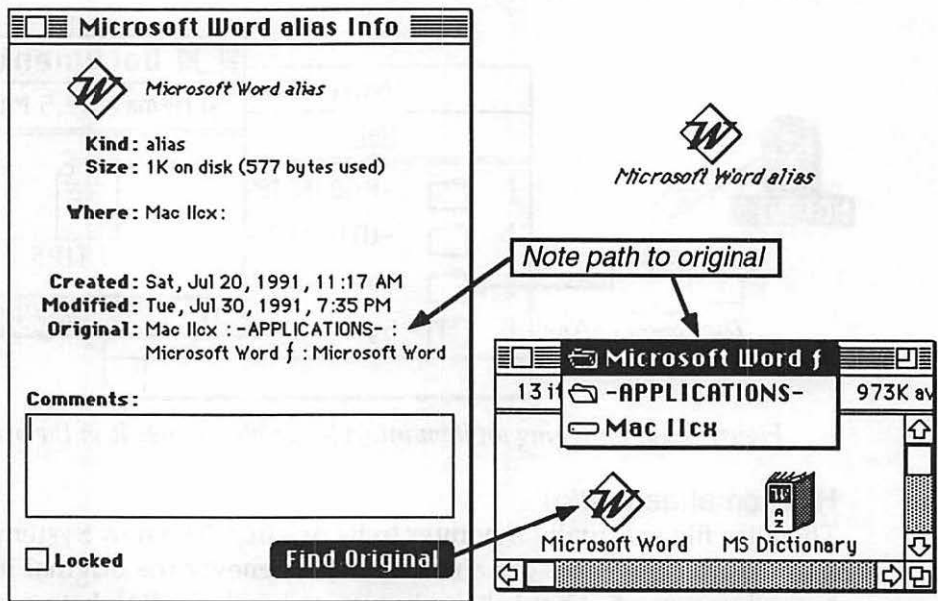
Figure 5-19. Locating the original of an alias

Pointer information describing the pathway to the original is displayed in the Info window. Holding down the command key (⌘) and clicking on the window title of the original will also show the path of nested folders leading to the original.

Creating an alias

You can create an alias of a single item or several items at once. Simply select the item or items and choose **Make Alias** from the File menu. There is no command key equivalent unless you use a utility program to modify the Finder menus (see chapter 6). A new item appears in the window with the same icon and name as the original, except the suffix *alias* is added to the title (Fig. 5-20).
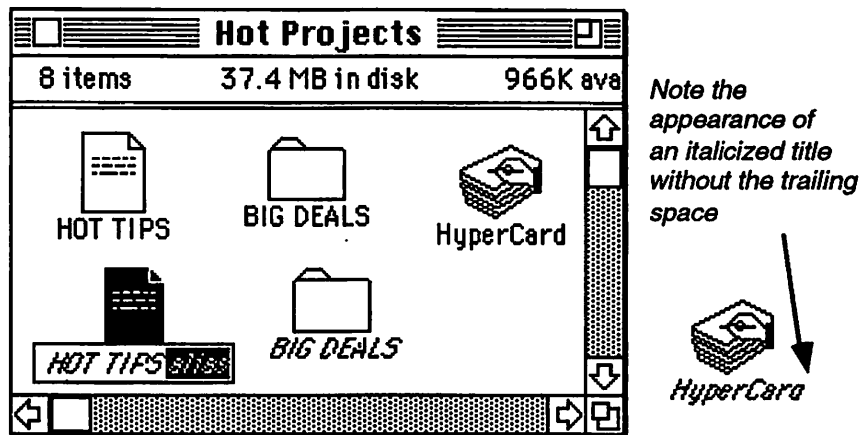
Figure 5-20. Making aliases and renaming them

You can eliminate the suffix by dragging through *alias* and pressing delete (Fig. 5-20). The Finder will not permit two items with the same name in a single folder. However, with a little care in selecting the suffix, you can leave the space that follows the original name. This not only makes the two names (slightly) different, it also makes the italicized title easier to read, as illustrated above in Fig. 5-20.

Multiple aliases of an item can be created and stored in different locations. For example, you might want to create several aliases of the trash can and store them inside folders with your documents. This makes it easy to discard an item without returning to the desktop or rearranging windows if the Trash icon is concealed.

Aliases can be moved, copied, and stored just like any other file. A copy of an alias will also point to the original. Consequently, when you want multiple aliases of the same item it might be easier to **Duplicate (⌘-D)** an existing alias rather than create a new one. To save effort, make duplicates after you've renamed the alias the way you want it to appear.

Using aliases

Aliases are an intriguing new feature with System 7. There are so many possibilities that we suspect new ideas will continue to emerge for a long time to come. We'll describe a few uses we've discovered or learned from other users, and we hope these will stimulate you to explore yet more ways of applying this fascinating new feature.

Perhaps the most obvious and useful idea is to create a "remote control" launch button for your applications. Many programs include support files (dictionaries, help files, etc.) that typically must be located in the same folder as the application. Moving the original to the desktop for easy access breaks the link to its support files. However, making an alias of the program and storing it on the desktop solves the dilemma. Double-clicking the alias will launch the application while it remains happily stored along side of its support files, nested neatly inside a main folder.

Application aliases on the desktop can serve another purpose, one that takes advantage of a new System 7 feature. If the original program can open a generic document (such as a text or pict format), then so can the alias. Simply drag the document over the alias icon for automatic launch.

Of course, application aliases need not be stored on the desktop. If you prefer, they can be located either directly inside the Apple Menu Items folder or nested in an Applications folder for quick access from the menu. Another handy place for an application alias is inside a project folder. For example, you might want aliases of your favorite draw, word processor, and page layout programs stored with your monthly newsletter files.

Another common use of aliases is to cross reference documents. For example, a project folder might be the most convenient place to store a group of related documents. When a project extends over several weeks or months, you might also want a chronological record. Simply make an alias of each document and store it in a "chron" folder, organized by date.

Document aliases can also come in handy on a network. If you have a file that is shared by several people, create an alias of the document and allow others to copy the alias to their Macs. That way, they will open the latest version even if you've renamed the original.

Navigating with aliases

Aliases can provide an efficient way to navigate between deeply nested folders. For example, after launching an application that is stored several layers down, you might want to open an existing document or later save your work. Unfortunately, the save and open dialog boxes will default to the folder where your application is stored. You could keep your work files directly in the application folder, which was commonly done in System 6. However, by using folder aliases you can quickly move to another location without having to return to the desktop and work your way back down another folder hierarchy.

Figure 5-21 illustrates a typical situation. The Canvas program is nested three levels down within the main applications folder, while the work files are neatly organized four levels deep in the projects folder.
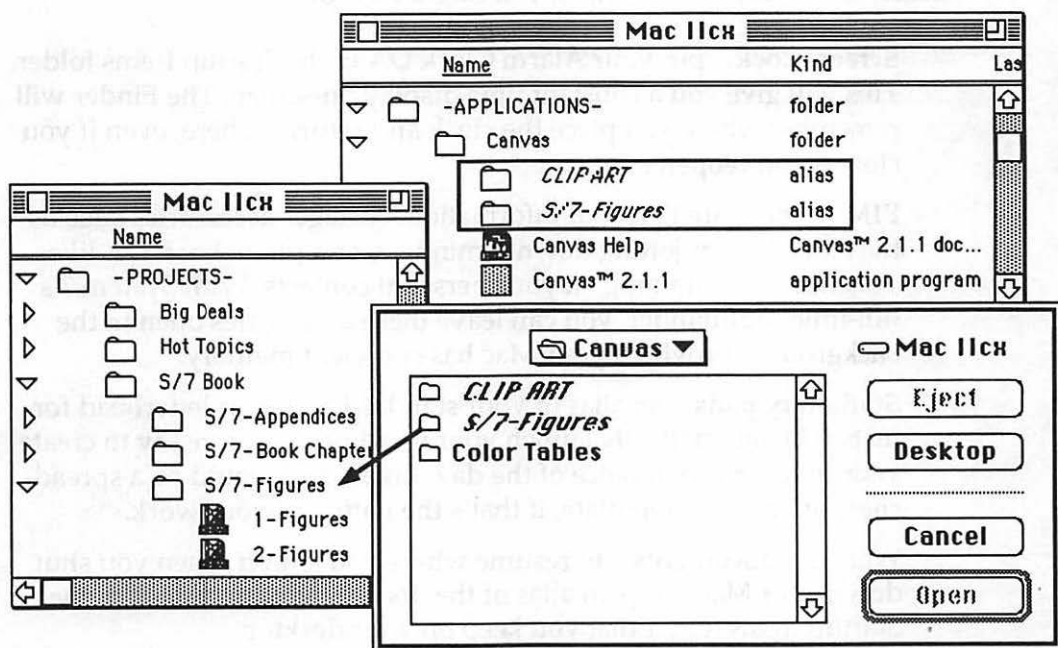
Figure 5-21. Using a folder alias in a dialog box for direct navigation

Rather than manually navigate this folder maze, it is much easier to create an alias of the S/7-Figures folder and store it in the Canvas folder. When using the Open and Save dialog boxes, the folder alias appears in the selection window. Simply double-click or open the folder alias and you're instantly transported to where your documents are stored.

Startup items

The Startup Items folder is one of the newly designated icons found in the S/7 System Folder. Any items stored in this folder automatically launch each time you start your Mac. To prevent startup items (and extensions) from launching at boot time, hold down the Shift key.

Startup items can be applications, documents, desk accessories, or control panels. In most cases, you'll probably want to store an alias in the Startup Items folder rather than the original. This will maintain your normal organization scheme, keeping programs and documents stored where you would usually look for them.

Candidates to consider for the Startup Items folder include items you use nearly every day. For example, you might include:

Screen clock   put your Alarm Clock DA in the Startup Items folder. This will give you a constant time display on-screen. The Finder will remember where you place the clock and return it there, even if you close it and reopen it later.

PIMs   these are Personal Information Manager accessories such as the Note Pad for jotting down reminders, or a phonebook DA like TouchBASE containing all your personal contacts. With System 7's full-time MultiFinder, you can leave these accessories open in the background, provided your Mac has sufficient memory.

Stationery pads   an alias of your standard memo or letterhead formats will automatically launch your word processor, ready to create your first correspondence of the day. Likewise, it could be a spreadsheet or database template, if that's the nature of your work.

Working documents   to resume where you left off when you shut down your Mac, drop an alias of the document into an alias of the Startup Items folder that you keep on your desktop.

Special events screens   most screen blankers and desktop background utilities allow you to select a particular image or pattern. Keep an alias in the Startup Items folder, and you'll be able to change it to suit your mood for the day.

Standard windows   if you normally close all of your windows at the end of a work session using Option-click on a close box, you might want to reopen a standard configuration at boot up. Make an alias of

your hard drive(s) or specific folders and include them in the Startup Items folder.

Because startup items are launched in alphabetical order, rename the alias of the item you want active at startup conclusion to be last in the list.

The new Apple menu

System 7's ⬢ menu is one of its most versatile new features. At first glance, it might appear the same, but its function has been greatly expanded. While the old menu was limited to a series of desk accessories (unless modified with a third-party utility), the new ⬢ menu can include any item—programs, folders, or documents.

To install an item in the ⬢ menu, simply drag it (or an alias) into the Apple Menu Items folder, which is another of the newly designated locations inside the System Folder. The new item will immediately appear in the menu—no need to reboot for the change to take effect.

Desk accessories

DAs can still be included in the ⬢ menu, but it's no longer necessary. System 7 treats DAs the same as any application program once they are removed from their suitcase icon (see chapter 4, Installing and testing DAs). Open desk accessories appear in the Applications menu along with any other programs that are currently launched. Closing a DA (usually by clicking the close box) is the same as quitting an application program, and removes it from the Applications menu.

Reflecting the new status of DAs, System 7 engineers created a special set of icons for standard Apple desk accessories. However, most old DAs will appear with a generic icon, as shown below in Fig. 5-22.

Desk Accessory icon   Application icon

Figure 5-22. Generic program icons

DAs can still be installed in an application (see chapter 6, Font/DA Mover 4.1), which means they will appear in the ⬢ menu only when the program is active. Typically, this isn't a requirement, but it could be beneficial when menu space is limited.

Candidates for the menu

Items in the menu are always available from the desktop or while operating in an application program. Consequently, the best candidates for inclusion are those that require frequent or immediate access.

The principal limitation is real estate. Although the new menu can accommodate a large number of items, it's not without a tax on efficiency. On a 13-inch monitor, 22 items will fit before you're forced to scroll below the screen to find those at the bottom of the list. That might seem like a lot, but it can be quickly consumed with the new menu's flexibility.

While DAs have traditionally appeared in the menu, it is no longer a requirement, and in fact some DAs might be better placed elsewhere. For example, the Alarm Clock could be included in the Startup Items folder, as suggested earlier. Less frequently used desk accessories might be organized in a DA subfolder, included in the main Apple menu. This approach requires one additional access step, but DAs would remain available at all times. You can even eliminate the extra step with Now Software's new S/7 savvy NowMenus™, which automatically displays the contents of subfolders in a hierarchical list view for immediate access.

As with other organizational issues on a Mac, the final decision is mostly a matter of personal preference. However, you might want to consider the following suggestions:

Almost startup items   anything you thought about putting in the Startup Items folder, but didn't quite include.

Basics   *must haves,* such as Chooser and Control Panel folder aliases.

Applications   aliases of the 2 or 3 applications you use daily.

PIMs   Personal Information Manager accessories such as calendars, phonebooks, and notepads.

DAs   stick to high-use accessories, such as the Calculator, Scrapbook, and Key Caps. Store others inside a DA subfolder in the menu.

Documents   aliases of frequently used templates or stationery pads. Store the originals in the folder where you'll be saving the actual documents. For example, store letterhead in your correspondence folder.

Folders aliases   of the Apple Menu Items folder and the Startup Items folder, for quick access to add or delete items.

Control panels aliases of frequently accessed CDEVs such as Views (a must for changing list view attributes). Other possibilities include Startup Disk (for switching between S/6 and S/7), Memory (for turning VM and 32-bit mode on/off), or File Sharing Monitor (if your Mac is accessed by others).

Items that aren't needed as frequently but still require convenient access can be grouped in subfolders such as APPs, DAs, Templates, and Documents. Typically, these folders would contain aliases (except for the DA folder), and be stored inside the Apple Menu Items folder.

Organizing the menu

Items included in the menu will appear in alphabetical order, which would normally intermingle applications, folders, DAs, and control panels. However, it's possible to group similar items together, as illustrated below in Fig. 5-23. A grouping scheme makes it easier to locate items.

Using special characters to prefix items, you can control where they appear in the menu.

In Fig.5-23 Access Folders are prefixed with a space, which makes them appear at the top of the list. Current Work folders and Applications appear next, using characters that precede letters. Finally, Δ (Option-j) and (Option-Shift-k) prefixes make the Control Folders appear at the end of the list.

The Key Caps DA can be used to identify special characters.

Figure 5-23. Possible Apple menu organization

Color

The first time you see System 7 on a color Mac, you'll be delighted and impressed with the colorful 3-D effect of icons and windows. Color might not be essential, but it certainly enhances the Macintosh experience and increases the pleasure of working with the new Finder.

Color features are incorporated in several of System 7's control panels, including General Controls (desktop pattern), Labels (icons), Color (text highlight and windows), and Monitors (color depth). With the appropriate video card, the Mac is capable of displaying millions of colors. However, a palette of 256 colors is more typical.

The Monitors control panel (Fig. 5-24) offers several levels of color depth or shades of gray. Generally, it's best to set your monitor to the maximum number of available colors. However, some applications might request fewer colors to operate properly.
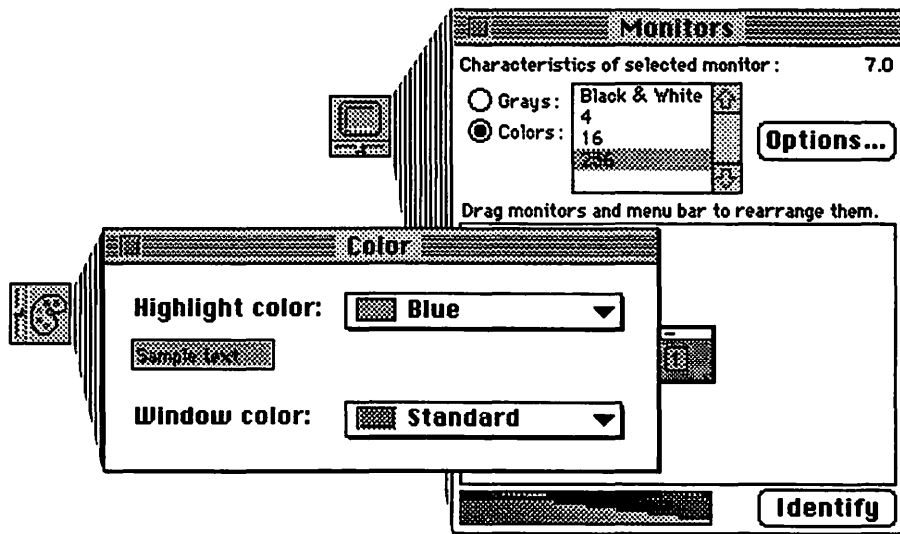
Figure 5-24. Color and Monitors control panels

The Color control panel allows you to set the text highlight color as well as the appearance of window frames. Monitor color depth must be set to at least 16 gray shades or 256 colors to maintain the 3-D look of windows. Similarly, the new color icons require at least 16 colors, otherwise they will revert to a 2-D black-and-white image.

While there are nine standard options in both the text highlight and window effects, you can create a custom highlight color by selecting **Other** from the pop-up menu. This will bring up the standard color wheel (Fig. 5-25).

The color wheel

Millions of color choices are available from the color wheel, even though your Mac might be able to display only 256 at one time. Selecting a new color for the current palette is simply a matter of clicking on the wheel. The new choice is displayed above the current selection in the box in the upper left corner (Fig. 5-25).
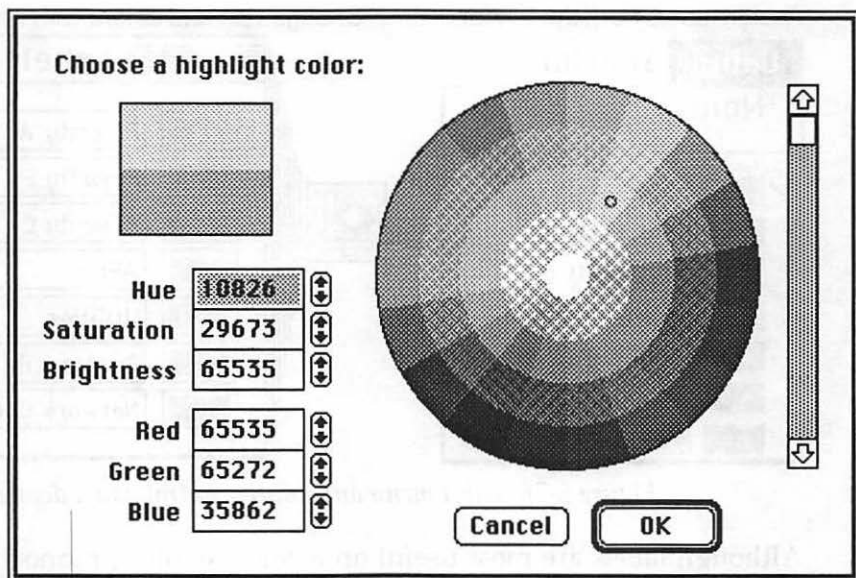
Figure 5-25. Standard color wheel for selecting a custom color

The scroll bar on the right controls color intensity, ranging from brightest at the top to darker shades toward the bottom. White is selected by clicking on the center of the wheel, and saturation increases as you move toward the outer edge of the wheel.

The color wheel is used whenever an option is available to substitute a different color for the current palette. For example, the desktop pattern in the General Controls CDEV includes a palette of eight colors. To change any of the colors, simply double-click the corresponding color box and the color wheel will be opened to enter a new value.

Labels

System 7 extends the "view by color" concept introduced with System 6. Renamed *Labels* in System 7 to more accurately reflect its extended capabilities, this feature now includes both a text label and a color, which can be assigned to any item.

Labels are assigned to items using the Label menu from the Finder. Changes to the text and color associated with each category are made through the Labels control panel (Fig. 5-26). There are eight labels to choose from (including None), of which seven can be modified.

Assign labels from the Finder   Change text and colors with Labels CDEV
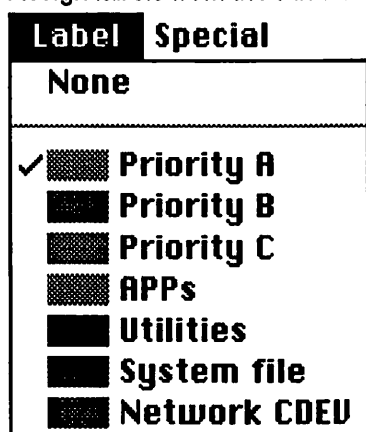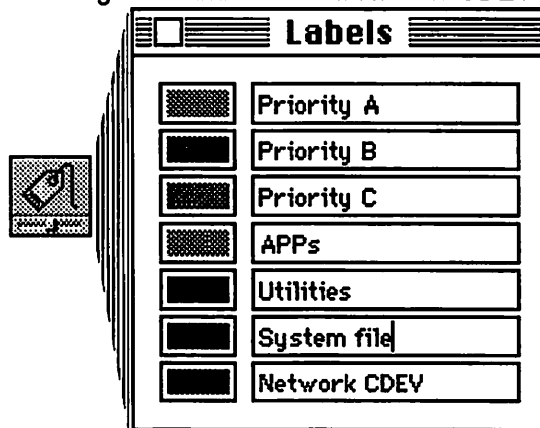
Figure 5-26. Label menu and Labels control panel device

Although labels are most useful on a color monitor, monochrome users can also benefit from the text component. Labels can be used to categorize items according to a user-defined set of colors and text descriptions. Because **Labels** is one of the display options in a list view window, items can be sorted by a label. However, the sort sequence will always be in the same order as the Label menu, and not necessarily alphabetical. In the example above (Fig. 5-26), items labeled Priority A will appear first, followed by Priority B, Priority C, etc. Items without a label will appear last.

Applying labels
To apply a label, select the item(s) to be labeled, and choose one of the categories from the Label menu. All selected items will be marked at once.

Changing label text and colors

To assign a new text description to a label category, simply open the Labels control panel, select the category, and type in a new label. Colors are modified by double-clicking the color box to the left of the text field, which opens the standard Mac color wheel (Fig. 5-25). Changes made in the Labels control panel are effective immediately and will affect any item that was previously assigned to a label category.

Tips for using labels

As with System 6, colors can be applied to icons for easier recognition, although they might not stand out as clearly because of System 7's own use of colored 3-D icons. Labels seem to be most useful in list views, as illustrated below in Fig. 5-27.
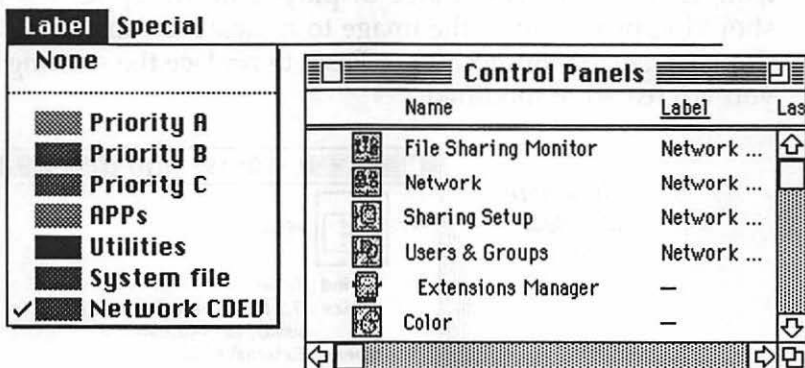
Figure 5-27. Grouping items in list view

Some possible uses of labels include:

Grouping items assigned to the same category will appear together in a list view by clicking on the Label column. For example, Fig. 5-27 shows all network CDEVs conveniently grouped at the top of the list.

Quick find items assigned to a category such as Priority A could be located quickly by using the Find (More Choices) command to search for "Label is Priority A" (all at once).

Multiple users if your Macintosh is used by more than one person, a label can be assigned to each user, with black reserved for items used by everyone.

By type existing file types could be further differentiated, such as distinguishing applications from utility software.

YOUR
LOGO
HERE
Custom icons

With System 6 and prior versions, a special utility program such as ResEdit was required to change an icon. System 7 provides an easy method to substitute a different icon for most items on the desktop.

Custom icons can provide visual clues to aid navigation or simply personalize your desktop. With this new feature, you can borrow icons, modify existing icons, or create your own.

Changing icons

Icons are accessed through the Info window (Fig. 5-28), by choosing **Get Info** (⌘-I) from the File menu. To borrow, change, or replace an existing icon, click on the icon image displayed in the upper left corner. A box should appear around the image to indicate the icon is selected. Simply Copy (to borrow or modify) or Paste to replace the existing icon with one you've created or modified.

Click here to select icon →

≡ -FONTS- Info ≡

A   -FONTS-

Kind: folder
Size: 7.8 MB on disk (8,159,098 bytes used), for 147 items
Where: External 80SC:

Created: Sun, Jul 7, 1991, 12:50 PM
Modified: Sat, Aug 3, 1991, 11:58 AM
Comments:

Contains TrueType and Bit-mapped fonts.

Custom Folder Icon - created 8/3/91.
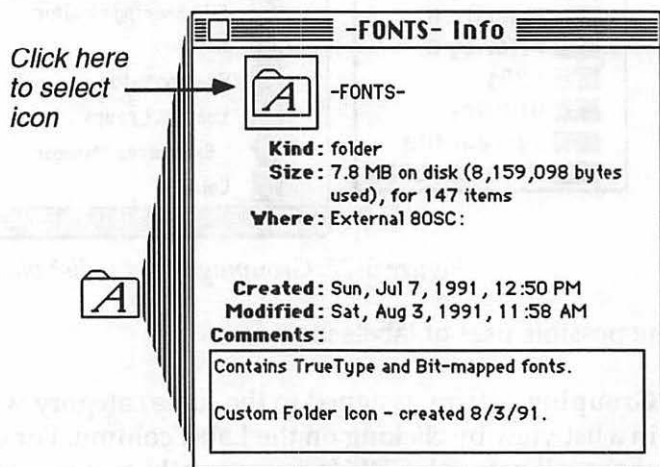
Figure 5-28. Accessing an icon through Get Info

If a box won't appear around the icon, it might be locked, open, or a system designated item such as the Trash, which can't be changed. However, an alias of the original can be modified. To revert back to the original, simply select the icon in the Info window and **Cut** (⌘-X).

A paint program can be used to modify an existing icon or create a new one. For the adventurous or experienced Mac user, Apple's ResEdit 2.1 (updated for System 7) includes a number of enhancements that make

icon modifications easy and colorful. Some things to keep in mind when you create or modify icons:

Basic shapes   although the choices are unlimited, it's probably better to make changes within the framework of generic icons for documents and folders. This will maintain an overall consistency, which enhances rather than detracts from the intuitive nature of the desktop.

Icon size   should be exactly 32 pixels square or less. Larger sizes will be automatically scaled when you paste it to your item, which might distort the appearance.

Colors   can be used to enhance the appearance, but you should stick to the standard palette on a 16- or 256-color monitor. Otherwise, colors might not appear as you expect.

Paint programs   use a grid size of 32 pixels to establish a boundary for your icon.

ResEdit   if you use this tool, always make changes to a copy—never to the original.

Icon file   create a paint or draw document containing all of your custom and borrowed icons for reference and use as needed.

Mass changes   use the Find (More Choices) command described earlier to select a group of icons and open their Info windows to paste in a new icon.

Ideas for using custom icons
Uses for custom icons is limited only by your imagination, but here are some ideas to get you started:

Disks   personalize your floppies with initials or replace the generic hard disk icon with a replica of your Mac.

Folders   insert miniature symbols within standard folder icons to signify their contents (see Fig. 5-28).

Documents   replace program-specific icons with symbols representing the content or type. For example, a memo or letterhead icon instead of the one assigned by your word processor.

Desk accessories   are prime candidates for new icons because most pre-System 7 versions are given the generic icon when removed from their suitcase.

Organization schemes

System 7 offers so many new ways to navigate that organizing your desktop might seem unnecessary. In one sense, it almost doesn't matter where you store items—there's always a way to locate them quickly with an alias or the Find command. On the other hand, having a dependable organization plan in place provides a structure for adding new items as well as a backup, if other methods fail to locate an item.

Organizational schemes are plentiful and there are probably as many styles and variations as there are Macintosh users. Certainly, there is no right or wrong way. However, some methods might be easier to manage than others.

By type

Figure 5-29 illustrates a scheme structured by type of item. Documents are separated from the applications that create them, and are further segmented into projects (groups related to the same task). Another root level folder (-DOCUMENTS-) is organized by class, and might include aliases of project folders as well as original items not related to a specific project. Applications and utilities are also subdivided by type.
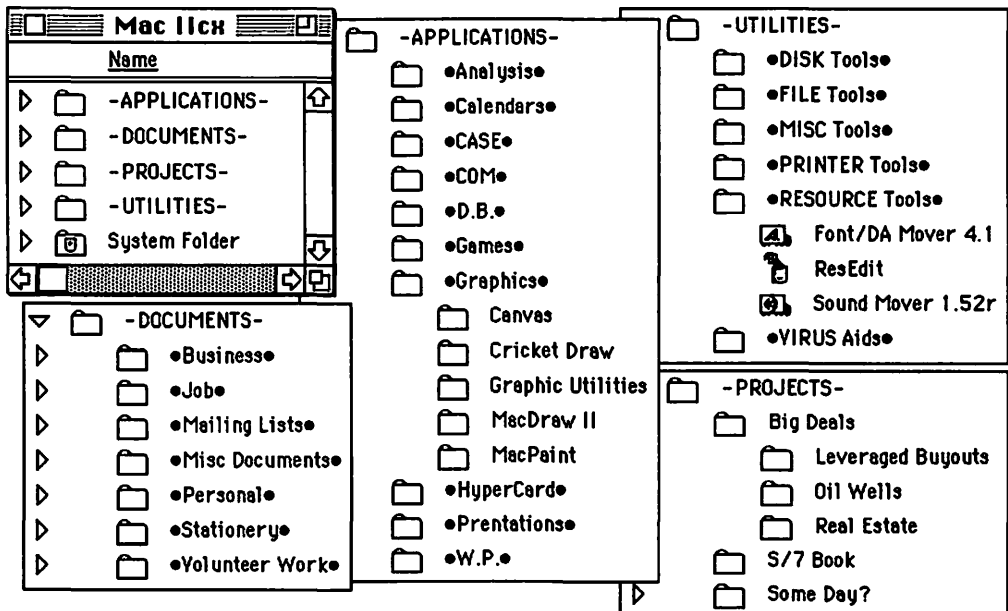
Figure 5-29. Organization by type

This scheme makes it easy to determine where an item should be stored. However, it might require penetrating several layers of nested folders to reach an item. Fortunately, many of System 7's new features can provide direct pathways, overcoming the tedious process of opening successive folders. Outline list views combined with alias navigation offer methods for reaching items quickly and efficiently.

By task

Another scheme for organizing your hard disk is focused by task, as illustrated in Fig. 5-30. Application programs are conveniently located near the results they produce, minimizing navigation to other folders.
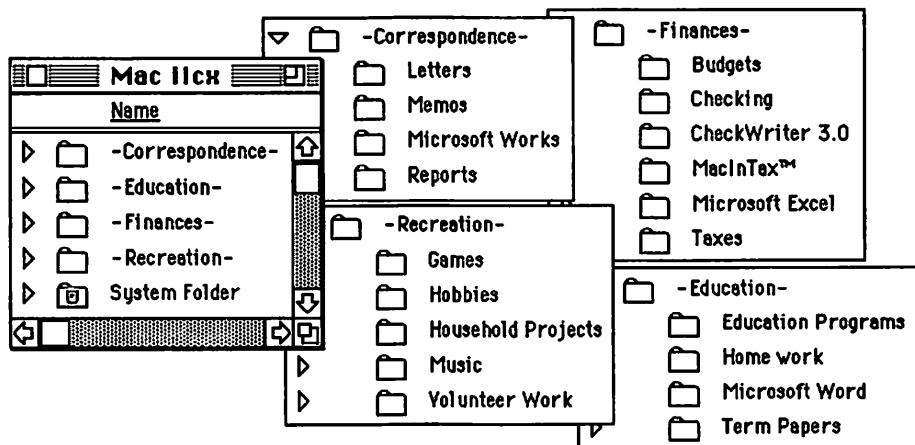
Figure 5-30. Organization by task

The primary dilemma with this scheme is determining where to locate an application. While some programs such as MacInTax™ clearly belong within the Finances folder, others might service multiple tasks. For example, Microsoft Works is a versatile multipurpose program that could be used with a variety of tasks. Again, System 7's alias feature provides an easy method to provide access from any folder.

Choosing a scheme

Selecting an organizational scheme is a matter of personal preference and what works best for you. There are many variations to the two basic approaches outlined above. Whichever method you select, System 7's new navigational features can be applied to facilitate travel and help you locate items quickly and easily.

Summary

In chapter 5, we've explored many facets of the new System 7 desktop, each contributing to the pleasure of your voyage on the AMS 7.

Finder windows   have a new 3-D look, which merely hints at the array of new features packed inside. Keyboard navigation, auto-scroll, and new list views are but a few of the extended capabilities.

Find command   finally a Finder that truly lives up to its name! Fast and powerful, it locates items wherever they might be hidden and automatically opens a window with the item(s) preselected.

Aliases   offer powerful access buttons to instantly open a folder, launch an application, and even mount a file server, no matter where you are. From the deepest folder to another Mac on your network, aliases stand ready to beam you instantly to your destination.

Startup items   automatically launch programs, documents, and desk accessories; even open windows to automatically prepare your desktop whenever you startup your Mac.

New ◀ menu   one of the most versatile enhancements in System 7. Add virtually anything from folders to control panels for instant access. Launch an application, open a stationery pad, or change the menu itself—it's all there, right at your fingertips!

Color   visually enhance your desktop with 3-D icons and windows.

Labels   prioritize and classify items with a text description and colors, chosen from 7 user-defined categories.

Custom icons   personalize documents, folders, DAs, and even disk icons with your own designs. No need to learn ResEdit, it's as simple as Copy and Paste.

Finally, we've concluded with two traditional schemes for organizing your hard disk, making it easier for you to manage and navigate with System 7's new features. As we've suggested in several places, each new feature is powerful in its own right, but when used in combination they offer even more ways of enhancing your efficiency and pleasure. Begin by learning how each new feature works, and then start to explore the synergisms available when combining features.

Inside the System Folder—
Below decks on the AMS 7

Topside is where the fun and daily action occurs on the AMS 7, but like a modern cruise ship it depends on smooth operations below decks. The System Folder is the engine room, filled with machinery that keeps the whole ship operating at peak performance.

In chapter 4 we described the importance of system software—without it, the Mac is reduced to a screen with only a disk icon and flashing question mark. Yet we also recognized that the majority of Mac users don't pay much attention to the System Folder, thanks to the clever Apple engineers who created the friendly desktop environment. Unless you're part of a select group of Mac users who enjoy adding sounds, special accessories, or other gadgets, you'll probably continue to ignore the System Folder most of the time. However, you might occasionally need to add a new software package or install a new font. Or you might encounter a few problems with an application that seems to get lost when starting up. Or perhaps, after reading this chapter, you might want to expand your horizons and experiment with some extra features or utilities that could enhance your Mac experience. In any case, it's not a bad idea to learn a little about how things work below decks.

How the System Folder is organized

One of the nice organizational features of the Mac's Finder is the ability to store things inside folders. Documents, programs, and even other folders can be kept inside a main folder to help keep things neat and tidy. However, until System 7 arrived, the System Folder reflected little use of these organizational capabilities.

When the Mac was first introduced in 1984, the System Folder was relatively simple and included only a few files. Over the past seven years a large number of extra files have been added, by both Apple and third-party software developers. As a result, the System Folder has grown cluttered and disorganized, making it difficult to locate a particular file. System 7 changes this by adding a series of special-purpose folders inside the System Folder.

The root level—deck S1

Opening the new S/7 System Folder and selecting a list view reveals several "nested" folders. Items that appear directly inside the System Folder are at the *root level*—the first deck of the AMS 7 engine room. For convenience, think of this as deck S1 (System Folder, level 1).

Deck S1 (the root level) includes two important pieces of systems machinery—the System file (suitcase icon) and the Finder (compact Mac icon). It also includes a number of compartments (folders), which are like doors or hatches leading to other decks below (Fig. 6-1). These folders are located on deck S1, but their contents are below on lower decks (S2, S3, etc.). For example, control panel devices (CDEVs) are stored on deck S2 inside the Control Panels folder. When the Control Panels hatch is closed, items stored inside are invisible at the root level.
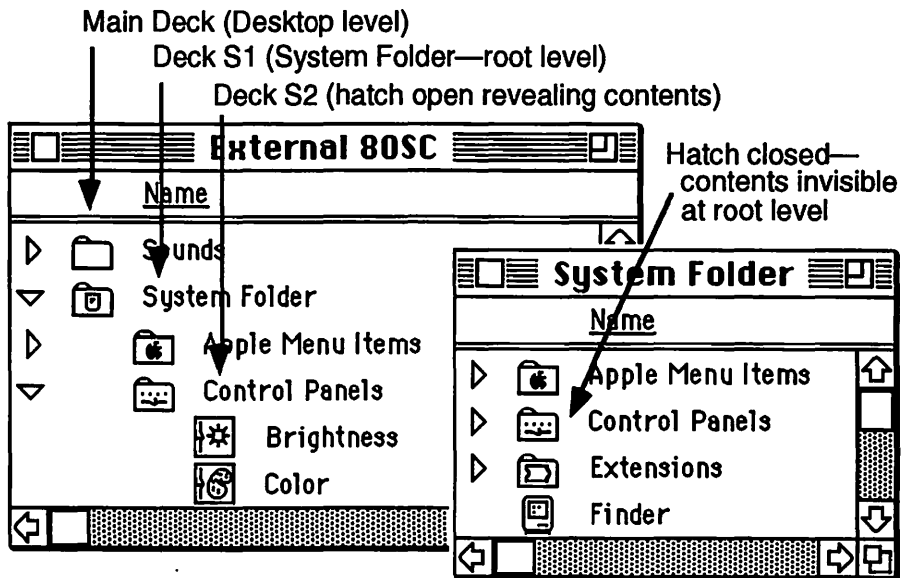
Figure 6-1. Deck levels on the AMS 7

This is an important concept to understand, because some software doesn't look beyond the root level (deck S1) when trying to locate a file.

In chapter 4, we described a technique for disguising an alternate System Folder by hiding its Finder in a temporary compartment. Even though the Finder is technically inside the System Folder, the Mac doesn't see it because it's stowed one level down (S2) and is therefore invisible *at the root level*.

While this little trick was helpful in disguising the alternate System Folder, the same principle can cause problems for some application programs. System 7 savvy programs will know that certain files are stored below decks in a nested folder. However, applications developed before System 7 might not be aware of these hiding places and therefore unable to locate files needed for the application to run properly.

This problem could show up when an application preference file is moved into the Preferences folder, or an INIT is stored in the Extensions folder. Some software can be "taught" where to locate a needed file. For example, Deneba's *Canvas*™ (version 2.1) looks for a file named Canvas Prefs , which logically belongs inside S/7's new Preferences folder. If its stored here, however, the next time Canvas is launched a dialog box will ask where the Prefs file is located. A standard file open dialog box is used to identify the new location (Fig. 6-2).
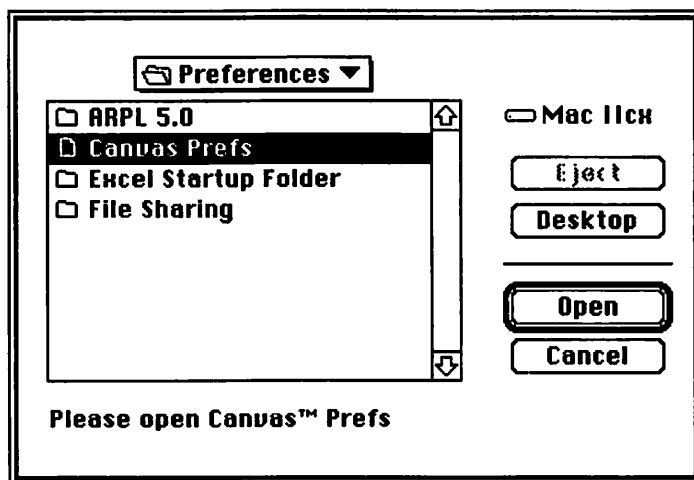
Figure 6-2. Locating a preference file inside S/7 System Folder

Canvas "remembers" where the Prefs file is stored so it won't ask again. Unfortunately, not all software is smart enough to allow this option. Some software might simply require that the needed files are stored at the root level of the System Folder.

If you encounter problems with an application or utility that worked with System 6, it could be due to files that are stored in one of System 7's new nested folders. Move the special files to the root level and try again.

System Folder contents—what's stored inside

Because a *blessed* System Folder is always required for the Mac to start up, it has become a convenient location for both Apple and third-party developers to store important files. In essence, it is the one constant in a user-controlled environment. Each Mac user organizes his files and folders according to his own personal style. For example, applications can be stored anywhere from the desktop to deep within a series of nested folders, where folder names are also determined by the user.

When an application program is launched, it typically looks for certain startup files, such as preferences, settings, or templates to set the stage for working. It's possible for an application to search the entire hard disk (because it doesn't have a clue where they might be stored). However, the search would add several seconds to the launch procedure. As a result, software developers usually instruct their programs to look in two places—the System Folder and the folder containing the application. Some programs are even more particular and require their startup files be stored in a specially named folder. Figure 6-3 illustrates the contents of a typical S/7 System Folder, including several third-party files and folders.
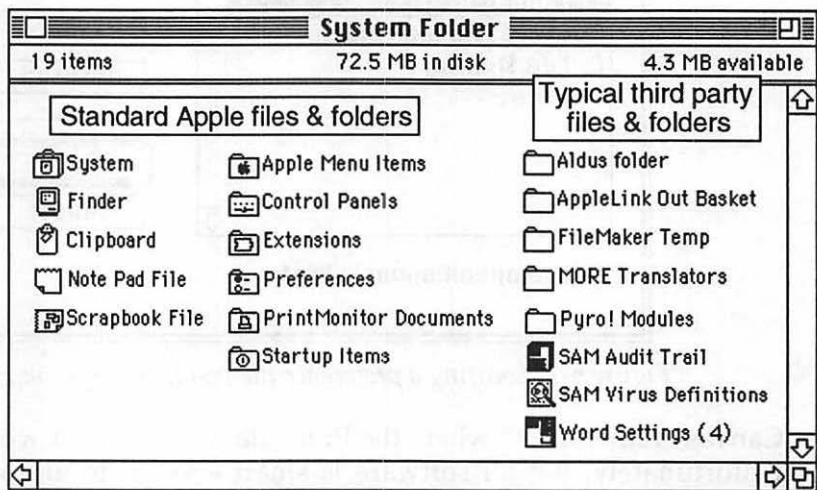
Figure 6-3. System Folder containing a typical assortment of files and folders

Most third-party packages caution the user not to change the name or location of these files or folders. System 7 goes a step further with its own set of designated folders (Apple Menu Items, Control Panels, etc.). These folders names are locked and can't be changed, even if you wanted to.

System files and folders

As we've described in previous chapters, System 7 changes the way you work with items inside the System Folder. The Font/DA Mover is no longer required to install fonts in the System file, and the new Finder cleverly selects the appropriate storage location for control panels, DAs, and other System Folder items. In this segment, we'll take an in-depth look at each component—some are new items while others are familiar but incorporate new features.

System file

The new suitcase icon for version 7 of the System file more accurately reflects its role as a repository of fonts, sounds, and keyboard files. In some ways, the new System file is more like a folder than a file. It can be opened and viewed in much the same manner as any folder. Making changes to an active System file is restricted, however; items cannot be added or removed while application programs are open.
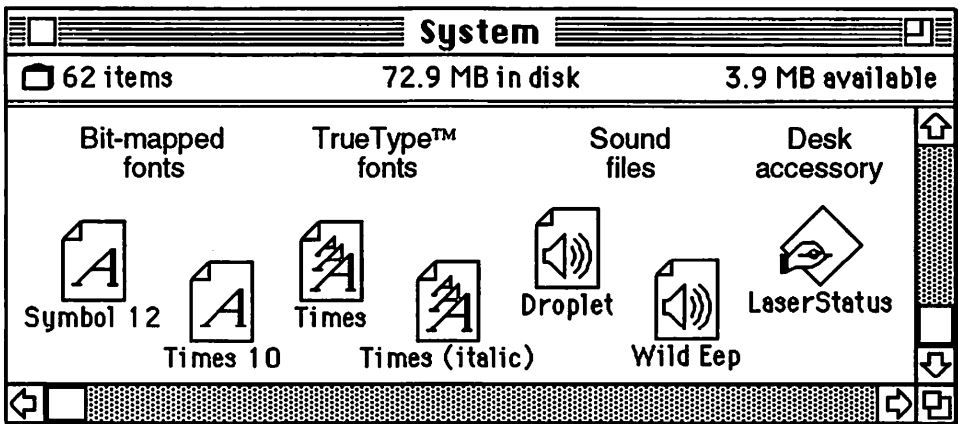
Figure 6-4. System file opened to icon view

Figure 6-4 illustrates the types of icons that can be stored inside the System file. Both bit-mapped and TrueType fonts can be included, as well as sound files and even desk accessories. Installing a font or sound file is simply a matter of dragging its icon into the System file. Alternately, these files can be dragged over a closed System Folder and the Finder will automatically install them in the System file.

While DAs are not typically found in the S/7 System file, they can still be added using version 4.1 of the Font/DA Mover.

Finder

While the Finder is responsible for many of System 7's new features, not much has changed in its outward appearance.The familiar compact Mac icon remains at the root level of the System Folder, although it has grown dramatically in size. Version 6.0.7 was 108K, while version 7.0 weighs in at a hefty 355K. Clearly, at lot more features have been packed into the new Finder and some of these have altered its internal structure.

The new structure could present problems with some utility software that attempts to alter certain Finder characteristics. Exercise caution in testing such utilities and make sure you have the System 7 Installer disks handy, in case the Finder becomes corrupted and you need to reinstall it.

Apple Menu Items folder

Any item stored in the Apple Menu Items folder appears under the pull-down menu. This includes applications, desk accessories, document files, folders, or an alias. The change is immediate and does not require restarting the Mac. This is a powerful new addition with System 7 that allows frequently accessed items to remain hidden under the menu, yet be opened with minimal effort. Various strategies for using this new feature are discussed in chapters 1 and 5.

Control Panels folder

As the name implies, control panels (CDEVs) are typically used to set some feature or characteristic, such as the desktop pattern, time, date, sound level, etc. They might also be used to monitor some activity, such as the level of file sharing in progress.

Some control panels are quite similar to INITs (system extensions) and are loaded into RAM during startup. Although they are not visible in the Applications menu, these programs are always available. For example, a virus protection program such as Symantec's SAM Intercept runs in the background and is constantly on alert for suspicious activity. Because these programs don't have their own set of menu bar options, changes are controlled through a CDEV.

With System 6 and earlier versions, all control panels were accessed from a common window, as shown in Fig. 6-5. A scroll bar on the left side of the window displayed available CDEVs. Clicking on the desired icon brought up its controls. Under System 7, control panels are still accessed from the menu through an alias of the Control Panels folder. When the

alias is selected, a Finder window is opened displaying each of the CDEVs currently stored in the Control Panels folder. Double-clicking an icon opens the control panel, and displays a window that is identical to the old style panels (Fig. 6-5).
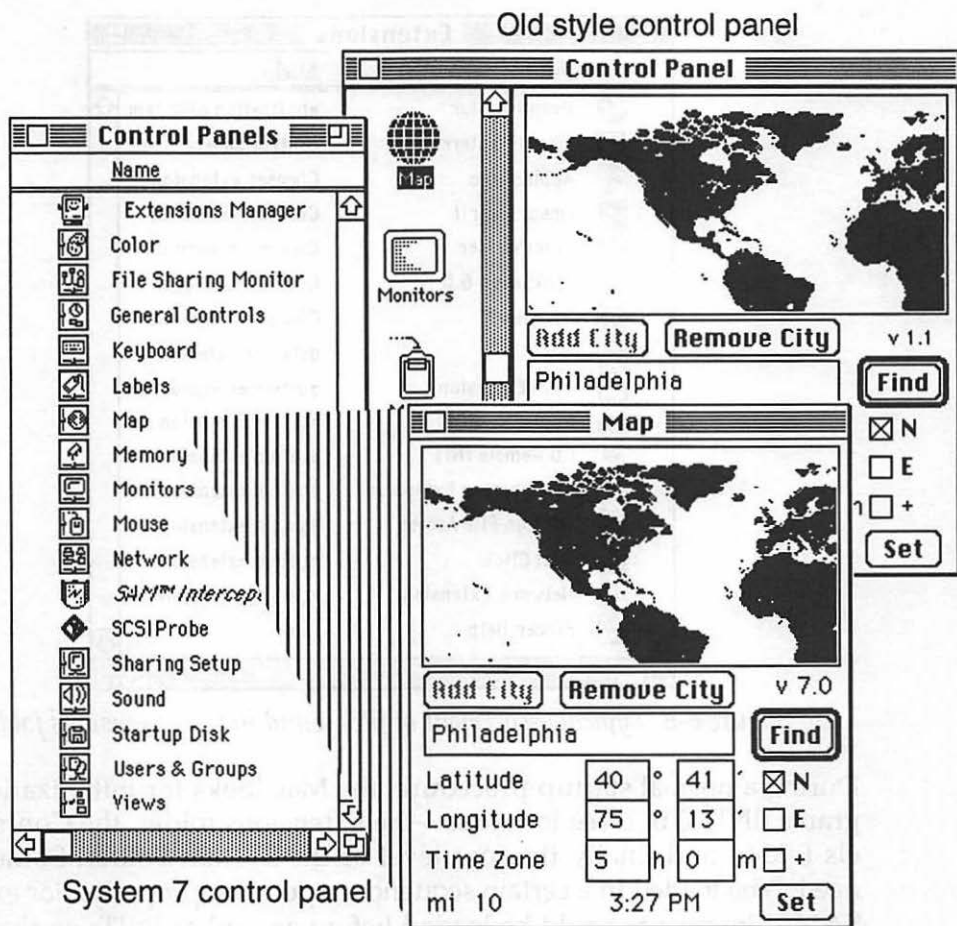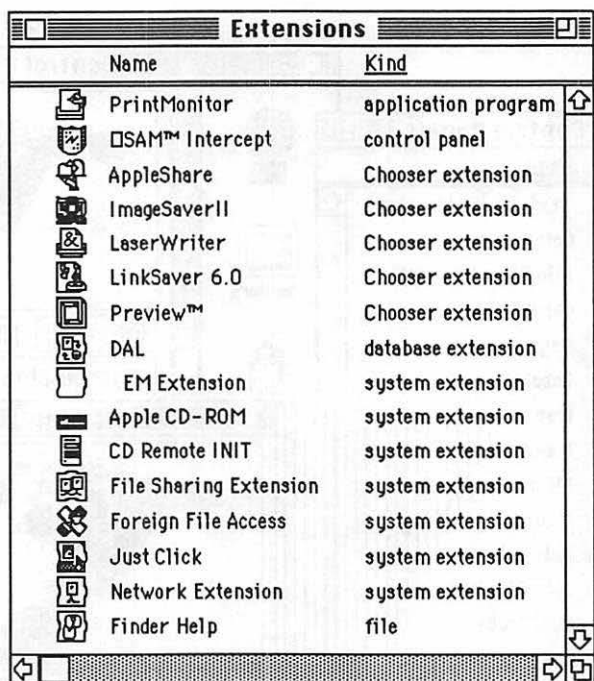
Figure 6-5. System 7 control panel compared to old style

Accessing control panels through a standard Finder window offers a variety of organizational possibilities. For example, Fig. 6-5 illustrates a list view in alphabetical order with medium-sized icons. This is similar to the old style scroll bar window, but displays many more icons for faster selection. A variation of this approach might be to label certain CDEVs and select **View by Label** so that related icons (such as network and file sharing items) are displayed together.

Extensions folder

The primary purpose of the Extensions folder is to store Chooser and system extension files. However, other types of files can be found inside the Extensions folder as shown in Fig. 6-6.

Name	Kind
PrintMonitor	application program
□SAM™ Intercept	control panel
AppleShare	Chooser extension
ImageSaverII	Chooser extension
LaserWriter	Chooser extension
LinkSaver 6.0	Chooser extension
Preview™	Chooser extension
DAL	database extension
EM Extension	system extension
Apple CD-ROM	system extension
CD Remote INIT	system extension
File Sharing Extension	system extension
Foreign File Access	system extension
Just Click	system extension
Network Extension	system extension
Finder Help	file

Figure 6-6. Typical assortment of files found in the Extensions folder

During a normal startup procedure, the Mac looks for initialization programs (INITs) in three locations—the Extensions folder, the Control Panels folder, and finally the root level of the System Folder. Some INITs need to be loaded in a certain sequence to perform properly. For example, SAM™ Intercept should be loaded before any other INITs so that it can check subsequent programs for viruses. However, SAM Intercept is a CDEV, which is normally stored in the Control Panels folder and would therefore be loaded after all of the INITs in the Extensions folder. To maintain the proper sequence, SAM Intercept is stored in the Extensions folder and an alias is located in the Control Panels folder.

On the other hand, Adobe Type Manager® needs to be last in line, so it should be stored at the root level of the System Folder.

Not all items in the Extensions and Control Panel folders are INITs. For example, most Chooser extensions are loaded into memory only when selected from the Chooser window. The same holds true for most control panels. If an item is loaded during the startup process, its icon is typically displayed at the bottom of the screen before the desktop appears.

Preferences folder

Although primarily intended for storing preference or Pref files generated by many application programs, the Preferences folder also includes a potpourri of items. In a sense, this folder becomes a collecting point for files that don't seem to fit in any of the other special folders. Figure 6-7 illustrates a typical assortment of Apple and third-party items found inside the Preferences folder.

Preferences		
15 items	37 MB in disk	1.4 MB available

Standard Apple files & folders	Typical third party files & folders	
AppleShare Prep		
DAL Preferences	CEToolBox.Prefs	Excel Settings
Finder Preferences	DT Launch.Prefs	Excel Startup Folder
Last Edition Used	DiskTop.Prefs	Calendar File
Users & Groups Data File	Canvas Prefs	PhonePad File
File Sharing	ResEdit Preferences	
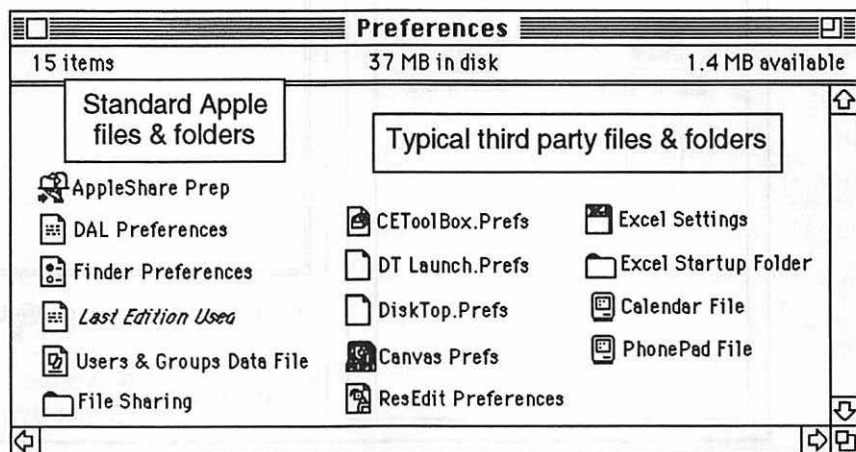
Figure 6-7. Typical assortment of files found in the Preferences folder

As described earlier in this chapter, some programs might have difficulty locating items stored inside the Preferences folder. If an application program can't locate its Prefs file, it might ask you to identify where it's stored, or it might simply generate a new one. As applications are upgraded for System 7, they will begin to automatically recognize the Preferences folder and store appropriate items inside. In the meantime, however, be cautious in selecting items to store in this folder. The safest bet is to allow the application program to decide. If it's System 7 savvy, it will probably make use of the Preferences folder. Otherwise, it's likely to store files at the root level of the System Folder.

Print Monitor Documents folder

The Macintosh is able to perform certain functions in the background, while you continue to work in an application program such as a word processor or spreadsheet. Background printing is available when printing to a LaserWriter. It allows you to resume working while the Mac continues to send information to the printer. To turn on background printing, open the Chooser from the ● menu, click the **LaserWriter** icon, select a printer, and then click the Background Printing **On** button (Fig. 6-8).
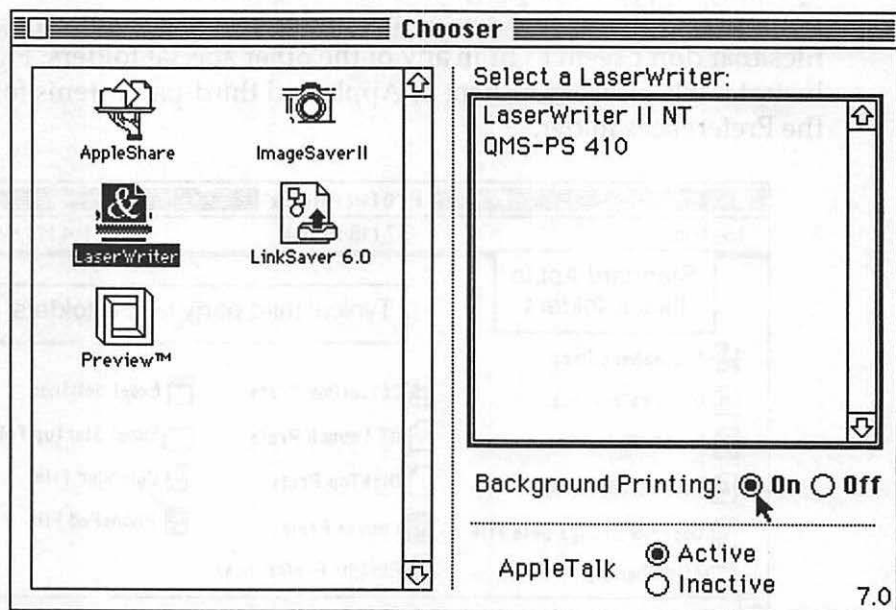
Figure 6-8. Turning on background printing in the Chooser

With background printing turned on, selecting **Print** from an application program will create a temporary spool file and store it in the PrintMonitor Documents folder, as shown in Fig. 6-9.
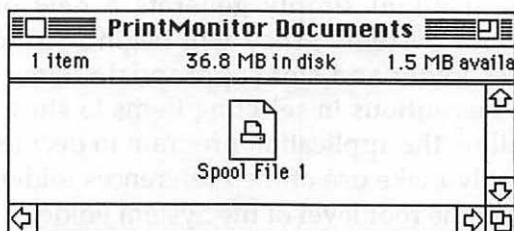
Figure 6-9. Temporary spool file

The spool file contains instructions telling the printer how to create an image of the pages selected for printing. These instructions are transmitted to the printer while you continue to work on other tasks. When the transfer process is complete, the spool file is automatically erased from the PrintMonitor Documents folder.

If you experience problems while background printing to a third-party laser printer, it might be due to incompatibilities. Turn off background printing and contact the vendor for possible upgrade information.

PrintMonitor program

During background printing, the PrintMonitor program is automatically launched and appears in the Applications menu (upper right corner of the menu bar). Selecting it will open the window illustrated in Fig. 6-10.
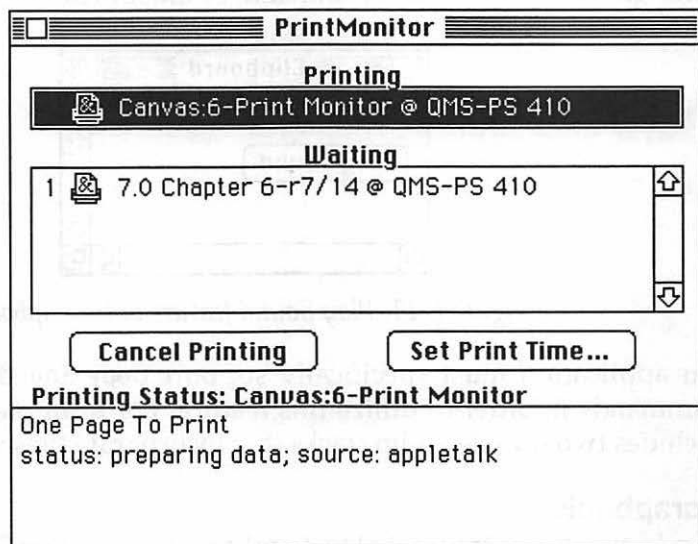
Figure 6-10. Print Monitor window

As background printing proceeds, information displayed in the Printing Status box will change to reflect the current state. This window also includes controls that allow you to **Cancel Printing** or postpone printing with the **Set Print Time** button. Control changes affect highlighted items in the Printing and Waiting boxes, so be sure you select the intended print job before clicking one of the buttons. PrintMonitor might appear automatically or its icon might flash in the upper right corner of the menu bar if you've selected manual paper feed or the printer runs out of paper.

Startup folder

Anything stored inside the Startup folder will open automatically at the conclusion of the startup process. This includes applications, desk accessories, CDEVs, utilities, folders, or documents. While it's possible to store the actual item inside the Startup folder, it's generally better to make an alias and include it instead of the original. Strategies for making use of this new System 7 feature are discussed in chapters 1 and 5.

Clipboard

The Clipboard file temporarily stores the results of a **Copy** or **Cut** command. When **Paste** is selected from the Edit menu, Clipboard contents are inserted into the currently active document. Although the Clipboard has been around since the first Macintosh, System 7 adds one interesting new feature. Sounds can now be copied to the Clipboard and played back through the **Show Clipboard** command, as illustrated below in Fig. 6-11.
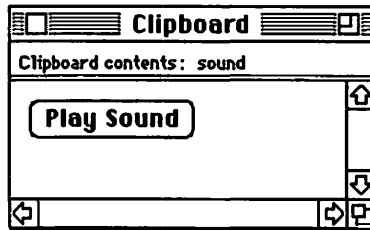
Figure 6-11. Play Sound feature of the clipboard

An application must specifically support **Copy Sound** and **Paste Sound** commands in order to utilize this feature. For example, HyperCard® 2.1 includes two sample audio stacks that incorporate these commands.

Scrapbook

In addition to the traditional text and graphics, System 7's Scrapbook now includes the ability to save and play sounds. You can see how this feature works by opening the Scrapbook file, which is installed with System 7. Scroll through the contents until you reach the sound page illustrated in Fig. 6-12, and click the **Play Sound** button. The sound can be copied from the Scrapbook using the usual **Copy (⌘-C)** command, and it will appear in the Clipboard as illustrated above in Fig. 6-11.

The ability to copy, paste, and store sounds in the Scrapbook is an example of how System 7 builds on familiar concepts. Future system versions

will further extend this paradigm to include video clips—short animated segments with accompanying sounds.
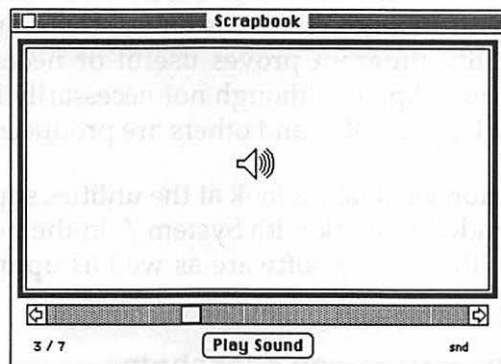
Figure 6-12. Sound feature in System 7 Scrapbook

If your Mac has color capabilities, you'll appreciate the attractive color images included in the sample Scrapbook. There's a neat trick you can apply with one of these images. Scroll through the pages until you locate the world map (Fig. 6-13). Copy the image to the Clipboard and then open the Map CDEV. With the Map CDEV active, **Paste (⌘-V)** the image. The old black-and-white version is replaced with a colorful world map.
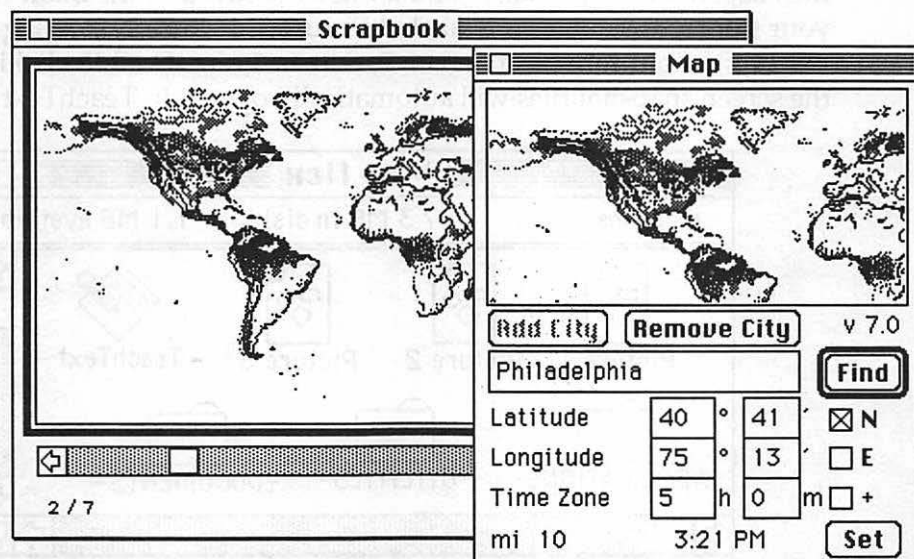
Figure 6-13. Replacing the black-and-white map with a color version

Apple System 7 utilities

While System 7 introduces a number of new and more intuitive ways of working with many system resources, there are still situations when a special utility program proves useful or necessary. Some of these are available from Apple (although not necessarily included with the System 7 Personal Upgrade Kit) and others are produced by third parties.

In this section we'll take a look at the utilities supplied by Apple that have been upgraded to work with System 7. In the next section, we'll examine some new third-party software as well as upgrades to a few traditional favorites .

TeachText and screen snapshots

A new version of the TeachText application is included with System 7. As with prior versions, it continues to display and print simple instructional documents that often accompany Apple and third-party packages. In addition, TeachText now has the ability to open PICT files created by a draw program or screen snapshot utility.

To take a snapshot of whatever is displayed on the screen, press the Fkey combination ⌘-Shift-3. The sound of a camera shutter click indicates that the snapshot has been taken and a PICT file saved to the main window of your startup disk. Files are labeled Picture 1, Picture 2, etc. (Fig. 6-14), replacing the old format of Screen 0, Screen 1, etc. Double-clicking one of the screen snapshot files will automatically open it in TeachText.
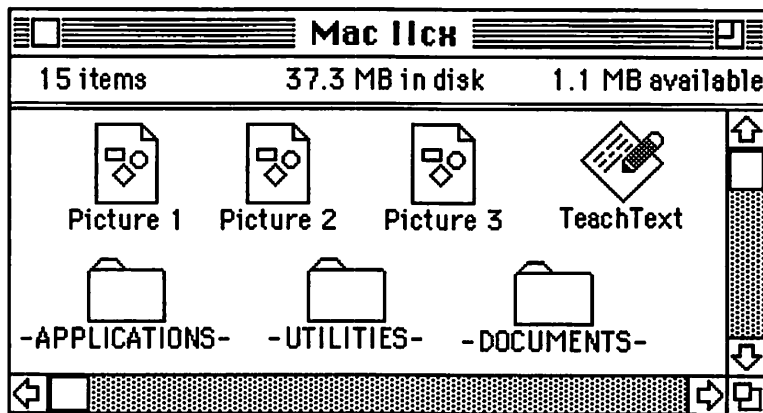
Figure 6-14. Screen snapshot files—Picture 1, Picture 2, etc.

System 7 also allows you to open a document by selecting its icon, dragging it,and releasing it over the icon of a program that is capable of reading it. Because screen snapshots are saved in a standard PICT format, this feature works with any draw program as well as TeachText.

Once the snapshot is opened in TeachText, any portion can be selected by dragging a marque as shown in Fig. 6-15. The selected portion can then be copied and pasted into the Scrapbook or another document.
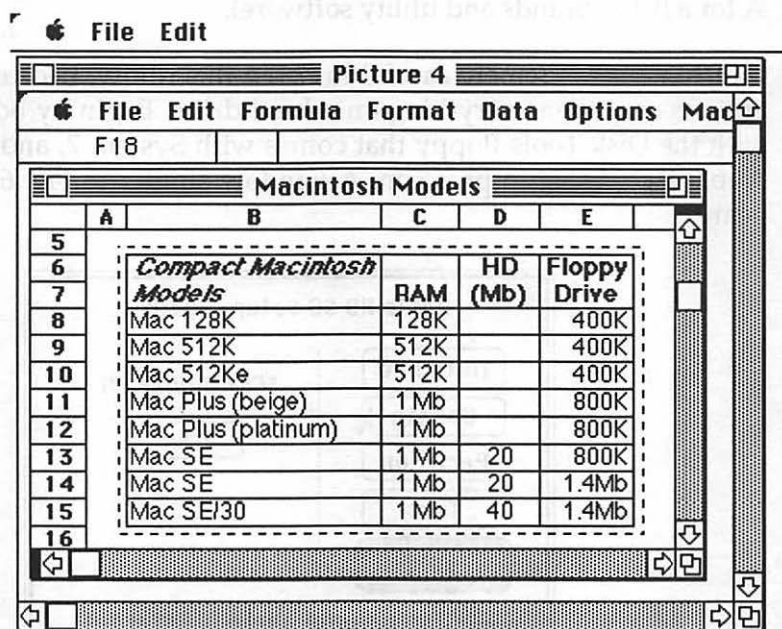
Figure 6-15. Selecting a portion of a screen snapshot opened in TeachText

This is a nice addition to System 7, because the screen snapshot also works with an application program active. For example, you might want to use this technique to take a snapshot of a spreadsheet or a database table and include it in a memo to emphasize a point. Simply open the program containing the illustration and press ⌘-Shift-3. Return to the Finder and open the Picture file with TeachText. Select the portion of interest and **Copy** (⌘-C) to the clipboard as shown in Fig. 6-15. Finally, open your memo or report and **Paste** (⌘-V) the image in the appropriate spot. This technique is most useful when the program containing the source material copies values rather than a formatted image to the clipboard, which is often the case with spreadsheet and database software.

Apple HD SC Setup utility

This utility includes several functions for setting up and testing an Apple branded hard drive. It is rarely needed unless a hard drive requires reformatting. However, System 7 requires updating the hard disk drivers before turning on virtual memory. Version 7.0 of the Apple HD SC Setup is included on the Disk Tools floppy (part of the Personal Upgrade Kit), and is used to update the drivers. If you have a third-party hard drive, you'll need to obtain a comparable utility from the vendor (see appendix A for a list of brands and utility software).

Caution—be extremely careful in using this utility, because some of the options can erase everything on a hard drive. Begin by booting the Mac with the Disk Tools floppy that comes with System 7, and launching the Apple HD SC Setup program. A window similar to Fig. 6-16 should appear.
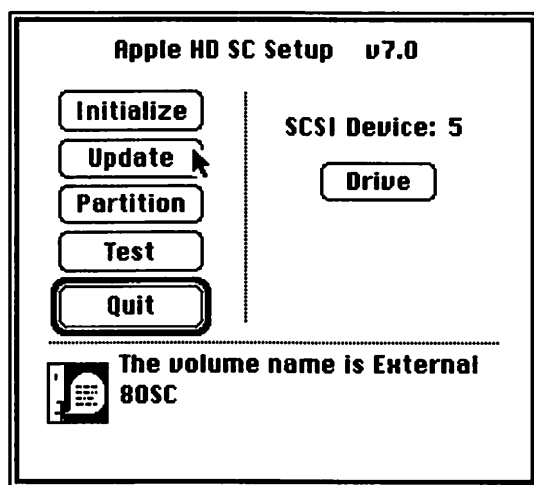
Figure 6-16. Apple HD SC Setup window

Click the **Update** button only (avoid the **Initialize, Partition,** and **Test** buttons). If you have more than one hard disk, the **Drive** button can be used to select another drive for updating. You should update all drives, although it's mandatory only for a disk you intend to use with virtual memory. When the updates are completed, **Quit** the HD SC Setup utility and restart your Mac. This operation is required only one time. Following a successful update, your hard drive is prepared for virtual memory operation, which is controlled through the Memory control panel.

LaserWriter Font Utility

This utility is useful only if you print to an Apple LaserWriter or a third-party laser printer that uses the LaserWriter print drivers. It offers several options for controlling printer operation, including the ability to display and print samples of the laser's built in fonts as well as to download additional fonts or PostScript® files.

A commonly used feature is to turn off the sample page that typically prints each time the LaserWriter is turned on or restarted. Selecting the **Start Page Options...** from the Utilities menu opens a simple dialog box, as shown in Fig. 6-17, which allows you to turn this option on or off.
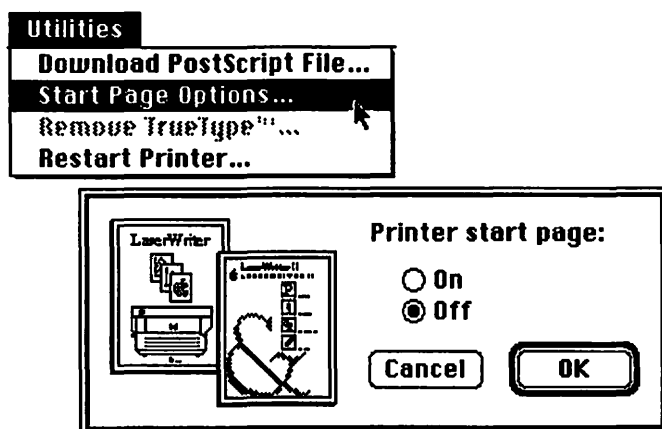
Figure 6-17. Changing the Start Page option of the LaserWriter

If you own a third-party printer like the QMS-PS 410, it might require downloading PostScript files to control certain characteristics such as paper tray selection. Because System 7's print drivers have been updated, utility software supplied with third-party printers might not be compatible. As a result, it might be necessary to use the LaserWriter Font Utility for downloading control files, until the vendor supplies upgraded utilities.

Downloading additional fonts is usually performed automatically by an application program. However, if you routinely use the same nonbuilt-in fonts, it might be faster to download them with this utility. They will remain in the printer's memory until a restart. If you have a hard disk drive attached to your printer, the LaserWriter Font Utility can also be used to initialize and load it with fonts.

Font/DA Mover 4.1

Although the Font/DA Mover is no longer required to install fonts in the System folder or to place DAs in the menu, you might find an occasional use for it. There are at least two areas where it still has a role:

Creating a suitcase to save fonts or DAs in a suitcase file, which might be needed to transport them to run with System 6.

Installing a DA in an application some DAs are useful only in specific programs.

Version 4.1 was introduced January 1991 (prior to S/7) to enable installation of TrueType fonts with System 6.0.7, but it is System 7 compatible. The most noticeable change from prior versions is the way it displays fonts (Fig. 6-18).
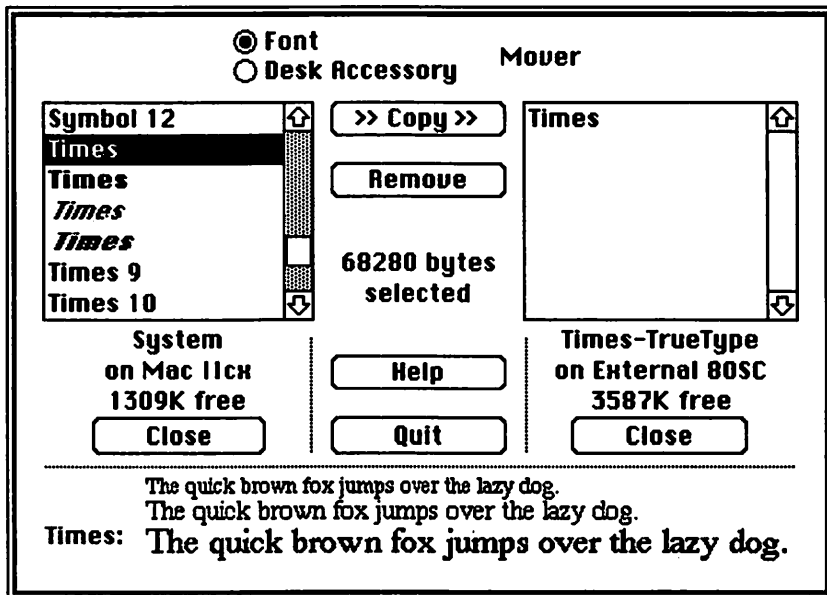
Figure 6-18. Font/DA Mover 4.1 showing Times TrueType font

TrueType fonts are distinguished from bit-mapped versions in two ways. Bit-maps always have a number after the name representing the font size, while TrueType fonts lack the numeric suffix and are displayed in their style (regular, **bold**, *italic*, and ***bold italic***). If you click on a TrueType font, samples will be displayed in three sizes (9, 12 and 18 point).

The Font/DA Mover can still be used to install a desk accessory into an application. This old but often overlooked technique is most appropriate when a DA can be used only with a specific application. For example, the version of Word Finder® included in the Microsoft Word package doesn't work with other applications. Consequently, it should appear in the menu only when Microsoft Word is the active application.

To install it directly into Word, first launch the Font/DA Mover, and then open the Word Finder suitcase. (Avoid double-clicking the Word Finder icon, because System 7 will merely open its suitcase rather than launch the Font/DA Mover). Next, hold down the Option key before clicking the **Open** button. The dialog box will display all items as shown below in Fig. 6-19. Open Microsoft Word and click the **>>Copy>>** button. **Quit** Font/DA Mover and launch Word. From now on, the Word Finder DA will appear only with Microsoft Word, saving valuable territory in the menu.
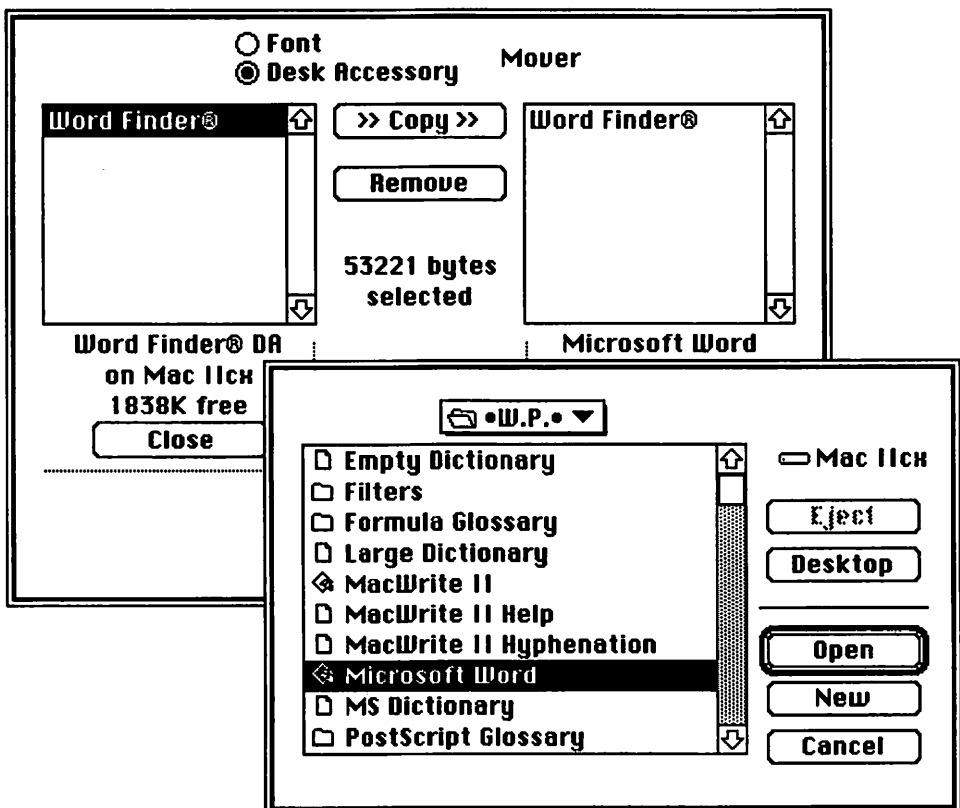
Figure 6-19. Installing a DA in an application program

Extensions Manager

During the past few years, the number of initialization programs (INITs) available for the Mac has grown immense. This has created two problems. First, INITs take up RAM, which leaves less available for application programs—a problem that is more acute with System 7's memory-hungry appetite. Second, INITs don't always get along with each other, and when multiple INITs are loaded it increases the likelihood of a conflict.

Managing INIT conflicts and memory consumption is easier with a tool that allows dynamic selection of items loaded at startup. With prior system versions, this could be achieved with a third-party program such as Microseeds' INITPicker or CE Software's Aask™. These programs temporarily altered the file type of deselected INITs to trick system software into ignoring them during startup. This allowed the programs to remain in the System Folder, but in an offstate.

The Extensions Manager (EM) is a control panel device (Fig. 6-20) created by Apple programmer Ricardo Batista for managing System 7 INITs. Highlighted items are turned on (available at startup).
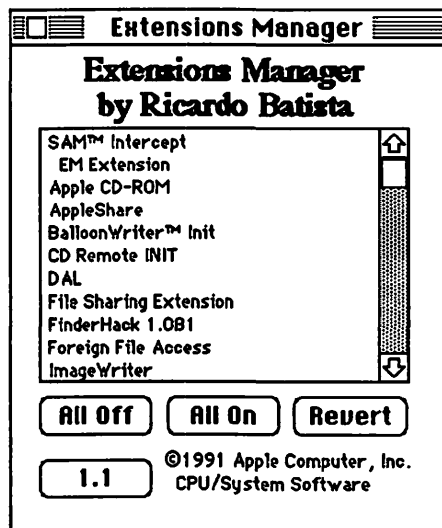
Figure 6-20. Extensions Manager control panel

Rather than alter the de-selected INITs, Extensions Manager hides them in special folders it creates, which are labeled with the suffix *disabled*. When an item is enabled by clicking on its name, EM simply moves the INIT or CDEV from its hiding place back to the appropriate folder. The

same effect could be achieved by manually moving items, but EM makes the process convenient and fast.

Clicking the 1.1 button opens a help window, which includes the ability to recover extensions that were disabled with one of the old-style INIT managers. This feature changes the file type back to its original state, so the system will again recognize it as an initialization program.

Command key equivalents

While the Mac's pull-down menu structure makes it easy to learn, experienced users often prefer keyboard equivalents rather than reaching for the mouse. Many of System 7's command key (⌘) equivalents are displayed in the Finder menus, and it's merely a matter of learning them. However, some keyboard commands are not so easily recognized, and a few include subtle distinctions:

> **⌘-E** ejects the floppy disk from the internal drive, even if it's not selected. Note, however, that a shaded disk icon remains on the desktop indicating the Mac hasn't yet released the disk from memory.

> **⌘-Y** when a floppy disk is selected, this command ejects it and removes the icon from the desktop. It's the same as dragging the icon to the Trash. Notice that this command is labeled **Put Away** in the Finder **File** menu, and is normally used to return an icon to its folder after it's been dragged to the desktop. This same command can be used to dismount CD ROMs, hard disk, and file server volumes.

> **⌘-Shift-1** at the Finder, this command is equivalent to ⌘-E. However, it also works from within an application when you want to remove a disk and insert another.

> **⌘-Option-Esc** forces the active program to quit if it freezes due to a system error. Although you can't save your work in the active application, it does allow you transfer to other open programs and save before rebooting. Note: always restart after a system error.

Some Finder menu items don't have a keyboard equivalent, which helps avoid accidentally invoking certain destructive commands such as **Erase Disk**. However, some of the missing command key equivalents could be beneficial. Within a matter of weeks following System 7's introduction, programmers were introducing new utilities to augment the standard Finder menus and even allow customizing command key equivalents.

Third-party utilities and extensions

In this section we'll take a look at some third-party utilities and system extensions. This is not intended as a comprehensive list, which could fill an entire volume itself. Rather, we've selected a few items that enhance System 7 operations or make it easier to manage system resources.

Backup utilities

With previous system versions, Apple included a hard disk backup utility. Unfortunately, HDBackup 1.1 is incompatible with System 7 and Apple has no plans to update it, apparently content to leave this area entirely up to third-party developers. There are several good alternatives including Dantz Development's Retrospect 1.3, which is System 7 savvy, supporting virtual memory, balloon help, and file sharing.

Macros

Another arena which Apple has left open to third parties is macros. The MacroMaker utility that was included with previous releases of system software is incompatible with System 7, and again Apple has no plans to update it. Fortunately, there are excellent third-party alternatives such as CE Software's QuicKeys v2.1, which is 32-bit clean with balloon help, and supports both Apple Events and UserLand IAC.

Virus protection

Unfortunately, viruses continue to be a problem, with new strains appearing in the Mac community every few months. With reasonable precautions, it's unlikely that you'll encounter a virus. However, some form of virus protection is virtually essential to avoid problems with your system. There are several excellent commercial packages as well as some very good freeware. The key ingredient in any virus protection program is the ability to upgrade as new viruses are discovered.

John Norstad's Disinfectant is a free program, which is updated frequently and generally available through user groups and bulletin boards. Commercial products include Mainstay's AntiToxin, Microcom's Virex, Microseeds' Rival, and Symantec's SAM. Recent releases have been upgraded to System 7 compatibility, and we strongly recommend you obtain the latest version of your favorite.

FinderHack

Donald Brown's FinderHack is a freeware INIT that adds a new Finder menu entitled **Futz,** which appears to the right of the Special menu. The new menu includes commands for trashing selected items or making an alias, as shown below in Fig. 6-21.

Figure 6-21. Don Brown's FinderHack menu

The **Make Alias as ...** command automatically creates an alias of a selected item and opens a save dialog to determine where it should be stored.

Finder 7 Menus!

Adam Stein's shareware package ($10) takes a somewhat different approach. Finder 7 Menus! is an application program that allows you to add or change keyboard equivalents for any selection item in three of the Finder menus—**File, Edit,** or **Special.**

Figure 6-22. Finder 7 Menus! adds command key equivalents

For example, Fig. 6-22 illustrates the addition of ⌘-H for the **Empty Trash** option and ⌘-K for **Restart.** Adding a command key is simple and clean. Changes are made to a copy of the Finder (not the active Finder), by selecting the item from the mock Finder menus and entering the desired key equivalent in a dialog box. Any existing command key can be changed and it won't let you accidentally duplicate a letter that is already

assigned to a command. The Finder copy is automatically updated when you quit the application. To implement the changes, hide the active Finder, replacing it in the System Folder with the altered version and restart your Mac. It works beautifully and, because it's an application rather than an INIT, there are no risks of conflicts with other initialization programs.

Helium

Robert L. Mathews' free CDEV is a handy little utility that allows you to temporarily invoke balloon help. A keyboard equivalent is set in the control panel, and balloons appear as long as these keys are depressed. Release the keys and the balloons disappear.

Just Click

Luis Bardi of Tactic Software has come up with another freeware INIT for those who miss the ability to rotate through several open applications by clicking the Applications menu icon. Just Click re-enables this feature, which was available in prior system versions by clicking the MultiFinder icon.

HandOff II

Fred Hollander's HandOff II published by Connectix Corporation has been upgraded to version 2.2, which is System 7 compatible and extends the apple menu with hierarchical submenus. Folders included in the apple menu will pop open a secondary menu, allowing documents or programs to be launched directly without the need for additional mouse action.

The new version maintains the capabilities described earlier in chapter 3 to change color depth and sound volume when switching applications. It also retains the ability to assign documents to a different creator so they can be launched without the application that created them.

Suitcase II

Fifth Generation Systems' Suitcase II (version 1.2.11) has been updated for System 7. It operates essentially the same as described earlier in chapter 3, providing a convenient method for changing fonts, sounds, and FKeys. Owners of a previous version can obtain small application programs that upgrade Suitcase II, Font & Sound Valet, and Font Harmony to the latest versions. Updates are available from the publisher as well as from selected bulletin board services.

Sound management

While most users are probably aware that the traditional system beep can be changed to an alternate sound, many might not know the extent and variety of ways sounds can be incorporated on the Mac. With the introduction of the Mac LC and Mac IIsi models, Apple began including a microphone and the ability to record sounds directly in a HyperCard stack. Add to that literally thousands of pre-recorded sounds available from user groups, on-line services, and other sources, and the choices become almost endless.

Unfortunately, the situation is complicated by the existence of several different sound formats and file types. System 7 will recognize a *snd* resource and provides an easy method to load it into the System file, but it lacks a comprehensive utility to recognize and convert other types.

Ricardo Ettore's $20 shareware Sound Manager Package includes utilities for converting, moving, and assigning sounds to various Mac activities. Sound Mover is the basic module, which operates in a fashion similar to the Font/DA Mover (Fig. 6-21). It will recognize and open sound files in virtually any format. Sound files can be edited and saved in the same or different formats, or transferred to existing files, including the System file.
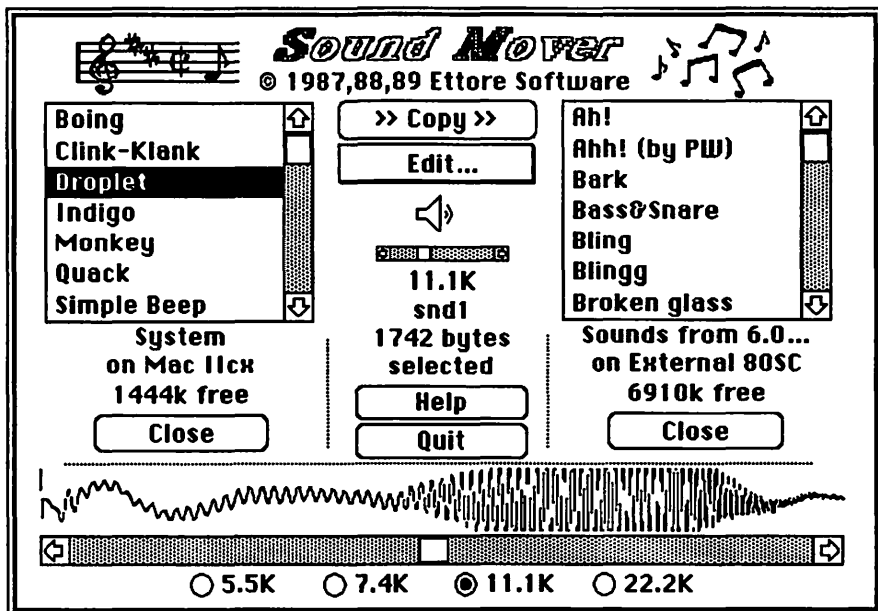
Figure 6-23. Sound Mover control window

Summary

In this chapter, we've taken a look inside the newly organized System Folder and examined the contents of its specialized subfolders. We've also reviewed Apple's utilities and several third-party software packages that enhance System 7 operation. Summarized below in Table 6-1 are Apple utilities. Most of these have been upgraded or built into System 7, but a few will need to be replaced with third-party software. For convenience, we've also indicated where to locate items that come with the System 7 Personal Upgrade Kit.

Table 6-1. System 7 Apple utilities

Software	System 7 version	Source	800K disk	1.4 Mb disk
Apple 800K Eject INIT	Built-in	System 7		
Memory Manager INIT	Built-in	System 7		
TrueType INIT	Built-in	System 7		
Apple File Exchange	7.0	PUK	Install 2	Tidbits
Apple HD SC Setup	7.0	PUK	Disk Tools	Disk Tools
Disk First Aid	7.0	PUK	Disk Tools	Disk Tools
LaserWriter Font Utility	7.0	PUK	More Tidbits	Tidbits
TeachText	7.0	PUK	Install 3	Tidbits
HD Backup	None	3rd party		
MacroMaker	None	3rd party		
Apple CD-ROM INIT	3.0	GUK		
Extensions Manager	1.1	Apple		
Font/DA Mover	4.1	TT		
The Namer	7.0	GUK		
ResEdit	2.1	Apple		

Sources: PUK = System 7 Personal Upgrade Kit from Apple
GUK = System 7 Group Upgrade Kit from Apple
TT = TrueType Printing Tools
3rd party = Compatible version not available from Apple; similar products available from third-party sources.

A fontastic voyage with TrueType™

The AMS 7 includes many new pleasures for novices as well as experienced travellers. One of the most pleasing new features is the attractive display of fonts, both on screen and in printed documents. TrueType™ eliminates the jagged appearance of certain font sizes. And because it's now built-in to the system software, good looking fonts appear everywhere on board—in Finder windows and in application programs.

For the most part, TrueType is automatic. If your system file includes a TrueType version of the font you've selected, it will appear on screen and in your printed output. Application programs do not need to be System 7 savvy to use TrueType fonts, which can be mixed with your existing outline and bit-mapped typefaces.

History of Macintosh fonts

To understand the significance of TrueType, it's helpful to learn a little Macintosh history and the background leading up to it. Over the past seven years, the Mac has evolved into the premier desktop publishing platform and in some measure its success has been due to the quality of its output. Three types of fonts have played a key role in this evolution:

Bit-mapped   the original font technology introduced with the first Macs. Each character is individually crafted from a series of dots (bits) mapped on a grid that is 72 dots per inch (dpi) square.

PostScript   characters are defined by mathematical equations that describe an outline of its shape, and can be scaled to any size. Initially developed for high-quality output on laser printers, and later applied to screen displays using Adobe Type Manager™. Must be used with corresponding bit-mapped screen fonts, so that the Mac knows which font to use in creating printer output.

TrueType   also uses mathematical equations to describe character outlines, but does not require bit-mapped versions. Outlines are used to automatically generate characters in any size.

All three technologies are supported by System 7, although the direction is clearly toward outline fonts. Bit maps will remain for some time to

smooth the transition, but will eventually fade away. To understand why they continue to exist alongside of two outline technologies, we need to look back at the Mac's evolution.

Bit-mapped for screen and dot-matrix output

When the Macintosh was introduced in 1984, it was accompanied by the ImageWriter (a forerunner of the ImageWriter II family). By today's standards, the ImageWriter pales in comparison to the 300-dpi output available from laser printers and high-resolution ink-jet printers such as the StyleWriter. But in its day, the ImageWriter was leading edge technology, because of the method it used to print characters and images.

Most dot-matrix printers of that era used a built-in set of characters, which yielded speed over quality. The dots forming the characters were clearly visible to the naked eye. The ImageWriter could produce the same dot-matrix characteristic output in draft mode, but it also included a "best" mode. Rather than use the printer's built-in characters, the Mac created a line-by-line output of dots, based on the fonts stored inside the System file. Each character in a family of fonts was described in detail at 72 dpi (the resolution of the Mac's screen). The Mac fed this information to an ImageWriter in two passes—a forward direction and then reverse, slightly offsetting the dots on the reverse pass. The result was much higher quality character images at 144x160 dpi, providing the appearance .of near letter quality output, as shown below in Fig. 7-1.

Screen image @ 72 dpi
Palatino 12. The quick brown fox jumped over the lazy dog!

ImageWriter @ 144 dpi
Palatino 12. The quick brown fox jumped over the lazy dog!

LaserWriter @ 300 dpi
Palatino 12. The quick brown fox jumped over the lazy dog!
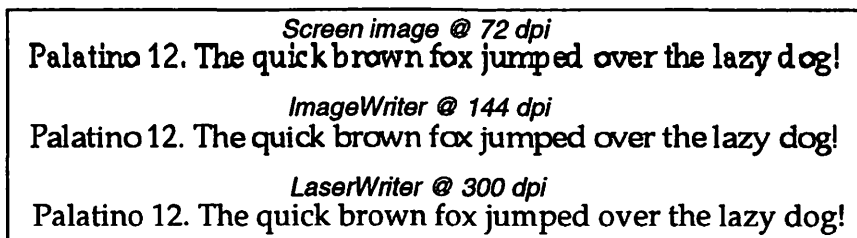
Figure 7-1. Comparison of Palatino 12 point at three resolutions

Onscreen character images were hand-crafted for a series of standard font sizes—9, 10, 12, 14, 18, and 24 points. Odd sizes (8, 11, 13, etc.) were possible, but didn't look nearly as good because the Mac attempted to scale standard sizes to fill in the missing points.

In fact, the same situation exists even with System 7 when a TrueType font isn't available and a nonstandard size is selected. Small sizes are hard

to read and larger sizes generally display a bad case of the "jaggies" (ragged edges rather than smooth), as shown in Fig. 7-2.

Small odd size—difficult to read
Palatino 11. The quick brown fox jumped over the lazy dog!

Standard size
Palatino 14. The quick brown fox jumped over

Large odd size—showing jaggies
Palatino 20. The quick brown fox
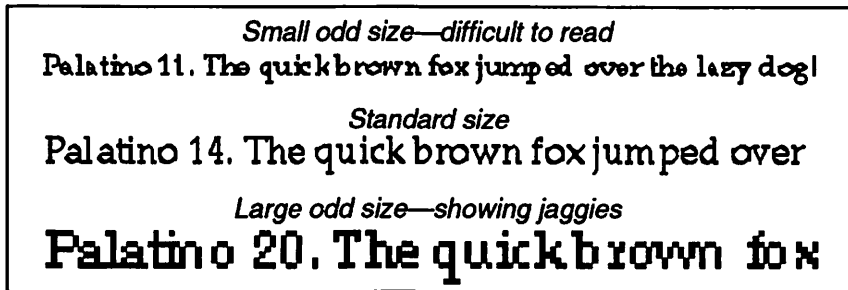
Figure 7-2. Screen fonts comparing scaled bit-mapped to standard size

LaserWriter and PostScript

While the ImageWriter's "best" quality mode was superior to most other dot-matrix printers, it wasn't until Apple introduced the LaserWriter that the Mac really earned its reputation as a desktop publisher. The new laser printer produced 300-dpi resolution, which is actually four times sharper than the ImageWriter and 17 times better than a screen image.

The LaserWriter is built around a page layout technology developed by Adobe Systems, Inc. called PostScript®, which includes a language for scaling images and fonts. For most users, PostScript is invisible, operating behind the scenes to create high-resolution printouts on any of several brands of laser printers. Apple and most other brands use a genuine Adobe PostScript interpreter, but some PostScript-compatible models are based on a clone.

The original LaserWriter included four built-in font families (Times, Helvetica, Courier, and Symbol), which were later expanded to the eleven families currently available (Avant Garde, Bookman, Helvetica Narrow, New Century Schoolbook, Palatino, Zapf Chancery, and Zapf Dingbats). Additional fonts were developed by Adobe and many others to augment those built-in to the LaserWriter.

When a nonresident font is selected, the Mac downloads information from a corresponding PostScript outline file to the printer. These files contain mathematical descriptions used by the built-in PostScript interpreter to form character shapes at the maximum resolution of the printer. Most Mac printers are 300 dpi, but other resolutions are available, ranging

from 400-dpi up to 3000-dpi on high-end professional typesetting machines.

Today, there are literally thousands of PostScript printer fonts to choose from, available in virtually every style. However, selection has been somewhat complicated by the existence of two formats—Type 1 and Type 3. While both are PostScript based, there are quality differences as well as limitations on which printers can utilize them.

Type 1 and Type 3 fonts

For a period of time, not all PostScript fonts were created equally. Adobe initially published information that allowed other font developers to create their own families. However, until 1990 Adobe withheld their "hinting" specifications, which improve the quality of character images, especially at small sizes. Only firms that licensed Adobe's proprietary technology could produce Type 1 fonts. Others created Type 3 fonts, which lacked Adobe "hints" but were less expensive and would operate on any PostScript printer, including clones.

Type 1 fonts produce sharper characters at low resolutions, and can be scaled with Adobe Type Manager (see next section). Font files are typically smaller and print faster than Type 3.

Type 3 fonts can be processed by any PostScript printer, but don't work with Adobe Type Manager.

When Apple and Microsoft announced their intentions to support True-Type, it represented the first major challenge to Adobe's dominance of the type market. Unlike Adobe's Type 1 fonts, TrueType was declared an open standard with published specifications available to anyone wanting to use them. In response, Adobe released its previously proprietary "hinting" algorithms so that Type 3 producers could upgrade their fonts to Type 1.

TrueType announcements also indicated that their technology would include methods for improving the quality of screen characters, as well as output to nonPostScript printers. Adobe responded to this challenge with ATM (Adobe Type Manager), which was aimed at similar results but based on their own Type 1 outline fonts.

Adobe Type Manager™

Before TrueType and ATM, the only way to achieve clean character images on screen and on nonPostScript printers was to select one of the standard font sizes (9, 10, 12, 14, 18, or 24 points), or load up your System file with additional sizes (if available). As described earlier, odd sizes produced unattractive characters, either difficult-to-read small point sizes or crude looking "stair stepped" images at larger sizes.

Adobe Type Manager was the first to provide an alternative, beating TrueType to market by over a year. Rather than scale bit-mapped images (which are custom crafted for each size), ATM uses Type 1 printer outline files to create smooth looking characters at any size, as shown in Fig. 7-3.
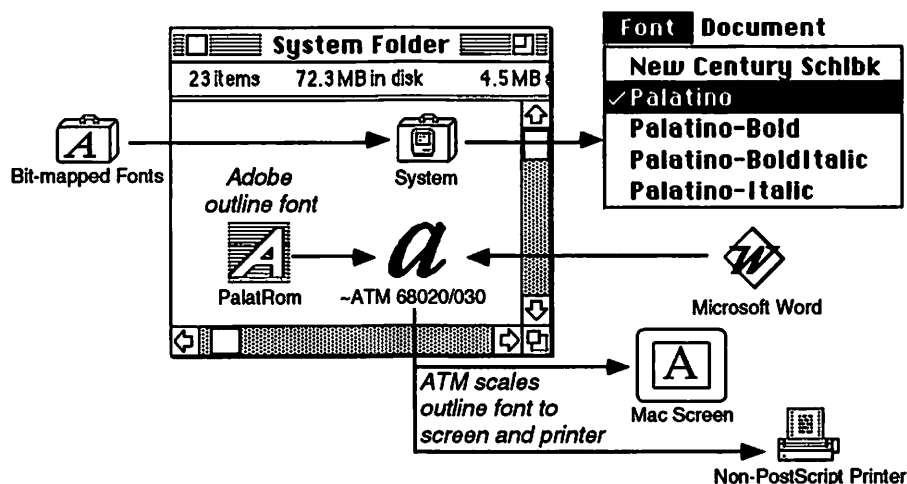
Figure 7-3. How Adobe Type Manager creates smooth fonts

Although ATM uses the outline font file to scale characters, it also requires that a corresponding bit-mapped version be installed in the System file. Without the bit-mapped fonts, system software would be unable to recognize the type family and application programs wouldn't include it in their font menus.

In the example illustrated by Fig. 7-3, Palatino is selected from the Font menu in Microsoft Word. When text is keyed into the document, Adobe's INIT (~ATM 68020/30) intercepts the characters and scales them to the appropriate size and resolution for screen display. In a similar fashion, the INIT also creates scaled versions for output to nonPostScript printers such as Apple's ImageWriter, StyleWriter, or Personal LaserWriter LS.

Outline fonts

To achieve a smooth appearance, both ATM and TrueType use mathematical formulas to describe the outline of character. Ultimately, however, outlines must be converted to a series of dots that corresponds to the resolution of the output device. For example, the Mac screen resolution is 72 dpi, while a laser printer is typically 300 dpi or greater. Unfortunately, the dots do not always fit neatly inside the outline, as shown in Fig. 7-4.
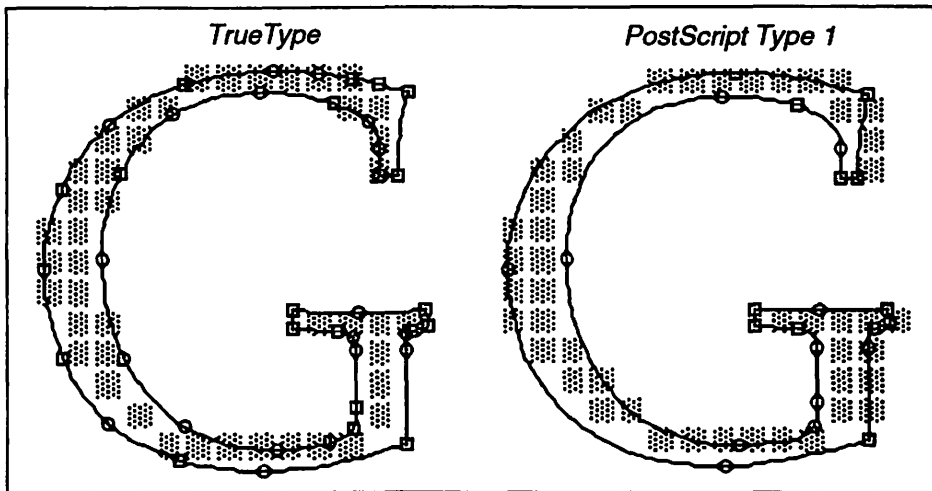
Figure 7-4. TrueType and PostScript Type 1 outlines

This enlarged view compares the results of TrueType and ATM in fitting dots to the outline of an 18-point letter at 72 dpi. Although the outlines are nearly identical, differences in dot placement will be readily apparent on screen. At higher resolutions such as 300 dpi, it becomes much easier to fill the outline, and differences are more subtle, as shown in Fig. 7-5.

Figure 7-5. TrueType versus PostScript at 72 and 300 dpi

However, at sizes below 12 points, dot placement is more critical even for a 300-dpi laser printer. This is where "hinting" plays a role in determining where dots should be placed for the most appealing results. Both TrueType and PostScript Type 1 include hints, although they each employ different methods to achieve similar results. TrueType hints are built into the fonts, while PostScript depends on instructions either included in ATM or built into a PostScript printer.

TrueType and PostScript also use different mathematical formats to describe outlines. TrueType is based on quadratic curves, which require more points (Fig. 7-4). However, the math is simpler than PostScript's Bézier curves, yielding at least a theoretical speed advantage to TrueType.

TrueType

Although originally announced in 1989 as a System 7 feature, TrueType was first released as a System 6 INIT to support Apple's new StyleWriter and Personal LaserWriter LS. When System 7 later appeared in May 1991, TrueType was built into the operating system, eliminating the need for a separate INIT. In both versions, TrueType delivers results that are similar to ATM, but with some important distinctions:

Bit-mapped fonts are not required, but can coexist within the same TrueType family. If a fixed size font is available, it takes precedence over a scaled TrueType version for screen display.

Outline files are installed directly in the System file, in contrast to PostScript outlines, which must remain as independent files stored inside the System Folder.

Formats unlike Type 1 and Type 3 PostScript, there is only one version of TrueType (at least so far).

Part of the Apple–Microsoft TrueType alliance is a PostScript-compatible interpreter, which can be built into laser printers. Because Apple includes the TrueType scaler in system software, a TrueImage interpreter doesn't need to be built into a printer to produce TrueType output. However, printers with the TrueImage interpreter can include built-in TrueType fonts, similar to the PostScript fonts found in many laser printers. Microtek's TrueLaser is one such printer, offering 35 resident TrueType fonts and claiming compatibility with all Postscript Type 1 and Type 3 fonts. It remains to be seen if other manufacturers will follow suit and also offer TrueImage-based printers.

Fonts and System 7

Installing and using fonts with System 7 is easier and more intuitive than with prior versions. The Font/DA Mover is no longer required to transfer and examine font samples, although version 4.1 is System 7 compatible and might come in handy under certain circumstances.

Fonts still come packed in the familiar suitcase icon, which can include both fixed sizes and TrueType versions. To examine the contents of a suitcase, simply double-click the icon, which opens a standard Finder window, as shown below in Fig. 7-6.
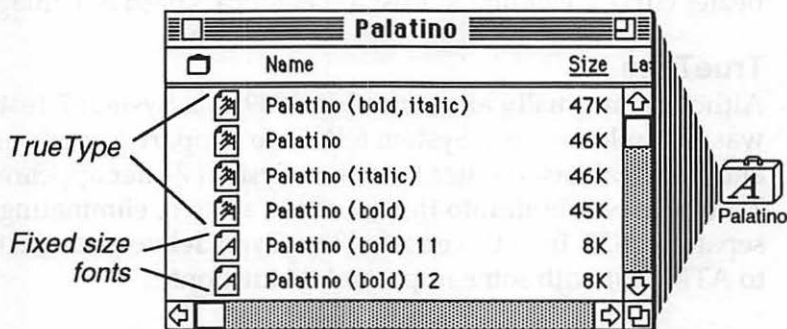
Figure 7-6. A font suitcase opened to reveal TrueType and fixed sizes

Each font is actually a separate file, which can be removed from the suitcase and stored in a folder, or installed in the System file. TrueType fonts are represented by a distinctive icon with three different sized As, signifying its scalable contents. A similar icon with a single A is used for fixed (bit-mapped) fonts. Figure 7-7 illustrates both of the new icons along with several others that might be used with System 7. PostScript files are stored in the System Extensions folder or at the root level of the System Folder. Unlike TrueType, they cannot be installed in the System file.
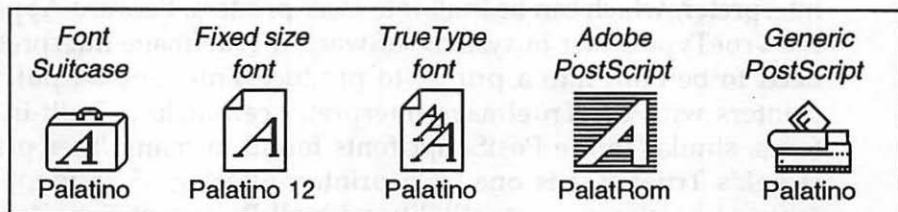
Figure 7-7. Font file icons

TrueType fonts are larger than individual fixed-size font files, but their economy is apparent when you consider how many fixed sizes would be needed for comparable quality.

You can inspect a sample of either TrueType or fixed-size fonts by simply double-clicking to open a display window, as illustrated in Fig. 7-8. True-Type files display three representative sizes (9, 12, and 18 point), but any size can be achieved in most application programs. Fixed-size files show a single type sample in the designated size.
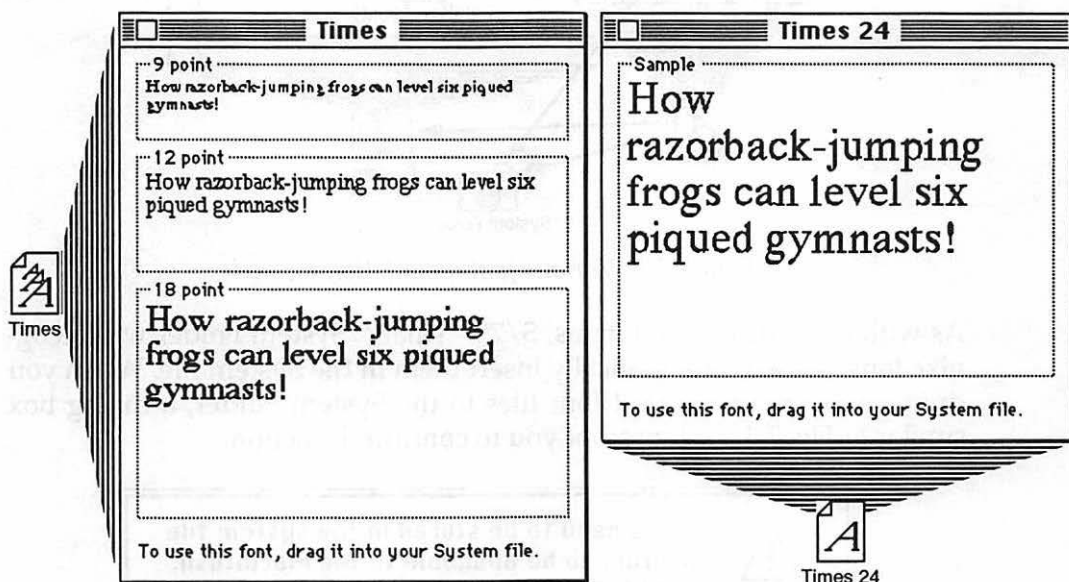
Figure 7-8. Displaying samples of Times TrueType and fixed-size fonts

Installing and removing fonts

Both TrueType and fixed sizes can be installed simply by dragging the entire suitcase of selected file to either the System Folder or to the System file, as shown in Fig. 7-9. Dragging an unopened suitcase will automatically transfer all of the fonts contained inside to the System file and then discard the empty (suitcase) shell.

To install only selected fonts, double-click the suitcase icon to open it. Then select one or more font files and drag them to the (unopened) System Folder. If you're not sure which fonts are already installed, open the System Folder and double-click the System file. Choose **View by Name** to display an alphabetical list of fonts and sounds. If you attempt to install a

font that already exists in the System file, the Finder will warn you with a dialog box. Click **OK** to replace the existing file or **Cancel** to stop.
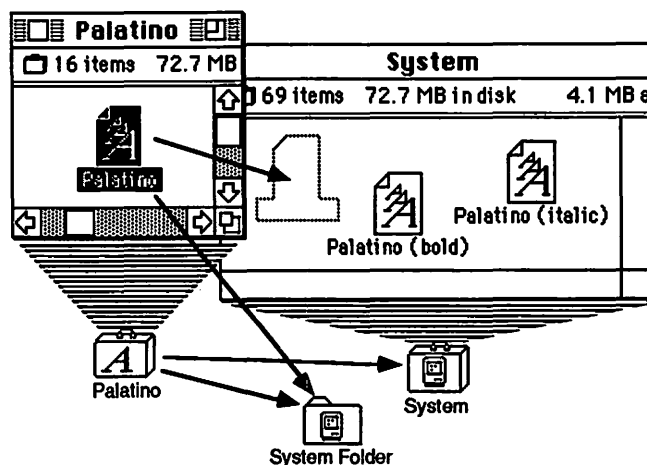
Figure 7-9. Various font installation methods

As with other designated items, S/7's "smart" System Folder will recognize font files and automatically insert them in the System file. When you drag a suitcase or selected font files to the System Folder, a dialog box similar to Fig. 7-10 will prompt you to confirm the action.

Fonts need to be stored in the System file in order to be available to the Macintosh. Put "1-800-Monotype" into the System file?

Cancel   OK
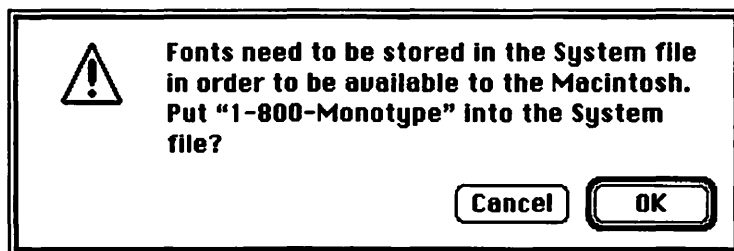
Figure 7-10. Confirming dialog box

To remove fonts, simply open the System file and drag the selected files to another location outside the System Folder. Unused fonts can be stored in suitcases or inside ordinary folders. If you use a font management utility such as Suitcase II, you probably will want to store your fonts in suitcases to make it easier to locate and open type families or font groups. Create an empty suitcase by duplicating an existing suitcase file, opening it, and dragging the contents to the Trash. Alternately, you could use Font/DA Mover 4.1 to create new suitcases and copy font files.

Applications—working with fonts

In most cases, working with fonts in an application program running under System 7 is much the same as before. Font names, sizes, and styles are still selected from the appropriate menus. However, there are some subtle distinctions to consider:

Font sizes

Outlined characters in a font menu indicate which sizes will look best on screen. As illustrated in Fig. 7-11, all sizes are outlined for a TrueType font, while only installed sizes of bit-mapped fonts are highlighted.
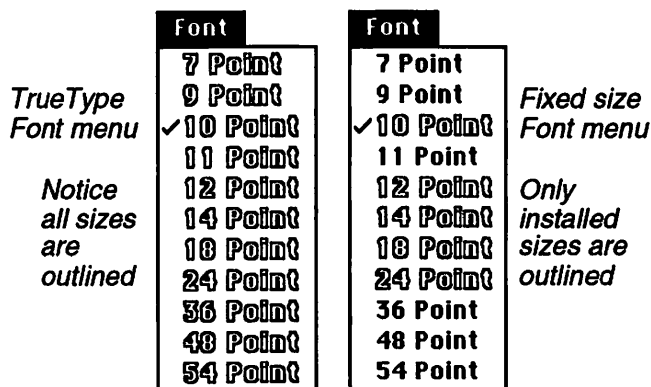
Figure 7-11. Font menus comparing TrueType with fixed size

Because TrueType looks good at any size, you might want to choose a point size not included on your standard menu. Most programs provide a way to select a nonstandard size. For example, Microsoft Word's **Format Character** (⌘-D) command opens a dialog box where the size can be keyed in directly. Word also allows you to add a size to the Font menu with the **Add to Menu** (⌘-option-=) command found under the Edit menu.

System 7 removes the previous 127-point upper limit and allows fractional sizes such as 24.5 point. However, some older applications might not be aware of the new rules. As more programs become System 7 savvy, you can expect that these features will be included, plus some exciting new possibilities. For example, Canvas 3.0 allows dynamic resizing of fonts by clicking and dragging a selected text area—a much more intuitive and efficient method of sizing a headline to match the available space.

Font names and styles

Adding some third-party font families to your system can cause confusion when selecting names and styles. Often, these families include separate font names that correspond to a style variation, as shown in Fig. 7-12.

Geneva	Geneva	
Helvetica	Helvetica	
Helvetica-Narrow-Bold	Helvetica Narrow ▶	
Monaco	Monaco	
N Helvetica Narrow	New York	
NB Helvetica Narrow Bold	Palatino ▶	Roman
Palatino	Symbol	✓ Roman
Palatino-Bold	Times	*Italic*
Palatino-BoldItalic		**Bold**
Palatino-Italic	*Font families grouped*	***Bold Italic***
Palatino-Roman	*with Adobe Type Reunion*	
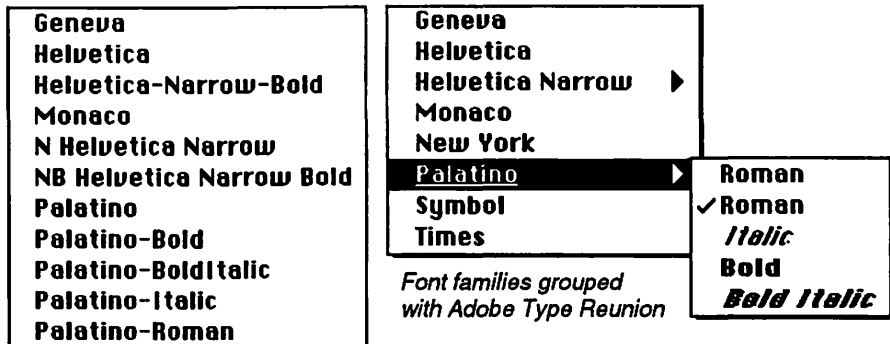
Figure 7-12. Font names reflecting style variations

Traditionally, variations have been chosen from the Style menu rather than selecting a different font name. For example, choosing **Bold** or *Italic* causes the Mac to alter the plain (Roman) typeface using its built-in software routines. Generally, this method is not as accurate as selecting a font that was specifically designed for a certain style. Consequently, designers offer separate files for each style. Unfortunately, choosing **Bold** from the style menu might not produce the same result as selecting **Palatino-Bold** from the Font Name menu.

To make matters worse, some naming conventions use a prefix such as N (Narrow) or NB (Narrow Bold), which tends to scatter a family across the font menu, making it difficult to locate a particular font. Fortunately, there are solutions, such as Adobe's Type Reunion, an INIT that gathers members of the same family and groups them in a submenu, as illustrated above in Fig. 7-12.

Apple's System 7 fonts do not suffer from these problems. For example, Times includes separate TrueType files for plain, bold, italic, and bold italic, but they do not appear as separate names on the font menu. Variations are accessed in the traditional manner through the Styles menu, indicating there is a method to overcome the confusion. Unfortunately, third-party vendors will need to alter current practices to make this preferred method more widely available.

Fonts on screen

All font types can be used in the same document—TrueType, PostScript, and bit-mapped. In fact, it's possible to have all three types of the same family available concurrently. For example, you might have both bit-mapped and TrueType versions of Times installed in your System file, plus have the PostScript outline file in your System Folder with ATM turned on. When you select a font and size, System 7 uses the following priorities in determining how to display characters on screen:

Fixed size   if you have the exact size available, it takes precedence over all other choices.

TrueType   if the appropriate fixed size isn't available and if a True-Type version is installed, it will scale characters to the selected size.

ATM   is the next choice, if the corresponding outline font file is available in the System Folder.

Scaled bit-map   when all other possibilities are exhausted, the system will scale the closest fixed size font to the specified size.

Both ATM and TrueType produce their best results at larger point sizes. For type 12 points or less, you might want to install fixed sizes because they are specifically crafted for optimal screen appearance.

Printing with System 7 fonts

When printing a document, System 7 automatically determines which font technology is employed. However, the priority order is different from those used for screen display, and depends on the type of printer. Table 7-1 summarizes how the Mac determines which fonts are used:

Table 7-1. Font technology printing priorities

PostScript Printers	Non-PostScript Printers
1. Built-in fonts (printer's ROM)	1. TrueType
2. Downloaded fonts (RAM)	2. ATM (if available)
3. Fonts from printer's hard disk (if available)	3. Bit-mapped fonts (scaled, if the correct fixed size isn't available)
4. Postscript outline files	
5. TrueType	
6. Bit-mapped fonts	

PostScript printers include the LaserWriter Plus, LaserWriter II NT, NTX, and Personal LaserWriter NT, as well as many third-party PostScript printers. NonPostScript printers include the ImageWriter, StyleWriter, LaserWriter IISC, Personal LaserWriter SC, and third-party units such as the HP DeskWriter™.

While System 7 makes it easy to print a document containing a mixture of bit-maps, TrueType, and PostScript fonts, there are some other issues you might encounter. Documents with TrueType fonts could take longer to print and text spacing might be different than when using the other font technologies.

Most existing PostScript printers do not have a built-in TrueImage inter-preter. Consequently, the Mac will download TrueType software along with the font outline files if TrueType fonts are used in a document. It might take longer to print a document that includes TrueType, because the printer must execute both the TrueType software and PostScript lay-out instructions while preparing the page image.

NonPostScript printers typically lack the computer engine and inter-preters found in PostScript models. Printing is slower because the Mac itself must perform the page layout tasks using a combination of Quick-Draw, TrueType, or ATM. Initial releases of TrueType printer software have been notoriously slow, especially on nonPostScript printers. Conse-quently, Apple has announced a new version of printer software that they claim is up to 2 times faster.

Page layout can be slightly different using TrueType. For example, if you have an existing document that was created with System 6 and fixed-size fonts, some lines and page breaks might be different using TrueType. This could occur if the TrueType characters are slightly wider, causing text in a tightly spaced line to overflow to the next line.

Another factor that might alter page layout is the method a particular program uses to determine printer spacing. With applications such as MacDraw and Microsoft Word, printed output is affected by how charac-ters are spaced on screen. For example, text in a fixed-size font could print differently than the same passage in a TrueType version. In Microsoft Word, turning on **Fractional Widths** in the File menu will help to minimize differences and tighten up spacing.

Font families—what's available in TrueType?

Apple includes eight TrueType families with System 7—four laser fonts plus outline versions of four traditional bit-mapped faces. Many other typefaces are offered by third parties, and the list is expected to grow as TrueType gains in popularity. In addition, utility programs are available that convert existing Type 1 and Type 3 PostScript files to TrueType.

What comes with System 7

Table 7-2 illustrates which TrueType fonts are included with the initial release of System 7. A plain style is provided for all families. Courier, Helvetica, and Times also include additional outline files for some other styles, as indicated by TT in the table. Styles without a specific TrueType outline file are formed automatically by the Mac.

Table 7-2. System 7 TrueType fonts

Family	Sample (Plain)	Bold	Italic	Bold Italic
Chicago	**ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz**	—	—	—
Courier	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz	TT	—	—
Geneva	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz	—	—	—
Helvetica	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz	TT	—	—
Monoco	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz	—	—	—
New York	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz	—	—	—
Symbol	ΑΒΧΔΕΦΓΗΙϑΚΛΜΝΟΠΘΡΣΤΥςΩΞΨΖ αβχδεφγηιφκλμνοπθρστυϖωξψζ	—	—	—
Times	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz	TT	TT	TT

There are seven more families typically built into PostScript printers, which do not yet have Apple TrueType equivalents (see outline fonts discussion in chapter 3). Fixed-size versions of these fonts will continue to generate high-quality results at any size on PostScript printers, but not on screen, unless a third-party alternative is used.

Third-party fonts

Of course, you don't have to settle for just the fonts that are included with System 7. Most of the major digital typeface companies have already announced several TrueType families, and many more can be expected. Samples from Kingsley/ATF and Casady & Greene are shown below; Monotype samples are on the following page. TrueType fonts are also available from Agfa Compugraphic, Bitstream, and Linotype-Hell.

TrueType font samples from Kingsley's ATF Classic Type™ collection

Thompson	*ABCDEFGHIJKLMNOPQRSTUVWXYZ*
Quillscript™	*abcdefghijklmnopqrstuvwxyz 1234567890*
𝕎𝕖𝕕𝕕𝕚𝕟𝕘 𝕋𝕖𝕩𝕥™	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 1234567890

TrueType font samples from Casady & Greene's Fluent Laser Fonts™

Galileo Roman	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 1234567890
Regency Script	*ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 1234567890*

Font Utilities

Since the Mac's introduction, there have been many utility programs developed to help you manage and manipulate your font collection. Some of these have been upgraded to work with System 7 and TrueType.

Managing your font portfolio

Suitcase™ II, which we reviewed earlier in chapter 3, has been upgraded to work with System 7. The interface looks much the same as before, but it now includes the ability to open TrueType fonts without installing them in the System file. The latest version (as of this writing) is 1.2.11. Small updater programs are available from several on-line services or directly from Fifth Generation Systems, which will upgrade a copy of Suitcase to the latest version.

TrueType font samples from Monotype's imprints™ collection

Albertus	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 1234567890
Forte	*ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 1234567890*
Gill Sans Light	ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 1234567890
Monotype	**ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 1234567890**

Preserving your font investment—conversion utilities

If you already have a collection of PostScript outline fonts, you might want to convert them to TrueType. This isn't a requirement, because PostScript fonts will continue to work as before and can even be mixed with TrueType fonts within the same document. However, you might prefer TrueType's screen renditions, which of course are always available with System 7. Or you might want to save some disk space.

There are at least two commercial packages that are primarily intended to convert among PostScript Type 1, Type 3, and TrueType outline files. Ares Software's FontMonger™ is a simple and elegant utility that converts among all three outline technologies, and offers some additional capabilities, such as creating true oblique character sets, adding fractions and small caps. Metamorphosis™ Pro from Altsys is another utility that can convert PostScript outline files to TrueType.

Creating and modifying your own fonts

If you're really into fonts and would like to create your own TrueType families, you might want to consider one of the high-end packages, such as FontStudio™ from Letraset. Version 2.0 supports TrueType and System 7, with full capabilities to create, display, and modify outline fonts. Figure 7-4 shown earlier in this chapter was created using one of Font-Studio's windows, which allows you to examine how TrueType and ATM will position bits for screen display.

Summary

In chapter 7, we've taken a look at the new TrueType font technology and how it can enhance your voyage on the AMS 7. TrueType is the latest advance in a series of evolutionary steps that have made the Macintosh the preferred choice for desktop publishing. In this chapter, we've examined some of the history and secrets behind this new technology.

History of Macintosh fonts   beginning with bit-mapped fonts on the original 128K Mac, through PostScript first on the LaserWriter and later on screen with ATM, and now TrueType for all occasions.

Fonts and System 7   installing and using fonts is easier and more intuitive. Mix and match with bit maps, PostScript, and TrueType, but be aware of how System 7 decides which method to use when printing and displaying fonts on screen.

Applications   there are some new wrinkles to consider when choosing TrueType fonts and applying styles in your favorite program.

TrueType font families   a starter set comes with System 7, but many more are available from third parties, and the choices are growing.

Font Utilities   allow you to convert PostScript outline fonts to True-Type, make changes and create your own new typefaces, and continue to manage your font collection with Suitcase II.

TrueType benefits

On screen   Easier to read—even at small point sizes. Great for live video presentations—no more "jaggies" on screen.

NonPostScript printers   Improved quality at any point size.

PostScript printers   TrueType works with existing PostScript printers and there's a new breed of TrueImage devices arriving on the scene.

Disk space   TrueType outline files take up less space than multiple sizes of bit-mapped fonts.

Font management   Easier to install and display samples—just double-click a TrueType outline file for a sample in three sizes.

Section III

System 7 Savvy Programs and Other Events

In earlier sections, we've prepared for our voyage and boarded for an in-depth look at the desktop, System Folder, and TrueType. The AMS 7 offers a wealth of new features, even before you've launched your first System 7 savvy program. Applications, however, are the primary reason for using a Mac. Whether for fun, education, or business, you're likely to spend most of your time working in application programs. And System 7 offers some exciting new possibilities for software developers to enhance their programs for your benefit.

Chapter 8 explores some new techniques for working with applications, beginning with expanded methods to launch programs and operate them under System 7's full-time MultiFinder. If you've never used MultiFinder before, you'll want to join us in reviewing some basic operating issues. Even if you're an experienced user, System 7 offers new options, such as virtual memory and 32-bit addressing, which extend memory space to accommodate those extra programs. Finally, we'll take a look at Publish and Subscribe and other features of System 7 savvy applications.

Publish and Subscribe, however, is only the tip of the iceberg. System 7's interapplication communication (IAC) introduces a whole new approach for applications to exchange data and share tasks. In chapter 9, we'll look at Apple Events and other IAC features that will lead to future program enhancements. Ultimately, you might be able to link your favorite applications, allowing each to contribute what it does best in a collaborative effort to meet your unique requirements.

Application programs—
Riding the waves of change

As you've seen in earlier chapters, System 7 offers a wealth of new Finder features, right out of the box. Some of these provide new ways of launching and working with multiple open applications. And, because MultiFinder is always on, managing memory usage becomes an important concern. In this chapter, we'll take a look at some basic application issues, such as:

Launching applications aliases and other System 7 features expand methods available to launch programs from any deck of the AMS 7.

Full time MultiFinder enables simultaneous operation of several programs, including desk accessories. Switching between applications is easy, but there are some issues to keep in mind, especially if you've never before used MultiFinder.

Memory management each open application consumes RAM space, which could push the limits of your Mac. Virtual memory and 32-bit addressing might expand your memory space, but certain conditions must be met.

System 7 savvy programs offer the potential to enhance your productivity even more. We'll take a look at an example of two programs that utilize Publish and Subscribe to complement the strengths of each application.

As captain of the AMS 7, you have a full crew of resources at your command. Startup items await your daily orders, while the ship's steward stands ready to log important events. Able applications are available to perform routine tasks and rescue stranded documents. Communications from the bridge flash across a network of aliases, transmitting orders to the waiting crew of applications. And, first officer MultiFinder maintains order as multiple programs are launched into action.

Launching applications

Under System 6, you might have kept applications in their own folders where you would have to go fishing for them. For quicker access, you might have put documents, templates, or perhaps the applications themselves right on the desktop.

These traditional methods continue to work as before, but System 7 offers additional launching flexibility through the use of aliases, and a new click-and-drag technique. With System 7, there are three basic ways of launching an application:

Application   as before, opening or double-clicking an application icon will launch the program. Because an alias acts as a stand-in for the original, you can also launch by opening a program alias.

Document   double-clicking the original or an alias of a document will automatically launch the application that created it. It could be a working document, a template, or a stationery pad.

Drag over   selecting a document and dragging and releasing it over an application will automatically launch the program. If it is able to open a document of this type, the program icon darkens.

As described earlier in chapter 1, this last method is useful for opening certain standard document formats, such as text, PICT, etc. It is particularly beneficial when you receive a document from a friend or associate, and don't have the application that created it.

Aliases add a new measure of convenience when launching an application. As suggested earlier in chapter 5, it's a good idea to keep applications stored in a folder together with their supporting files. By using one or more aliases of a program, you can avoid the fishing expedition required with System 6. These aliases can be stored in several locations, providing convenient access no matter where you happen to be when the need to launch arises.

The same technique applies to documents. Regardless of where you store document originals, aliases can provide an alternate launching point. Table 8-1 summarizes several possible storage locations for aliases of both applications and documents.

Table 8-1. Multiple launch points

Storage folders	Application	Document	Notes
Startup Items	Alias	Alias	Auto launch at startup
Apple Menu	Alias	Alias	Quick launch anytime
Applications	Original		
Documents		Original	
Projects	Alias	Alias	Convenience launch
Desktop	Alias	Alias	Convenience launch or drag over

Startup items   For automatic launch of documents, templates, stationery pads, applications, or desk accessories, include an alias in the Startup Items folder. See chapter 5 for a list of suggested uses.

Apple menu   No matter where you are—at the desktop or in another application—an alias stored in the Apple Menu Items folder provides the quickest launch. Because MultiFinder is always on, you won't need to quit the current application to launch another, assuming you have enough memory for both programs.

Applications folder   Keep program originals in a folder with their supporting files. Aliases provide alternate launching points.

Documents folder   Stationery pads or templates should be stored near where you normally keep your documents, to minimize folder navigation when you **Save As**. Keep an alias in the menu, desktop, or another folder for quick access.

Projects folder   If you follow one of the organizational schemes suggested in chapter 5, it might be convenient to keep aliases of related applications and templates stored with project documents.

Desktop   Keeping aliases of several applications on the desktop provides both a convenient launch and a quick way of using the drag-over technique to open standard format documents.

Aliases and the new drag-over feature add several new convenient methods to launch an application, even if you're operating only one program at a time. However, with System 7's full-time MultiFinder, these convenience features become even more important in managing a set of open applications.

Running several applications at once

The ability to launch multiple applications and switch between them dates back to the early days of the Macintosh. In 1985, Apple introduced the concept with a software utility named Switcher, which later became MultiFinder with System 4.2 in 1987. In retrospect, the early versions were a bit crude, and were primarily adopted by more adventurous Macintosh fans. Over time, however, MultiFinder has become more smoothly integrated and, with System 7, it is now a full-time partner with other system software features.

Early MultiFinder adopters recognized the benefits of launching multiple applications, which included:

Quick switch capabilities   to run several applications at once and quickly switch between them, eliminating the time required to quit one program and return to the Finder before launching another.

Fast copy-and-paste   transferring information between applications is much faster when both programs are running.

Instant Finder access   temporarily suspend applications work and return to the desktop to copy, move, or delete documents.

Background printing   to avoid long delays while waiting for your Mac to print a document, turn on background printing and continue with your other work.

The same benefits are available in System 7, along with a few enhancements, such as additional background tasks and the new pull-down Applications menu.

MultiFinder's primary benefit is speed. It's simply much faster to launch all of the programs you need to work on a task and switch between them, rather than quit one application, return to the Finder, and launch another.

The alternate solution is a single multipurpose application, such as Microsoft Works, which combines several functions—word processing, spreadsheet, database, etc. If the program handles all of your needs, there might not be any reason to switch applications. This approach is useful when tasks are fairly basic and don't require sophisticated features. However, the trend in Mac software has been toward single-purpose, feature-laden programs, which demand a MultiFinder approach.

How MultiFinder worked with System 6

Prior to System 7, MultiFinder was an optional feature that was activated through the **Set Startup** dialog selected from the Special menu. It required restarting your Mac to enable MultiFinder features. Once activated, several applications could be launched from the Finder. The number of concurrent programs depended upon the amount of available memory.

Figure 8-1 shows both Microsoft Word and Excel open under System 6.

Active application icon

| **File** | **Edit** | **Format** | **Font** | **Document** | **Utilities** | **Window** | |

First Quarter Report

The following figures show staff performance in t
quarter of this year. Please note...

Telemacho

	Jan	Feb
Bob	12	2
Carol	21	3
Ted	32	5

Microsoft Word (active program)

Page 1

Q1 Performance

	A	B	C	D
2		Jan	Feb	Mar
3	Bob	12	23	51
4	Carol	21	34	27
5	Ted	32	56	39
6	Alice	56	76	92
7				
8	Totals	121	189	209
9				

Microsoft Excel (inactive)

Trash

Figure 8-1. MultiFinder under System 6

Under System 6, MultiFinder lacked a method to conceal windows from other open applications, which could sometimes lead to confusion. There were several subtle clues to determine which application was active:

Menu bar   menu options belonged to the active application.

Window bars   were textured and scroll bars appeared for the active application; inactive windows lacked these characteristics.

Miniature application icon   in the upper right corner of the menu bar belonged to the active program.

The concurrent display of windows from multiple applications was a mixed blessing. By arranging windows similar to Fig. 8-1, it was easy to copy-and-paste between them. After copying information from the source program, you simply clicked on the destination window to activate it, positioned the cursor where you wanted the material inserted, and then pasted the clipboard contents. On the downside, this often required resizing and rearranging windows to fit more conveniently on the screen.

If the window of the currently active application was enlarged, it generally concealed windows from other programs, and switching was a bit more tedious. Clicking on the miniature application icon in the upper right corner of the menu bar cycled through all of the open programs until you reached your destination. The more open applications, the more tedious the process. You could, however, move directly to the destination program by selecting it from a list, which appeared at the bottom of the Apple menu below all of the desk accessories.

Consistent with Apple's philosophy, the System 7 MultiFinder continues to operate much the same as before, but now incorporates several enhancements that overcome many of the previous problems.

MultiFinder in System 7

As described earlier, MultiFinder is no longer an option—it is always active with System 7. Some might consider this a negative, but there are some compelling arguments in favor of a full-time MultiFinder. First, it eliminates the need to restart the Mac to activate MultiFinder. Second, it is consistent with a trend toward linking multiple special-purpose programs to achieve the best solution. And finally, having MultiFinder active doesn't force you to launch multiple applications. If you prefer or are limited by RAM, you can still quit one program, return to the Finder, and launch another.

The most prominent System 7 MultiFinder enhancement is the addition of the Applications menu, which appears below the traditional miniature icon located in the upper right corner of the menu bar. It offers two improvements over System 6:

> **Application list** provides a quick method to switch between open programs.

> **Hide/Show options** to conceal or reveal windows from either the active application or other open programs.

Figure 8-2 illustrates how our earlier example (shown in Fig. 8-1) would look with System 7. The Application menu provides a quick and direct indication of which program is currently active. The check mark (√) indicates that the Finder is active. To switch applications, you merely need to drag down the list and select the desired program.
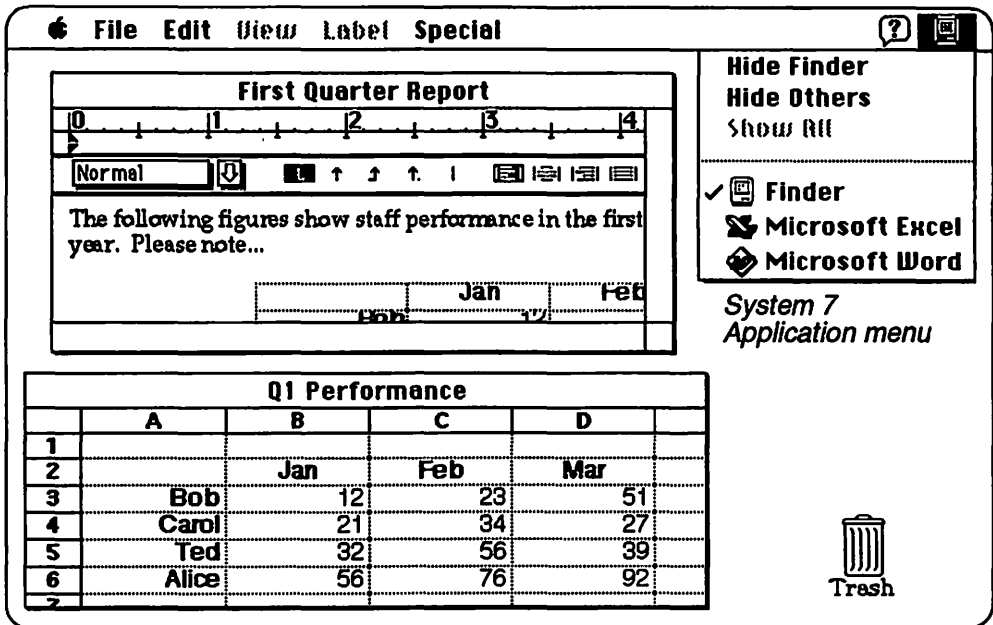
Figure 8-2. Multiple applications open with System 7.

Because the miniature icon now represents a pull-down menu, clicking it no longer cycles between applications as it did with System 6. If you miss this feature, you might try Luis Bardi's Just Click INIT, which is described earlier in chapter 6.

System 7 continues to support the other methods of switching between applications, such as clicking in the window of an inactive program, or double-clicking the icon of a document created by another application, which will open it and activate the alternate program.

While our example illustrates just two open applications, it's possible (with sufficient memory) to have many programs open, including desk accessories and control panels. Consequently, the screen can become confusing with a myriad of open windows.

You can manage window clutter with the Hide/Show options in the Application menu. **Hide Others** conceals all other windows except those belonging to the active application. However, the desktop remains visible if not completely concealed by an application window, and clicking on it will activate the Finder. On the other hand, if one of the open program windows covers the entire screen, switching to the Finder might be a bit disconcerting. Only open Finder windows will appear. The Trash, disk icons, and desktop surface will be concealed by the inactive application window. To remedy this situation, simply choose **Hide Others** to conceal the inactive windows and reveal the desktop.

Holding down the option key before selecting another program from the Applications menu will hide the current windows and activate the other program. The same technique works when clicking either the desktop or a window of an inactive program. **Option-click** the desired program to conceal the current application windows.

The Application menu also provides a visual clue to indicate which program windows are visible. In Fig. 8-3, the miniature icons for Microsoft Excel and Word are dimmed, indicating that their windows are currently concealed. In contrast, the Calculator DA, Finder, and TeachText icons appear normal to show their windows are visible.
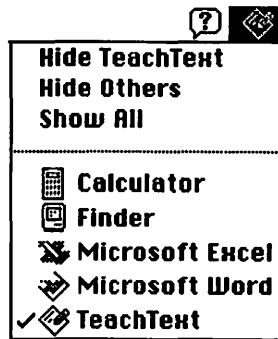
Figure 8-3. System 7 Application menu

Selecting the first option in the Applications menu will conceal the current program and switch to the most recently active item. For example, in Fig. 8-3, if the Calculator was used just prior to TeachText, choosing **Hide TeachText** will conceal its windows and activate the Calculator. As you might expect, the **Show All** command reveals all hidden windows.

While MultiFinder offers some valuable benefits, it can be a bit confusing if you're accustomed to working with only one application at a time. Switching applications isn't the same as quitting one program and starting another. The first program remains loaded in memory, and in some cases might even continue to perform certain tasks. If this occurs, it is known as background processing.

Background processing

With System 7, the active application (foreground program) takes precedence over any background processing. However, MultiFinder continuously monitors foreground activity and can allocate processing time to a background task whenever the active application is idle. For example, if Microsoft Word is the active application, it could be waiting for you to key in a text passage or select a command from a menu. Unless you are actively keying or have selected a command, Word is idle or in a wait state. When MultiFinder recognizes this condition and has a request for a background task, it will borrow a slice of time from Word and give it to the background program.

System 7 includes two built-in background tasks—background printing and background file copy. Other programs could also use background processing if they have been upgraded to use this feature.

PrintMonitor (described earlier in chapter 6) typically operates as a background program. If you have selected the **Background Printing** option from the Chooser, PrintMonitor will automatically launch when you print a document to a laser printer. Although you can continue to work in the active application, you might notice a slightly delayed reaction to a keystroke or mouse movement, which is caused by PrintMonitor as it performs background tasks.

Normally, PrintMonitor will remain in the background and quietly complete its tasks. In fact, you might not even notice it, except for the delayed reactions described above. Occasionally, however, PrintMonitor might need to alert you to take certain actions, such as replenishing the paper supply or inserting a manual feed document. In such cases, it will either flash the application icon or beep and display a dialog box asking that it be made the active program.

To activate PrintMonitor, simply select it from the Application menu. After taking the appropriate action, you can return to the previous program

by clicking a window or selecting it from the Application menu. Print-Monitor will continue to work in the background and will automatically quit when it completes its tasks.

When PrintMonitor is active, the notification method can be changed by selecting **Preferences** from the File menu, which will display a dialog box as illustrated below in Fig. 8-4.
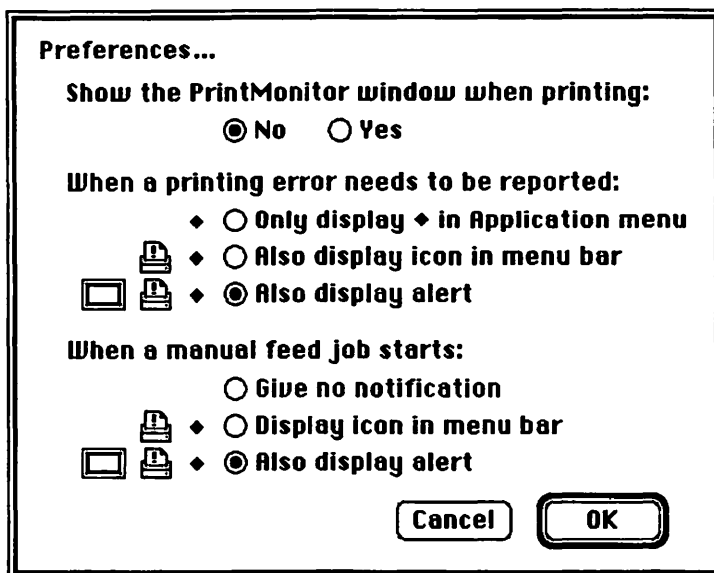
Figure 8-4. PrintMonitor preferences.

Selecting the **Yes** option will force PrintMonitor to become the active application whenever it's printing. Other options allow you to set the level of notification, ranging from a passive icon flash to a more direct alert, which will display a dialog box and interrupt your current work.

Background copying is another System 7 built-in background task. To use this feature, you must first have an application open before initiating the copy. You cannot begin a copy and then open an application. The Finder can perform copy tasks in the background, but not concurrent with launching an application.

Figure 8-5 illustrates a typical background copy. Microsoft Word has been previously launched and several files have been selected, which are dragged in the usual manner to a destination disk. Once the copy process

is begun, Word is selected from the Applications menu. Copying will continue in the background, while work resumes in Word.
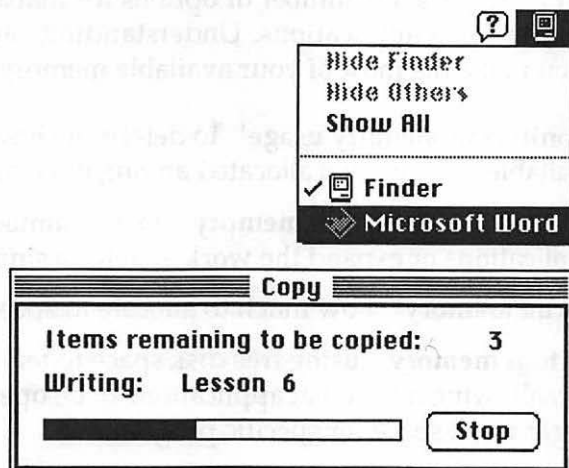
Figure 8-5. Background copying

MultiFinder's memory-hungry appetite

While MultiFinder provides several benefits, including faster program switching and background processing, it has a voracious memory appetite. Each open application and DA consumes additional memory, which is added to the amount required by System 7 itself. System software alone will consume at least 1Mb on a Mac Plus and up to 1.6Mb on a Mac LC. Add a few third-party INITs and your system could easily demand 2Mb, before you've launched even your first application.

Moreover, the latest versions of application programs continue to increase their memory demands. As more features are packed into a package, it requires more memory to function efficiently. For example, Microsoft Word 4.0 and HyperCard 2.1 each prefer 1Mb, while the latest version of Excel (3.0) asks for 1.5Mb. Because of new programming possibilities, such as Publish and Subscribe, we expect that System 7 savvy applications will expand their memory demands even further.

System 7's full-time MultiFinder makes it easy to open several concurrent applications. It's so easy, in fact, that you might not notice until a message appears, warning you of insufficient memory to open the next program. All of which emphasizes the need for effective memory management.

Memory management

System 7 expands the number of options for managing memory and allocating it to open applications. Understanding several key concepts will help you make the most of your available memory:

Monitoring memory usage to determine how much memory is available and how it's allocated among open applications.

Adjusting application memory to accommodate more concurrent applications or expand the work area for a single program.

Cache memory how much to allocate to speed up disk access.

Virtual memory using free disk space to temporarily expand memory, allowing additional applications to be opened or providing a larger work space for specific programs.

32-bit addressing can enable access to more than 8Mb of physical RAM and expand virtual memory beyond 14Mb for some models.

Memory fragmentation can occur when several applications have been opened and closed during a work session. It's important to recognize the symptoms and take appropriate corrective actions.

In this section, we'll examine each of these issues and discuss alternatives for applying various memory management techniques.

Monitoring memory usage

Selecting **About This Macintosh** from the menu will display a window similar to Fig. 8-6 shown below.
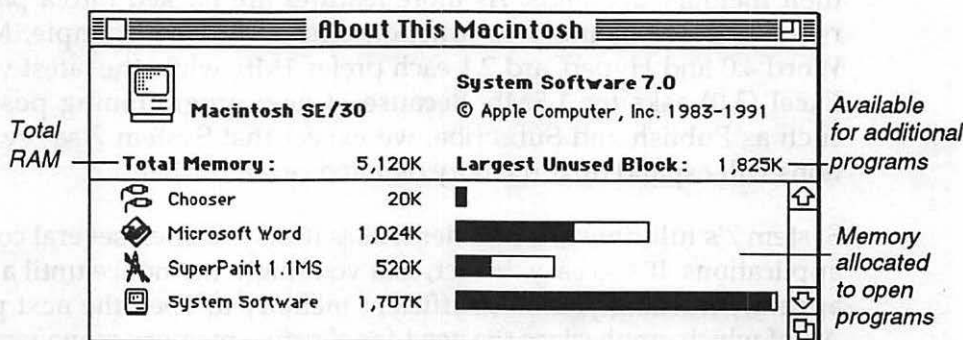
Figure 8-6. Memory usage

This window provides three important pieces of memory information:

Total Memory shows the amount of physical RAM installed in your Macintosh. With virtual memory turned on, this value would reflect the combined total of real and virtual memory (see Fig. 8-13).

Current memory usage lists all open programs (including system software) and indicates the amount of memory allocated to each.

Largest Unused Block indicates the amount of memory remaining to open additional programs.

In the example shown in Fig. 8-6, this SE/30 has 5Mb (five times 1,024K) of installed RAM. System software is currently using 1.7Mb, while another 1.6Mb is allocated to two applications and the Chooser. This leaves 1.8Mb of remaining memory, which is available for additional programs.

Horizontal bars in the memory usage section indicate how much of the memory allocated to each program is actually in use. For an exact reading, choose **Show Balloons** from the Help menu and place the mouse pointer over one of the bars, as illustrated below in Fig. 8-7.
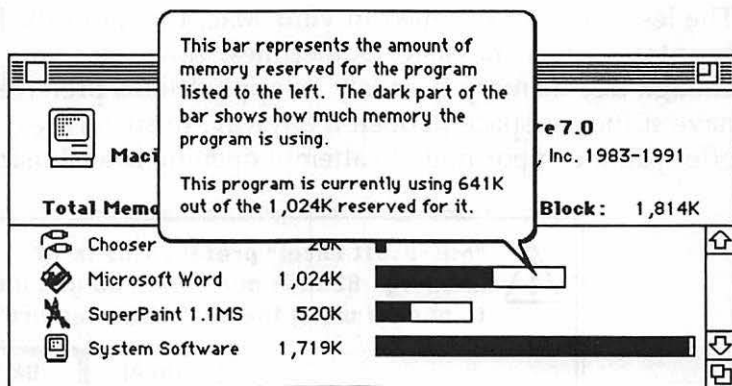
Figure 8-7. Balloon Help indicates exact usage

In this example, Microsoft Word is using 641K of the 1,024K allocated to it. The amount in use will vary depending upon the size and number of documents open, as well as which options are turned on in Word. For example, Word offers several options to keep documents and the Word program stored in memory, or to read sections from disk as needed. Using RAM rather than accessing the disk provides faster performance if you have enough free memory available.

Memory—how much is enough?

To operate System 7, you must have a minimum of 2Mb of RAM, which will accommodate system software and perhaps one moderately sized application. However, to really take advantage of System 7's MultiFinder capabilities, we recommend 4Mb or more.

As you open multiple applications, the amount of available free memory will shrink, and eventually you might encounter a warning message similar to the one shown below in Fig. 8-8.
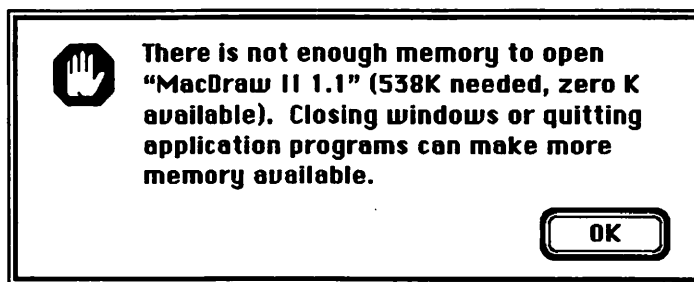
Figure 8-8. Insufficient memory alert

The less memory installed in your Mac, the more likely you are to encounter such a message. Sometimes, however, you might not have enough free memory to satisfy an application's preferred size, but could have sufficient space to open it anyway. In such cases, the Finder might offer you the opportunity to attempt opening it, as illustrated in Fig. 8-9.
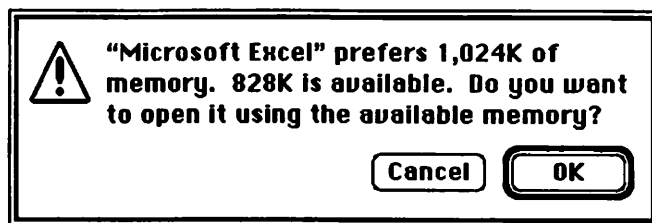
Figure 8-9. Less than ideal amount of memory available

If you select **OK** to go ahead, be aware that you're likely to encounter at least some limitations, such as less space available for documents or reduced performance if the program is able to swap information to and from disk. In the worst case, the program could quit unexpectedly, which loses all changes since your last **Save**, or it might even cause a system error that requires restarting your Mac. To protect your work, be sure to

save often, in both the size limited application and any other programs you might have open.

Adjusting the amount of memory an application uses

You don't have to wait for a dialog box like the one shown in Fig. 8-9 to adjust the amount of memory allocated to an application. You can change the allocation by selecting the application and choosing **Get Info** from the Finder's File menu. Memory changes are allowed only when the application is closed, so be sure to quit before attempting to alter the current size.

You can either increase or reduce the amount of memory allocated when a program is launched. If you attempt to specify a size less than the minimum recommended by the software developer, the Finder will warn you with a dialog box similar to the one shown below in Fig. 8-10.
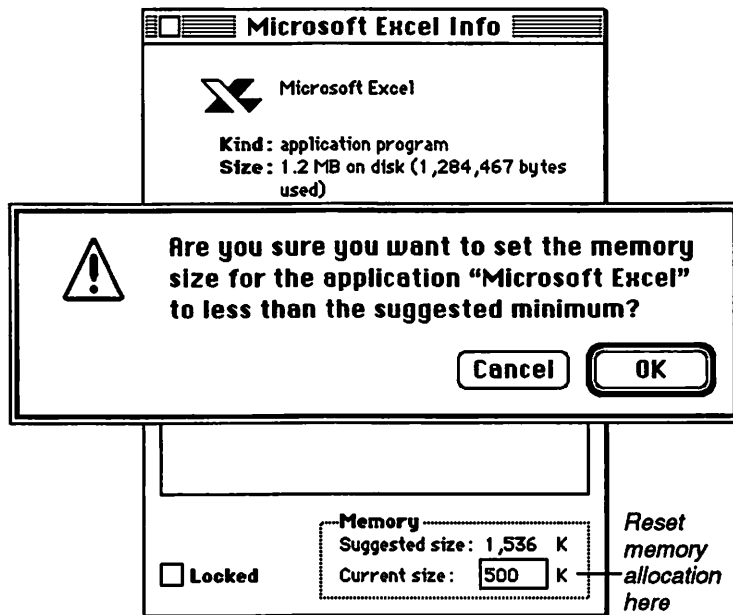
Figure 8-10. Reducing memory allocation for Excel 3.0

If you receive such a warning, click **Cancel** and increase the value in the current size box. Repeat the process until you no longer get the warning message, indicating you've reached the suggested minimum. As suggested earlier, reduced memory allocations might limit performance, but could allow you to open a program that wouldn't otherwise fit.

Of course, you might also want to increase the current size value to improve performance or provide more space for several open documents. Changing an application's memory allocation is basically a trial-and-error process, although you can gain some insight by checking memory usage in the About This Macintosh window described earlier. When the dark portion of the bar approaches the allocation limit, increasing current size will probably improve performance. On the other hand, if an application is using a smaller portion of its allocation, you might safely reduce the current size without affecting performance.

Cache memory

Improving application performance is also possible by allocating a certain amount of RAM to a function known as a *cache*. With System 7, the Disk Cache feature is always on; it's only a matter of how much RAM is allocated to it. To examine or change the cache, open the Memory control panel, which will display a window similar to Fig. 8-11.
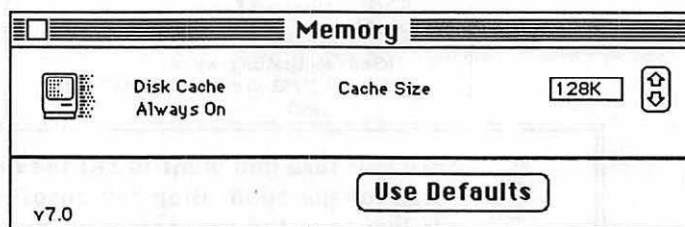
Figure 8-11. Memory control panel showing Disk Cache setting

Changing cache size is accomplished by clicking the arrows next to the size box, which will adjust the amount of allocated RAM in predefined increments from 16K up to 2,560K. Clicking the **Use Defaults** button will automatically adjust the setting to the recommended size, which will vary depending upon the amount of RAM installed For example, with 8Mb of RAM, the recommended cache size is 256K. With less RAM, the amount is proportionally smaller. Changes in cache size do not take effect until you restart your Mac.

Cache memory is used to temporarily store information retrieved from disk. It is designed to take advantage of the fact that accessing RAM is much faster than reading data from a hard disk or floppy. When a program requires information from disk, the cache routine might retrieve more than requested and store the extra data in RAM. It's betting that the information needed by the next disk read is already stored in cache. If it's

correct, the data is transferred from one part of RAM to another, which happens much faster than reading it from disk.

Caching tends to be most effective when a program makes a series of requests for information that is stored in consecutive disk segments. For example, some applications read in portions of program instructions only when needed. Typically, such instructions would be stored nearby on disk and retrieved together by the cache routine.

While disk caching can improve performance, it might also reach a point of diminishing returns. Moreover, RAM allocated to a disk cache reduces the amount available for open applications. Consequently, it's generally best to set your cache within the recommended or default settings. If you need more space for applications, you might reduce the cache size, although the gains will generally not be very great unless your cache was set significantly higher than the recommended values.

Virtual memory

For certain models, System 7 offers extended memory by using free space on a hard disk. Virtual memory (VM) is available on 68030-equipped Macs (SE/30, IIx, IIcx, IIsi, IIci, and IIfx) or the 68020 Mac II with a 68851 PMMU added. Chapter 2 includes a detailed discussion of hardware requirements and how VM operates.

Virtual memory options are set in the Memory control panel, as shown below in Fig. 8-12.
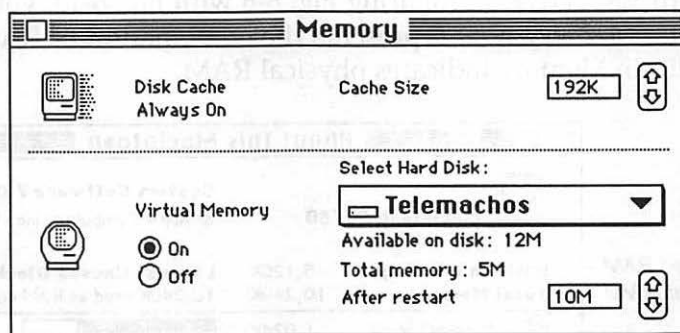
Figure 8-12. Setting VM in the Memory control panel

For best performance, Apple recommends that total memory should not exceed twice the size of physical memory (RAM). For example, a Mac

with 5Mb of physical RAM could use up to 5Mb of virtual memory, for a total of 10Mb.

To use virtual memory, you must first have enough free disk space to accommodate the total of VM plus physical RAM. In our example, 10Mb of disk space must be available to add 5Mb of virtual memory. While this might seem excessive, it allows VM to operate in the most efficient manner possible. As described earlier in chapter 2, VM swaps information between your hard disk and RAM. Because disk access is relatively slow, VM performs best when fewer swaps are required. By creating a disk file large enough to hold everything in total memory, VM is able to operate with the fewest number of swaps and hence most efficiently.

In the example illustrated in Fig. 8-12, there is 12Mb of available disk space. After assigning 10Mb to VM, there will be only 2Mb remaining for saving documents, background print spooling, and other disk storage needs. Take care to ensure that you have enough free disk space left to perform basic tasks. Otherwise you might find yourself unable to save or print a large document.

After choosing the amount of disk space and clicking the **On** button in the Memory control panel, you must restart the Mac to activate VM. Following startup, our 5Mb Mac has been transformed into a 10Mb machine, providing additional memory for more open applications. As described earlier, selecting **About This Macintosh** from the menu will display memory information. Figure 8-13 illustrates memory usage on the 5Mb Mac with VM active. Comparing Fig. 8-6 with Fig. 8-13, you might notice that Total Memory now represents the combination of RAM plus VM, while Built-in Memory indicates physical RAM.
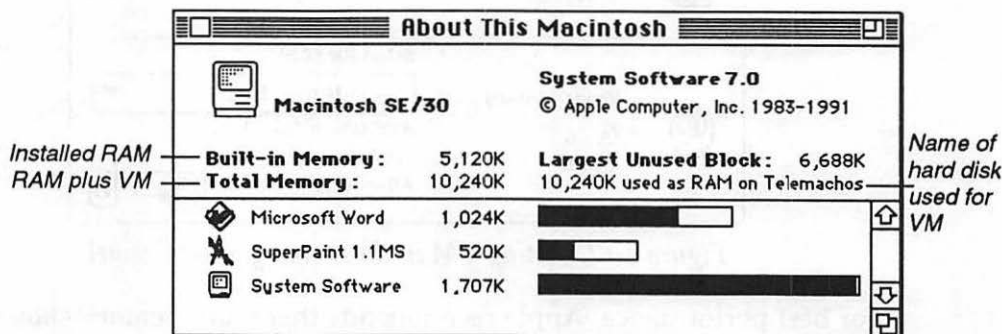
Figure 8-13. Memory allocation with VM turned on.

The memory usage window also indicates the amount of disk space and the name of the hard drive where the VM swap file is located. If you have more than one hard disk, you can select which drive will provide space for VM. However, you cannot use a removable drive or split VM storage over two drives.

As described earlier in chapter 2, VM typically requires that you update the software driver for your hard disk. If you haven't yet done this and attempt to start VM, you might encounter a dialog box similar to the one shown below in Fig. 8-14.

Before you can turn on Uirtual Memory, you need to update your hard disks. Start your computer using the "Disk Tools" disk, then use the Rpple HD SC Setup program to update your hard disks.

OK
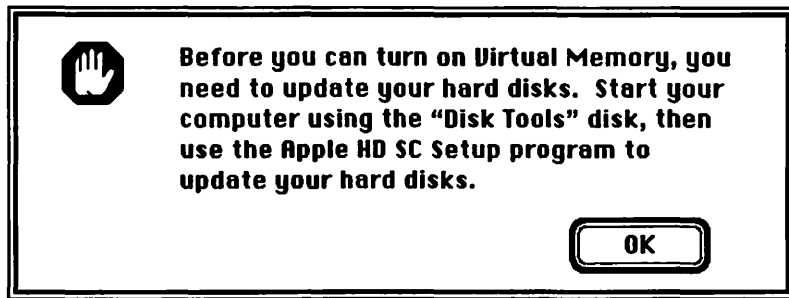
Figure 8-14. Alert showing need to update hard disk driver for VM

Updating your hard disk software driver is required only one time, assuming you have a VM-compatible version of the drive utility. As indicated in the dialog box, Apple supplies the appropriate version on the Disk Tools disk that comes with System 7. For a third-party drive, you might need to obtain a current version from the vendor. See appendix A for a list of third-party drives and software driver versions.

VM limitations
Virtual memory can be much slower than straight RAM operation because it will occasionally need to swap information from disk into physical memory. As programs are launched, physical memory is used first, postponing use of VM until RAM space is exhausted. To minimize performance degradation, open large applications first and save smaller programs until last. That way less swapping will be required when the smaller programs are activated and brought into RAM.

VM is not intended as a substitute for small amounts of RAM. For example, if system software plus your normal set of applications requires 4Mb of memory, you shouldn't expect to get by with 2Mb of RAM and use VM for the balance. Rather, you should install 4Mb of RAM and reserve vir-

tual memory for occasional use, such as adding one or two smaller applications to your normal set.

As described earlier in chapter 2, virtual memory on some Mac models is limited to 14Mb (less 1Mb for each NuBus slot used) by their lack of 32-bit clean ROMs. However, you can overcome this limitation by using Connectix Corporation's MODE32. Shown below in Table 8-2 are the maximum practical memory configurations, based on Apple's performance recommendation that limits VM to no more than twice physical RAM.

Table 8-2. Maximum memory configurations

Model	Max physical RAM	Max memory using VM	Comments
Mac Plus, SE, Classic	4Mb	-NA-	Lacks PMMU capability
Mac Portable	9Mb	-NA-	Lacks PMMU capability
Mac LC	10Mb	-NA-	32-bit clean, but lacks PMMU
Mac II with PMMU	8Mb	14Mb	16Mb max using MODE32
SE/30 and Mac IIx	8Mb	14Mb	16Mb max using MODE32
Mac IIcx	32Mb	14Mb	64Mb max using MODE32
Mac IIsi	17Mb	34Mb	Includes 32-bit clean ROM
Mac IIci and IIfx	128Mb	256Mb	Using 16Mb SIMMs

The Mac Plus, SE, Classic, Portable, and LC cannot use VM because they lack PMMU capability, which provides memory paging. The SE/30, Mac IIx, and IIcx include PMMU capability, which is built into the 68030 processor chip, but these models lack 32-bit clean ROMs. The IIsi, IIci, and IIfx models include 32-bit clean ROMs, which removes the 14Mb restriction on total memory.

However, even 32-bit clean models cannot exceed the 14Mb total memory limit until 32-bit addressing is turned on in the Memory control panel. In fact, turning VM on alone will automatically limit the maximum total memory allowed for a particular Mac. For example, a IIfx with 8Mb of RAM and a video card using one NuBus slot sets the maximum at 13Mb (14Mb minus 1Mb) until 32-bit addressing is also turned on.

32-bit memory addressing

Any computer, including the Macintosh, requires a scheme for locating information stored in memory, be it real (RAM) or virtual memory. Typically, a computer assigns a numerical value to each storage location, which is similar to a post office box number. Such schemes are generally referred to by the size of the address field, such as 24-bit or 32-bit.

Prior to System 7, 24-bit addressing was the normal mode of operation on the Macintosh. It permitted the Mac to access 2^{24} bits or 16Mb of memory. System software assigned 8Mb to physical memory (RAM), 6Mb to NuBus cards, and 2Mb to input/output functions. By extending the address length to 32 bits, System 7 enables the Mac to theoretically access nearly 1Gb (Gigabyte = 1,000Mb) of memory. Consequently, 32-bit addressing removes the 8Mb RAM and 14Mb virtual memory barriers. In practice, however, hardware designs can impose a lower limit on RAM. For example, the Mac IIfx cannot address more than 128Mb of physical memory.

Another practical consideration is the condition of application software and INITs. Not all programs written for the Mac are 32-bit clean, meaning they could fail to operate properly when 32-bit addressing is active. Apple's Compatibility Checker typically indicates if a program is incompatible with 32-bit operation, and recommends contacting the developer for upgrade information. If you have any programs in this category, you should not attempt to run them while 32-bit addressing is turned on. Don't forget that this includes INITs, which could crash on startup.

Apple has encouraged software developers to follow 32-bit clean guidelines for some time. While some programs are already in compliance, System 7's introduction is likely to spur others to introduce new versions that will operate properly in 32-bit mode. In the meantime, you can try out 32-bit operation if your hardware and software meet the following criteria:

Mac LC, IIsi, IIci, IIfx   include 32-bit clean ROMs, which directly support 32-bit addressing.

Mac II, IIx, IIcx, SE/30   can use Connectix MODE32 software.

Applications   that launch only 32-bit clean programs.

INITs and CDEVs   must also be 32-bit clean, otherwise turn them off or remove them from the System Folder to prevent launching at startup.

To initiate 32-bit addressing, open the Memory control panel and click the **On** button, as illustrated below in Fig. 8-15.
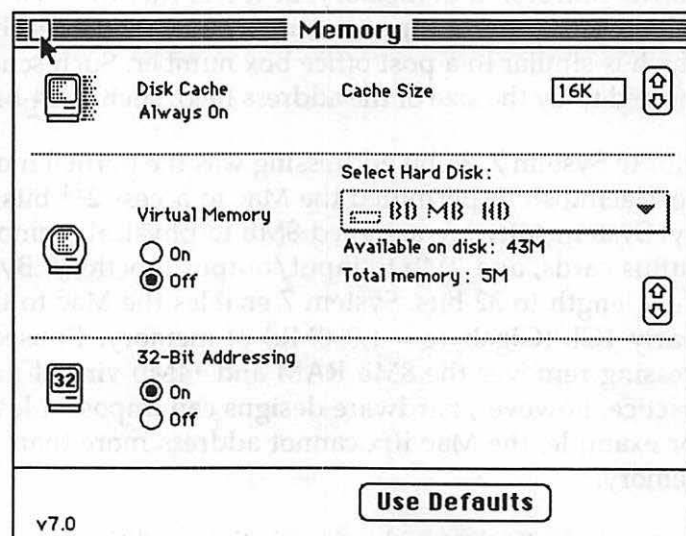
Figure 8-15. Turning on 32-bit addressing in the Memory control panel

32-bit addressing does not take effect until you restart your Mac. If your Mac crashes on restarting, it's likely due to an INIT or CDEV that is not 32-bit clean. To confirm this, restart and hold down the Shift key, which will prevent all system extensions from loading. If the desktop appears and the restart is successful, one or more of your extensions is causing the problem. To isolate the offenders, restart again (without holding down the Shift key) and note the icon of the last INIT prior to the crash. The next item in alphabetical sequence is the likely culprit. Remove it from the System Folder and try restarting again. Repeat the process until all 32-bit dirty INITs have been identified and removed.

While 32-bit addressing extends memory limitations beyond 8Mb of RAM and 14Mb of VM, it also requires compatible software. If some of your software is not yet 32-bit clean, you might want to place it in a separate 24-bit folder to avoid confusion when running in 32-bit mode. If you prefer to remain in 24-bit mode (which is the System 7 default) and would like to access more than 8Mb of RAM, you might want to consider another utility from Connectix. MAXIMA allows a Mac II, IIx, IIcx, IIci, IIsi, IIfx, LC, or SE/30 to access up to 14Mb of physical RAM with either System 6 or 7. It can also use additional memory as a RAM disk.

Memory fragmentation

While working with System 7's MultiFinder, you might occasionally encounter a situation where you're unable to open an application, even though there appears to be enough free memory available. Generally, this is caused by opening and quiting a series of applications, which leaves free memory divided into a number of small segments, as illustrated below in Fig. 8-16.
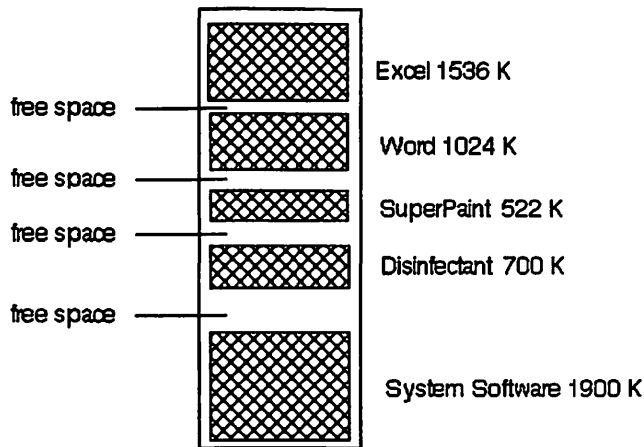
Figure 8-16. Fragmented memory

System 7 requires a contiguous block of memory large enough to open an application before it will allow you to launch it. To remedy the problem, you might need to quit several open programs or restart your Mac, which will provide a fresh block of unused memory.

To minimize the occurrence of memory fragmentation, launch programs that you're unlikely to quit during a session before opening others. When you need to free up memory for another application, quit the program that was opened last.

Memory management summary

With System 7's MultiFinder and memory extension features, managing memory has become an important part of maintaining smooth operations. Some of the new features, such as virtual memory and 32-bit addressing, are optional and you might not use them at first. However, as System 7 savvy applications grow in availability, you might begin to incorporate VM and 32-bit operation in your daily routine. You can refer back to these topics whenever they become relevant to you.

System 7 savvy applications

Most of the content of this book is focused on System 7 and how it affects your use of the Mac. However, the primary reason to use a Mac or any computer is the application programs. Whether you use your Mac for entertainment, business, or education, you probably spend most of your computer time working with one or more applications.

One of Apple's two primary System 7 goals was to provide new tools to allow software developers to build more exciting and useful applications. If an application has been written or upgraded to use these new capabilities, it is often referred to as System 7 savvy. But what does that really mean? System 7 savvy programs typically include most, if not all of the following features:

MultiFinder support compatible with S/7's full-time MultiFinder.

TrueType aware enables user to select any point size.

VM compatibility operates with virtual memory.

32-bit clean compatible with 32-bit addressing option.

Balloon Help utilizes S/7's new built-in help features.

Publish and Subscribe supports the Edition Manager, which provides live copy-and-paste capabilities.

IAC support permits links to other programs using interapplication communications.

AppleShare aware allows access to other programs or documents stored on another computer attached to yours through a network.

The first four features have been described earlier. In this section, we'll take a look at some of the first applications to incorporate Publish and Subscribe and Balloon Help. Later, in chapter 9, we'll look behind the scenes at Apple's new interapplication communications (IAC), which provides the foundation for Publish and Subscribe, as well as a host of new possibilities to link programs. Finally, chapter 11 examines network file sharing using System 7's new personal AppleShare.

Of all the new program features, perhaps Publish and Subscribe is the one most frequently associated with the term *System 7 savvy*. And with good

reason. It significantly improves the traditional copy-and-paste methods of moving information between documents and programs.

Simple copy-and-paste

Whether or not you've used MultiFinder before, its likely that you've copied a block of text or a graphic from one document and pasted it into another. Since the first 128K model, Mac's have provided easy transfer methods, such as the clipboard and the scrapbook. MultiFinder simply makes the process easier, eliminating the need to quit one application before switching to another.

Figure 8-17 illustrates a simple copy and paste between Microsoft Excel and Microsoft Word, using System 7's full-time MultiFinder.

É File Edit Format Font Document Utilities Window

Q1 Performance

	A	B	C	D	E	F
2		Jan	Feb	Mar		
3	Bob	12	23	51		
4	Carol	21	34	27		
5	Ted	32	56	39		
6	Alice	56	76	92		
7						
8	Totals	121	189	209		
9						
10						

First Quarter Report

The following figures show staff performance in the first quarter of this year. Please note...

	Jan	Feb	Mar
Bob	12	23	51
Carol	21	34	27
Ted	32	56	39
Alice	56	76	92
Totals	121	189	209

Page 1   Normal+...   Trash
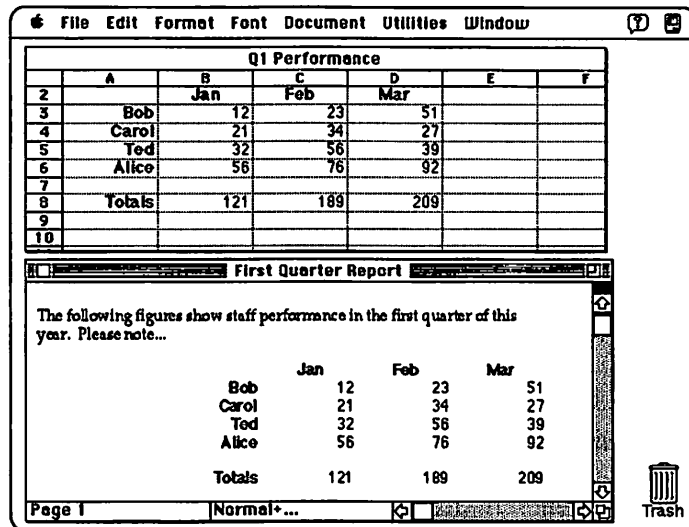
Figure 8-17. Simple copy and paste using System 7 and MultiFinder

The table of information has been selected from Excel, copied to the clipboard, and pasted into the Word document.

This approach works fine, assuming that the Excel data remains the same. However, if changes are made to the Excel document, you might need to repeat the copy-and-paste process to update the Word document. While a few changes could be managed in this fashion, it becomes more tedious and error prone with many modifications, which is often the case as a report goes through several iterations before being finalized.

Publish and Subscribe

Wouldn't it be great to eliminate all those repetitive copy-and-paste operations? Well that's exactly what Publish and Subscribe does! Sometimes referred to as "live copy and paste," System 7's new feature reduces the drudgery, freeing time for more productive or entertaining endeavors.

Applications that have been upgraded for live copy and paste will include Publish and Subscribe options in the Edit menu, similar to Fig. 8-18.
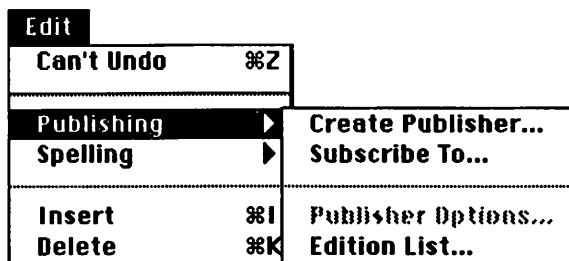
Figure 8-18. Publish and Subscribe commands

The first step in live copy and paste is to select an object to be published. It could be a text block, a segment of a graphic image, or a group of cells in a spreadsheet. Then choose **Create Publisher** from the Edit menu, which will open a dialog box similar to the one illustrated in Fig. 8-19. The selected segment will be saved as an edition file with a name you assign and stored in a folder of your choice.
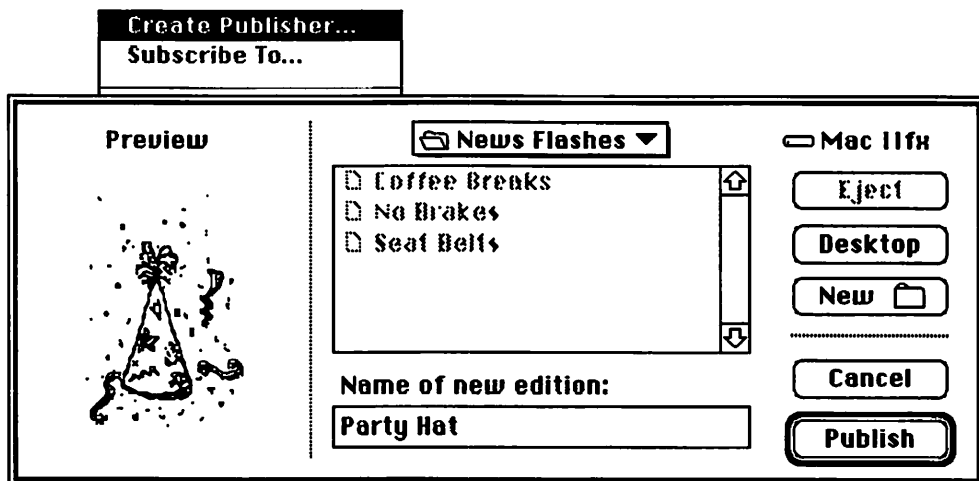
Figure 8-19. Creating a publisher edition

The second part of the process is subscribing to a published edition. A subscriber is typically another document, created either by the same application or by a different program, providing it supports the Publish and Subscribe feature. Select an insertion point in the subscribing document, and choose **Subscribe To** from the Edit menu. A dialog box similar to Fig. 8-20 will appear, allowing you to select the desired edition file.
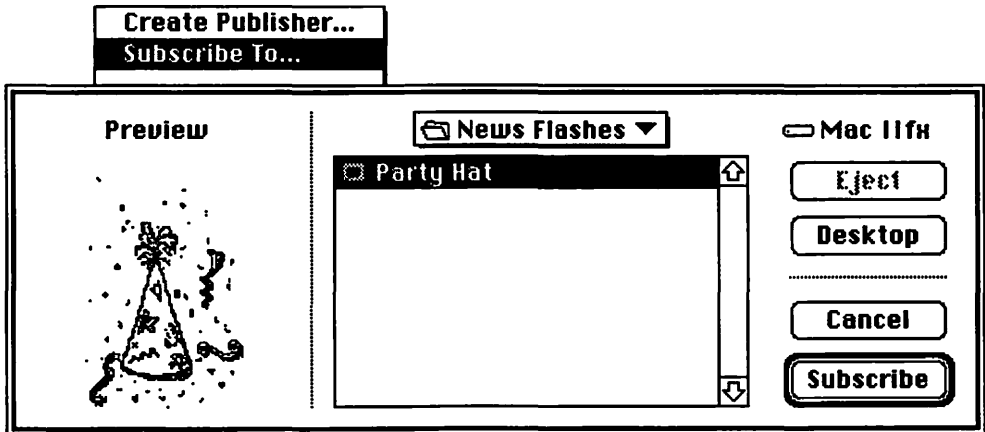
Figure 8-17. Subscribing to a published edition

The dialog will automatically open to the most recently used edition file, because the Finder stores an alias of it inside the System 7 Preferences folder. A miniature view of the edition file contents is displayed in the Preview section so you can confirm your choice before subscribing. If this isn't the edition you were seeking, simply use the navigation buttons to locate the correct folder and file. When the appropriate file is located, clicking the **Subscribe** button will create an invisible link between the subscribing document and the edition file.

The edition file will be automatically updated whenever the publishing document is saved. If the subscribing document happens to be open when the edition is updated, changes could be reflected immediately. If the document isn't open at the time of update, System 7 will store a notification message, which will be delivered the next time the subscribing document is opened.

Automatic updating can be overridden using the Publish and Subscribe Options command. In the case of a subscribing document, selecting an object that was received from an edition file and choosing **Subscriber Options** from the Edit menu will display a dialog box similar to Fig. 8-18. Selecting

the manual option will allow you to control when updates are received. You can also request an immediate update by clicking the **Get Edition Now** button. Cancelling the subscriber link will leave the current version in place, but it will no longer be updated when changes occur in the edition file. The **Open Publisher** option will automatically launch the publishing document so that changes can be made to it.
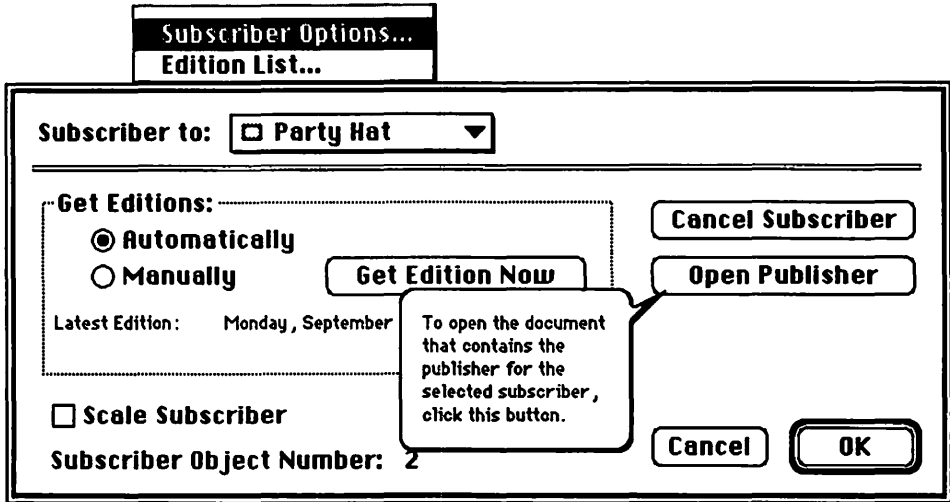
Figure 8-18. Subscriber options

Similar options are available for a published object, as shown below in Fig. 8-19. Updates can be transmitted manually with **Send Edition Now,** and the edition link can be broken with the **Cancel Publisher** button.
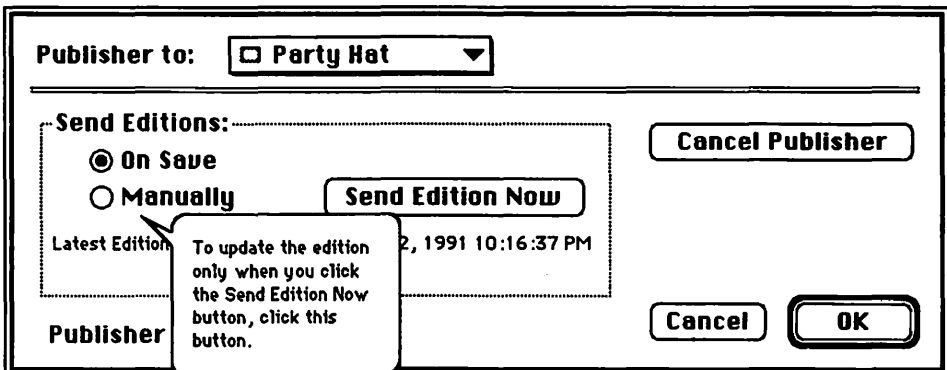
Figure 8-19. Publisher options

Figure 8-20 illustrates a simple Publish and Subscribe example. Three members of the Party Committee collaborate to create an announcement for an office party. Pete is responsible for the artwork, so he selects an appropriate piece from his collection of clip art and publishes an edition named Party Hat. Patty is in charge of the schedule, so she publishes another edition named Party Plans, which is part of a memo to Bill. Finally, Bill creates the announcement by subscribing to the Party Hat and Party Plans editions.
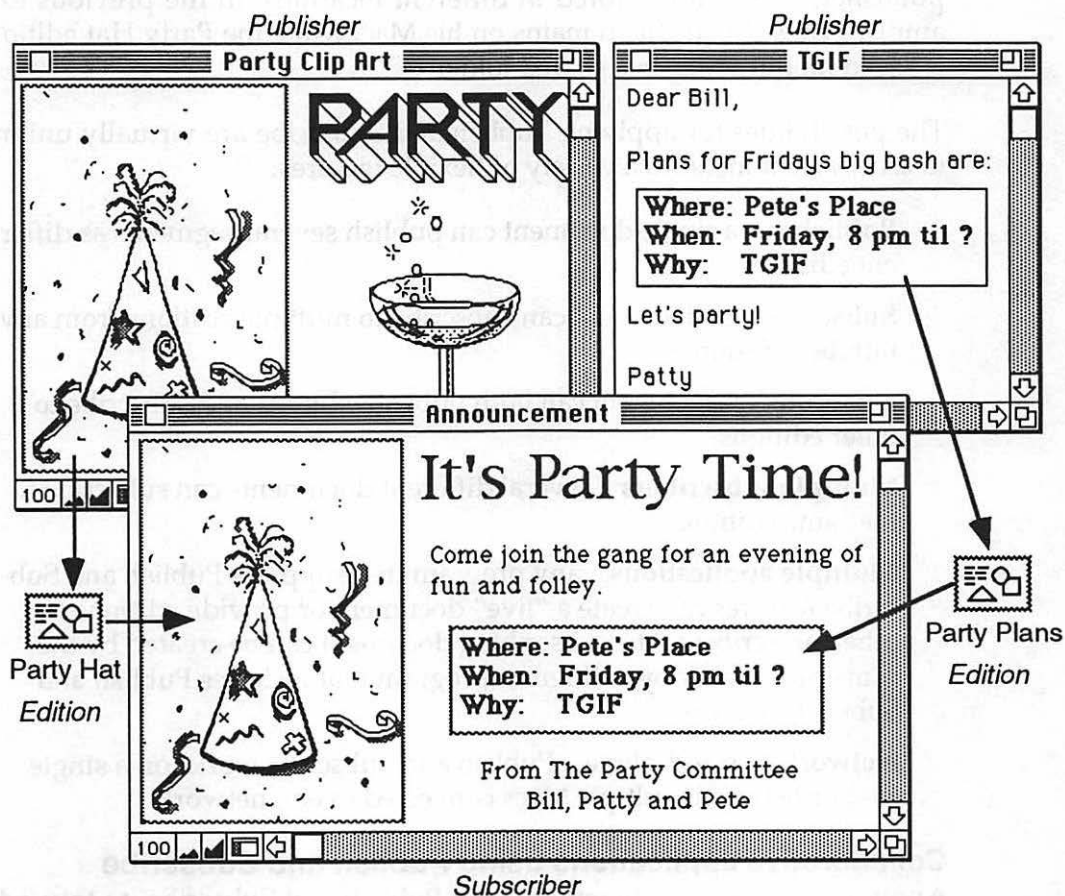
Figure 8-20. Putting it all together

Patty, Pete, and Bill work in the same office, and their Macs are connected by a network. With System 7's AppleShare, Bill creates a shared folder on his Mac that Patty and Pete use to save their editions. If Patty needs to revise the plans, she simply makes the change and saves it. Her changes

automatically update the Party Plans edition, which then updates the announcement whenever Bill opens it. The announcement will reflect the latest changes, no matter how many revisions occur. Moreover, the same format can be used for another event, with new artwork and agenda, by simply updating the editions.

Information always flows from the publisher to the edition, and then to the subscriber. Because the edition file is a separate document from the publisher, they can be stored in different locations. In the previous example, Pete's clip art file remains on his Mac, while the Party Hat edition is saved on Bill's Mac in a shared folder.

The possibilities for applying Publish and Subscribe are virtually unlimited because it includes a variety of flexible features:

Publisher   a single document can publish several segments as different editions.

Subscriber   a document can subscribe to multiple editions from any number of sources.

Dual role   a document can both publish editions and subscribe to other editions.

Multiple subscribers   several different documents can subscribe to the same edition.

Multiple applications   any program that supports Publish and Subscribe features can create a "live" document or provide editions for other subscribers. The subscribing document can be created by the same program or by a different program that includes Publish and Subscribe features.

Network or stand-alone   Publish and Subscribe works on a single Mac or between multiple Macs connected over a network.

Collaborative applications using Publish and Subscribe

Applications can work together using Publish and Subscribe to take advantage of features found in each program. Figure 8-20 illustrates an example of this technique, where Softsync/BLOC's Accountant, Inc. program collaborates with Claris Resolve to enhance a report with a graphical presentation of the data.

In the example, Accountant, Inc. produces an inventory report showing sales and returns for a book company. The table is selected and published as Unit Sales, an edition file. Resolve subscribes to Unit Sales, and a column is added to calculate net sales after returns. Then a bar graph is created using Resolve's charting features, and published as the Sales Chart edition. Finally, Accountant, Inc. subscribes to Sales Chart, producing an enhanced report that incorporates the chart from Resolve.
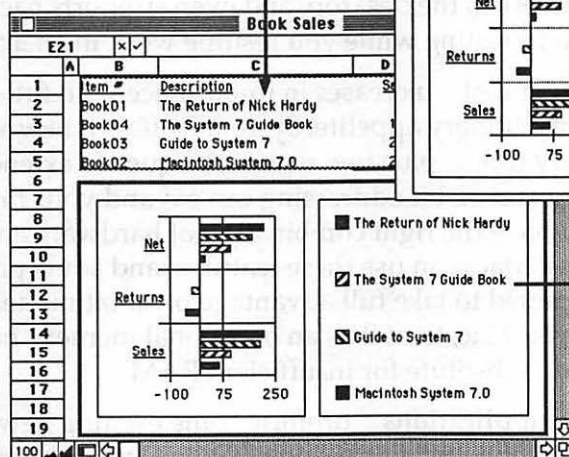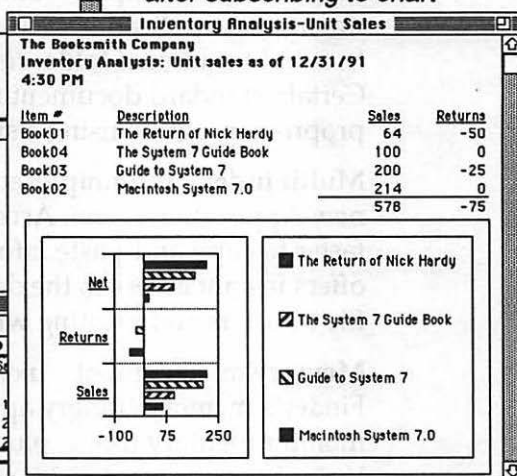
Figure 8-21. Collaborating applications using Publish and Subscribe

Resolve's spreadsheet and charting features complement Accountant, Inc's ability to extract data from a database and present it in tabular form. Strengths of each program are used in a complementary fashion, and the links will continue to update the chart whenever the data is changed.

Summary

In this chapter, we've focused on some of the basic issues in working with application programs and System 7. While your existing applications will continue to operate the same as before, System 7 offers some new possibilities for launching and running several programs at once. And, with multiple programs in operation, you'll want to dedicate some attention to managing memory resources. As new System 7 savvy programs are released, you'll begin to enjoy additional benefits. In the meantime, some of the key issues include:

> **Launching techniques** Startup items, Apple Menu items, and document and application aliases offer convenient multiple access points to avoid traditional folder fishing when launching an application. Certain standard document formats can automatically launch an appropriate program using a simple new drag-over technique.
>
> **MultiFinder** is omnipresent in System 7 and easier to use with the new Application menu. Access to multiple open programs makes it faster to copy and paste information between them. MultiFinder also offers instant access to the desktop, and even supports background file transfers and printing while you resume work in an application.
>
> **Memory management** increases in importance with full-time MultiFinder's memory-hungry appetite. System 7 offers a new window to monitor memory usage, plus two new techniques to extend RAM. Virtual memory and 32-bit addressing can expand your memory horizons if you have the right combination of hardware and software. However, not all Macs can use these features, and some programs need to be upgraded to take full advantage of 32-bit mode. Even if VM works on you Mac, treat it as an occasional memory boost and not as a full-time substitute for insufficient RAM.
>
> **System 7 savvy applications** promise some exciting new capabilities, such as live copy and paste using Publish and Subscribe. Most programs will need to be upgraded to incorporate these and other new System 7 features.

Publish and Subscribe is only the beginning of the possibilities that can be developed using System 7's new interapplication communications (IAC) features. In the next chapter, we'll explore how these features work behind the scenes and some of the implications for future software.

Chapter 9

IAC—Wave of the future

Interapplication communications (IAC) enables applications running under System 7 to talk to one another. Publish and Subscribe is perhaps the most visible example, but it's only the tip of the IAC iceberg. Many exciting possibilities are offered by Apple events and other IAC capabilities. With IAC, one program can open another, instruct it to perform certain tasks, and return with the results—all automatically and without any intervention from the user.

IAC is a term borrowed from mainframe and UNIX operating systems that describes how programs communicate. From a technical viewpoint, System 7 is much more robust than prior versions because it now includes IAC capabilities—extending the reach of programs, both within the same Mac and to other computers connected through a network.

Apple's implementation of IAC is consistent with one of System 7's key design goals—to provide software developers with new tools that would enable them to build more exciting and useful applications. System 7's new IAC programming features include:

High-level events   new programming services that make it easier for developers to exchange messages between applications.

Apple events   a high-level event protocol that defines how applications should talk to each other.

Publish and Subscribe   a special class of Apple events that includes tools and guidelines for incorporating dynamic copy-and-paste features in application programs.

PPC Toolbox   program-to-program communications provides the low-level foundation on which other IAC features are built.

In this chapter, we'll take a look at how these new capabilities are being used to enhance applications and extend your reach beyond the boundaries of your own Mac. Although some of the terms are technical, you don't have to be a programmer to begin to appreciate the powerful capabilities IAC introduces.

Linking application programs

IAC enables programs to send messages to each other, requesting actions or transferring information. But what does this really mean? Hasn't the Mac always had the ability to copy and paste data between applications? Of course the answer is yes, but System 7 significantly extends earlier capabilities. To put these advances in perspective, we'll first examine how things worked before System 7.

How it worked before System 7

Prior to System 7, applications pretty much kept to themselves. Multi-Finder was an option for running several programs at once, but most Mac users operated without it, which meant a program had the entire memory space to itself. Even with MultiFinder turned on, each application was assigned to its own memory partition. Once an application was launched and loaded into RAM, it was expected to remain in its own partition. If it did stray outside its assigned area, it generally collided with another program and the dreaded system error message occurred.

The clipboard gave some relief by allowing you to copy data from one document and paste it into another. This was much easier than reentering the information, but was not the optimal solution. If changes were made in the source document, it required a conscious effort to recopy and repaste. This could become a tedious and error-prone process, especially when the number of changes were extensive. The limitations of copy and paste have been recognized for some time, and a few software producers created their own solutions, most notably Microsoft.

Some that dared—Microsoft

Publish and Subscribe features appeared even before System 7. Microsoft has supported active links between Word and Excel, as well as offering their technology to other developers. Figure 9-1 illustrates the **Paste Link** command in Microsoft Word, which enables an Excel graph to be linked to a Word document. When changes are made to the original graph, **Update Link** or **Edit Link** commands are used to automatically update the information in the Word document.

Microsoft terms their linking technology *dynamic data exchange* (DDE), and offers it on both the Macintosh and through Windows on IBM and IBM clones. Their latest version of Excel (3.0) continues to support DDE, as well as System 7's Publish and Subscribe features.

```
 🍎  File  Edit  Format  Font  Document  Utilities  Window          ◈
       Redo Paste        ⌘Z   ▓▓▓▓▓▓▓▓▓▓▓  demo doc  ▓▓▓▓▓▓▓▓▓▓
                              below.shows,.the.number.of.blue.puppies.is.getti
       Cut               ⌘K   ..compared.to.last.year's.numbers,.the.number.
       Copy              ⌘C   increased.by.300%..¶
       Paste             ⌘U   ¶
       Clear
       QuickSwitch Again ⌘A            Number of Puppies

       Table...
       Glossary...       ⌘K        18.66%
       Hide ¶            ⌘Y
                                                              45.74%
       Paste Link
       Update Link             22.77%

       Short Menus                        12.84%
       Preferences...
       Commands...                          ¶
                              ▓ Page 1 ▓▓▓▓▓▓  Normal ▓▓▓▓▓ ◁▯ ▓▓▓▓
```
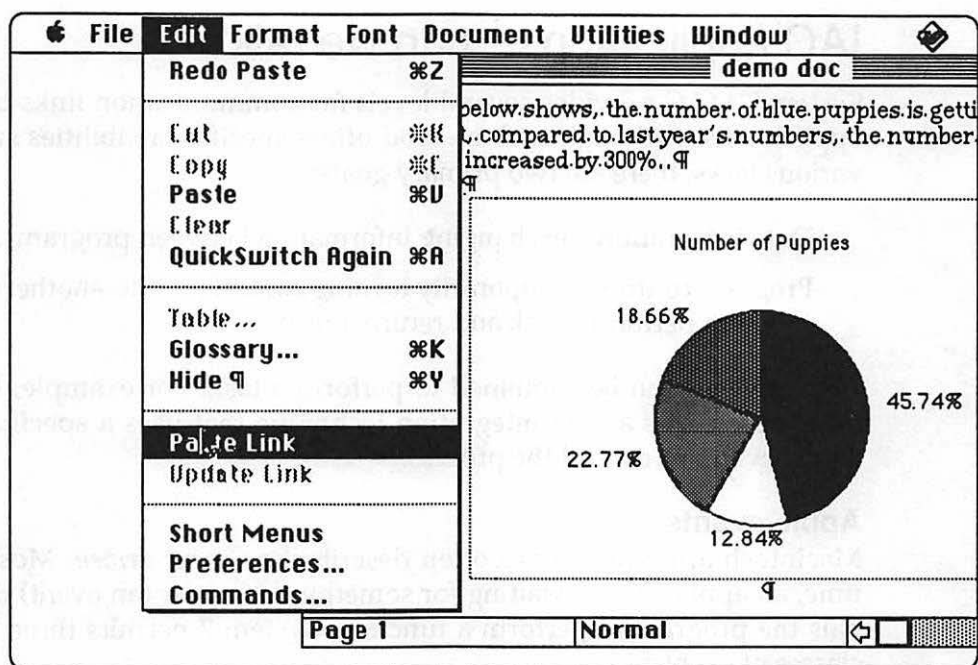
Figure 9-1. Dynamic Data Exchange in Microsoft Word.

Microsoft's DDE and System 7 use different techniques to achieve similar results. However, both seek a better method of keeping shared data up to date in a more automatic fashion than copy and paste.

Applications and System 7

With System 7, applications are no longer confined to their own little corner of the machine. In fact, they are encouraged to get out and be sociable. System 7 creates an environment in which applications communicate with ease, using several new standards such as Publish and Subscribe, and other Apple events.

While Publish and Subscribe features are perhaps the most visible example of IAC, it also includes the ability for applications to work together in a sort of "buddy system." For instance, a word processing application could be cooperatively linked to a graphics package, rather than combining both features in a single "all-in-one" style program. Benefits include smaller (less memory-intensive) applications, optimized for a particular function. Because this approach is less complex, programs are easier and faster to develop. Moreover, it might ultimately allow you to combine several of your favorite programs into a seamless package.

IAC applications—can we talk?

System 7's IAC provides several levels for communication links between applications. Although each method offers specific capabilities suited to various tasks, there are two primary goals:

Data integration   exchanging information between programs.

Program control   temporarily turning control over to another application to perform a task and return a result.

IAC methods can be combined to perform a task. For example, Publish and Subscribe is a data-integration technique that uses a specific set of Apple events to control the process.

Apple events

Macintosh applications are often described as *event driven*. Most of the time, an application is waiting for something to occur (an event) that signals the program to perform a function. System 7 permits three general classes of events:

Low-level events   include user actions such as clicking the mouse button or pressing a key.

Operating system events   might tell the active application to prepare to suspend or resume operation, or provide information about the current mouse location.

High-level events   are primarily intended for the exchange of messages between applications, such as notification that a new edition has been published.

Apple events are a special category of high-level events that conform to a standard protocol that defines the content of a message. When an Apple event is received by an application, it could trigger any number of actions, depending on the message content. Consequently, the message must first be examined by the receiving program to determine the appropriate actions.

At the most basic level, there are four required Apple events: open applications, open documents, print documents, and quit. System 7 friendly applications must recognize and support this minimum set of events. However, Apple events are not limited to a fixed set of predefined events.

The Apple event protocol is important, because it establishes a structured framework for exchanging both data and control among multiple applications. This framework could be used in a variety of ways, such as:

Apple defined sets   provide methods for IAC actions that might be commonly used by any application, such as manipulating text, graphics, sounds, or even video clips.

Application classes   such as databases, spreadsheets, or word processing packages might require a specialized set of events tailored to perform specific tasks, such as extracting a data subset and sending it to another program for charting or other functions.

Scripting languages   can be built on the Apple events framework to provide user-defined control links between programs.

Apple events are open-ended, allowing software developers to create new sets that might be program specific or offered to other developers by registering them with Apple. Although it is relatively early in the evolution of Apple events, there seems to be two approaches emerging:

Application suites   major developers, such as Claris and Microsoft, are likely to create their own Apple events to enhance cross application communications among their respective suite of programs.

Application pairs   some developers with complementary applications have begun to form alliances to create links between their products.

For example, Shana Corporation's Informed Designer and Manager provide sophisticated forms that interact directly with Softsync/BLOC's Accountant, Inc. Similarly, GeoQuery Corporation and ACI/ACUIS have announced integrated versions of their products based on Apple events.

In either the suite or pairs approach, developers might use a combination of existing standards along with newly devised Apple events to provide automatic links between applications. These links could perform predefined functions, such as opening another application, sending data and instructions for processing it, and then returning the result.

In contrast, scripting languages are much more open-ended, allowing a user to define the steps and then process them.

Scripting languages

Several Macintosh applications include a built-in scripting language that is often referred to as a *macro* feature. Macros are indeed user-defined scripts that can control the behavior of a specific application. However, by themselves, macro languages generally can't span the gap between programs. They are limited to controlling activities within the application.

On the other hand, a scripting language built on System 7's IAC features will be able to open an application, request information, and control functions within the program. Because Apple events is a new operating system element, a standard scripting language has not yet been established. However, there are several potential candidates:

> **AppleScript** is a language that has been widely reported in the computer press to be under development. While Apple acknowledges that user scripting is a desirable extension of its IAC strategy, it has not announced any specific plans.

> **HyperTalk** is the language built into HyperCard. Claris might elect to reposition it as a scripting language for IAC.

> **UserLand Frontier™** is a general-purpose user scripting language for external control of the Macintosh operating system and applications software. Planned for release in late 1991.

> **Microsoft DDE** dynamic data exchange is the IAC method incorporated in Microsoft Excel and Word, and is also available to other developers for linking programs. Excel 3.0 command macros can use DDE to open other applications, send and request data, and carry out commands, provided the second program also supports DDE.

Any of these alternatives could emerge as the leading standard for scripting Apple events. Because each of them is either being developed or might be expanded, it is difficult to predict when a standard scripting language will emerge. However, it seems apparent that a standard is needed to fulfill the potential of Apple events.

HyperCard scripting

HyperCard is sometimes described as an applications "control center" because scripts can be created to execute a series of events in another program. Version 2.1 is one of the first programs to offer IAC control links between applications. Figure 9-2 illustrates a sample HyperCard script that passes control to another stack. The script prompts the user to

identify a target program and enter a command, such as **go next card**, before transferring control.

```
on mouseUp
    answer program "Choose a HyperCard program running on a
    different machine"
    if the result is not "Cancel" then
        put it into theTarget
        ask "Enter message to send to the remote HyperCard."
        if it is not "Cancel" then
            put it into theMessage
            send theMessage to program theTarget
        end if
    end if
end mouseUp
```

Figure 9-2. Sample HyperCard script

Apple events have been designed as an efficient method of transmitting brief messages in real time between applications. For example, an Apple event can query another program to determine specific capabilities, such as what type of graphics it supports. It can also serve as the vehicle to notify a subscriber that a new edition has been published. However, the actual transfer of information is handled by a specialized method, known as the Edition Manager, which controls the Publish and Subscribe function.

Dynamic data integration—Publish and Subscribe

Chapter 8 describes how Publish and Subscribe functions are used to maintain a dynamic link between portions of separate documents. While specific commands within System 7 savvy applications trigger these events, actual information transfer is handled separately.

Here's what takes place backstage. The Publish command creates a new document called an edition, and stores it wherever you specify. Anyone with access to this location and a program that supports Publish and Subscribe features, can subscribe to the edition. A subscriber might be a different document created by the same application or by another program. The subscribing program could be running on your Mac or from another user connected through a network to your Mac.

When the link is established, the edition file is opened and its contents are inserted by the subscriber, as illustrated below in Fig. 9-3.
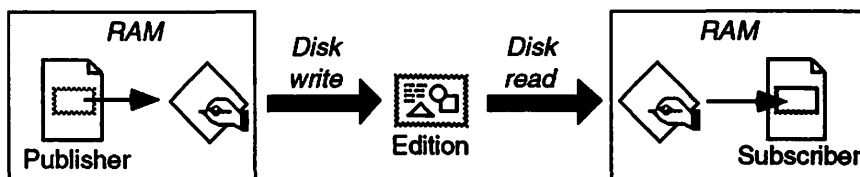
Figure 9-3. The publisher, edition, and subscriber.

Publish and Subscribe is an effective vehicle for live copy-and-paste operations. However, it isn't always the fastest method for transferring information because it requires two disk operations. First, data is saved to the edition file and then read (from disk) into the subscribing document. Updates to the edition file normally occur whenever the source document is saved. The save operation updates both the source document and the edition file, writing information from physical memory (RAM) to disk. Even with the manual override options to update editions immediately, the same disk operations are required.

Although this could appear to happen quickly, hard-disk access is roughly 10 times slower than reading and writing information directly in RAM. The problem becomes more noticeable when large amounts of data need to be transferred. As a result, software developers might seek faster methods of moving large amounts of information between programs. Figure 9-4 illustrates an approach for exchanging data between two applications that is faster than Publish and Subscribe because everything is carried out in physical memory.
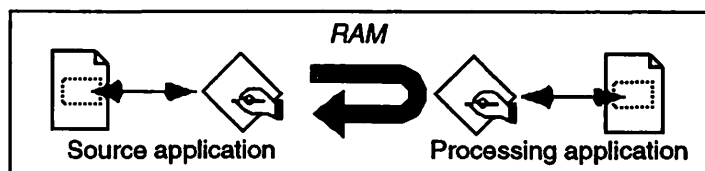
Figure 9-4. A faster method for information transfer between programs

To perform such an operation, a software developer might employ a technique known as *program-to-program communications,* which is the foundation for all System 7 IAC processes.

The PPC Toolbox

Underlying all IAC operations is the program-to-program communication (PPC) Toolbox. The PPC Toolbox is the mechanism on which Apple events, and other IAC processes, ride. Figure 9-5 illustrates the basic IAC architecture.
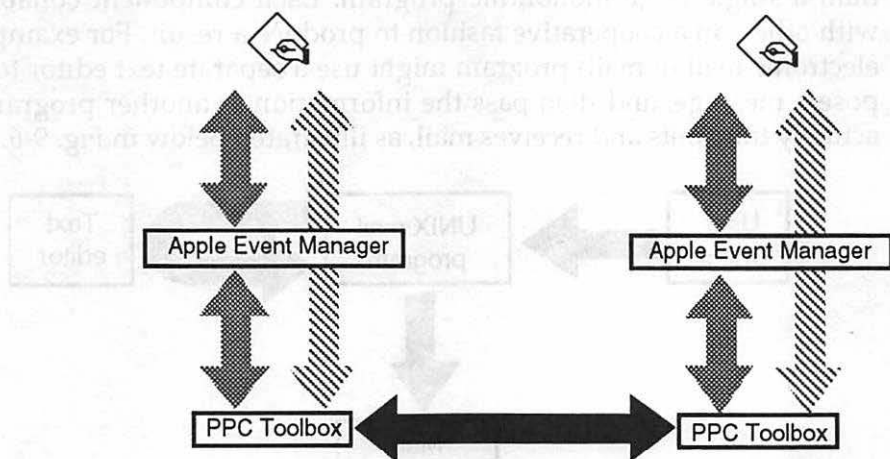
Figure 9-5. Apple events and PPC

The PPC Toolbox is more flexible than Apple events because it doesn't require adherence to a predefined format. Consequently, it might be used by a software developer to perform certain specialized functions that don't fit well with an existing high-level or Apple event protocol. For example, real-time transfer of information could be performed using the PPC Toolbox, avoiding the disk-access operations required by the Edition Manager (Publish and Subscribe).

Although the PPC Toolbox offers greater flexibility, it is more difficult to program, requiring additional time and effort to develop an application. Also, it requires that the developer create a unique protocol, which typically would not be supported by applications from other developers. As a result, using the PPC Toolbox directly might be limited to actions that are self-contained within a single application.

UNIX and PPC

Program-to-program communication is not new to the computer world. PPC principles have been included in UNIX, an operating system developed by Bell Labs in the late 1960s. UNIX operates on a wide variety of

hardware platforms, including IBM PCs and Macintoshes (AUX is the Mac version). Because UNIX includes PPC capabilities, it offers some insights concerning the future evolution of Mac applications.

UNIX applications tend to consist of multiple small components, rather than a single large monolithic program. Each component collaborates with others in a cooperative fashion to produce a result. For example, an electronic mail (e-mail) program might use a separate text editor to compose a message, and then pass the information to another program that actually transmits and receives mail, as illustrated below in Fig. 9-6.
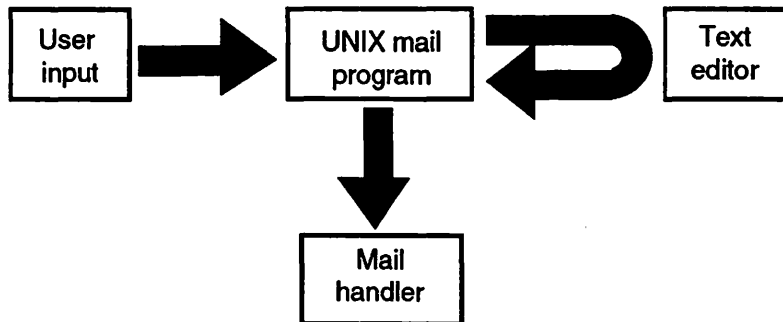
Figure 9-6. UNIX mail program example

Each component is a specialized program designed to perform a specific function, and linked together by UNIX's PPC capabilities.

IAC implementation approaches

System 7 provides software developers with a basic set of IAC tools, as well as an open architecture to extend Apple events, which offers them a wide range of implementation choices. There are at least three basic IAC approaches, with multiple variations and combinations of each:

Tools similar to the UNIX example, an application could be composed of small specialized programs that work together through IAC.

Suite as suggested earlier, major developers with multiple application suites could develop custom IAC links between their programs.

Dynamic duo smaller developers with a limited number of applications could form alliances to create specialized IAC links between their programs.

In this section, we'll take a look at the advantages of each approach and how they might be combined in a hybrid solution.

The tools approach

Figure 9-7 illustrates how a series of small component programs might be combined to form an application. Each component is limited in scope and optimized for its intended function. Because each program is highly specialized, it could be considered a tool—hence *tools approach*. Taken alone, each component offers limited value to a user, but when combined with other tools, they provide a satisfactory solution.
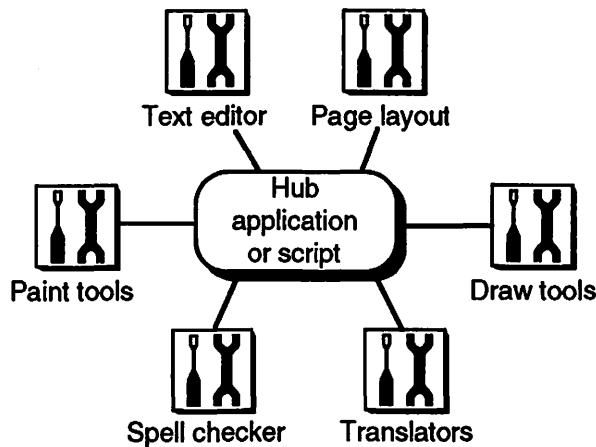
Figure 9-7. The tools approach.

The tools could be bound together with a central script or by a core application, acting as a hub, to link and coordinate the functions of each component. Such a core application is sometimes referred to as an *engine.*

The advantages of this approach include:

Custom assembly   the best tools for a particular task can be assembled for a custom solution. In one scenario, an end user could select their favorites from each category and combine them, perhaps using a scripting language built on Apple events.

Focused development   by limiting the scope of each component, it is inherently less complex and therefore easier for software developers to create and maintain. This should reduce development time and costs, which could be passed on to consumers.

In a perfect world, developers would recognize these benefits and reconstruct applications based on the tools approach. However, the reality is that both developers and customers already have a substantial investment in existing applications, which typically are not constructed in this fashion. Moreover, it will take some time for standards to emerge, such as a universal scripting language and specialized Apple event protocols, that will bind components together. Consequently, the tools approach is more likely to evolve slowly, with some tools incorporated in new System 7 savvy software versions of established applications.

The suite approach

Because both Claris and Microsoft offer a fairly comprehensive set of applications, they are the most likely candidates to implement the suite approach. In fact, Claris has already announced their intentions to define custom Apple events that will enable applications to communicate more effectively. In Claris' view, users will be able to blend applications together, creating what they term hybrid solutions. Initially, Claris has announced four System 7 friendly packages, as shown in Fig. 9-8.
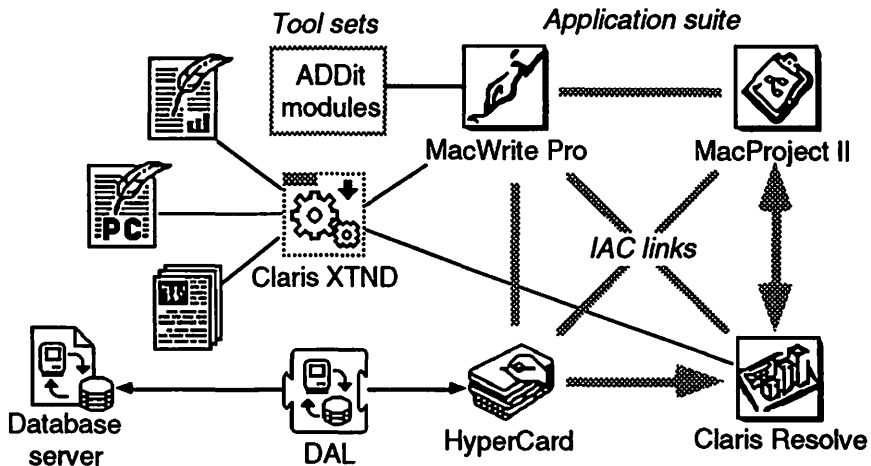
Figure 9-8. Claris System 7 application suite

Eventually, Claris expects to add all of their other products to the System 7 suite. In the initial release, MacWrite Pro is touted as the hub application for multi-authored compound documents. In addition to IAC linking capabilities, MacWrite Pro will offer tool sets called *ADDit modules,* which augment functions found in the basic application. Two ADDit modules are planned for the initial release—a Tables ADDit and a Notes ADDit

that will enable users to paste text and sound notes into a document frame.

Custom Apple events are illustrated with version 2.5 of MacProject II, which sends project cash flow information to Claris Resolve, instructing it to run a script that creates a custom color chart. The result can then be transferred back into MacProject to augment the project cash flow table. In another example, HyperCard 2.1 can issue a query through DAL to a remote database server and pass the retrieved information to Resolve.

A suite approach, such as that offered by Claris, offers several important advantages:

Custom Apple events tailored to enhance communications between specific applications in the suite.

Common toolkits could be developed for one application but shared with others in the suite, or perhaps even with other developers. For example, Claris currently licenses its XTND translators for use by other software developers.

Consistent user interface across applications in the suite reduces the effort required by a user to learn additional programs and combines the benefits of several suite members.

Evolutionary building on existing application platforms, allows both users and developers to maintain and enhance their investment.

Claris has indicated they are actively working with other developers to standardize custom Apple events, which is a positive indication of their intention to share such developments. In the long term, standardized IAC events will benefit all users because other developers will have access to linking methods that will enable closer integration of applications, even if they don't belong to a particular suite.

Although the suite approach is new and just beginning to evolve, it promises new synergisms among families of applications. However, it also leaves many unanswered questions, such as who will emerge as the leading influence in setting standards, and when will standards stabilize so that everyone will benefit? While Claris seems to be first out of the gate, Microsoft certainly can't be discounted. Their influence spans both the Mac and IBM PC world, and they hold a leading share of the Mac spreadsheet and word processing markets.

The dynamic duo

While Claris and Microsoft seem to have an edge in establishing IAC standards, at least in the suite arena, other developers could well set the pace in specialized areas. Complementary pairs of applications offer the most obvious opportunities to benefit from custom Apple events. For example, GeoQuery Corporation and ACI/ACIUS have announced integrated versions of the GeoQuery® business mapping program and 4th DIMENSION® (4D) relational database. As shown below in Fig. 9-9, a 4D user could select a set of records from a customer or prospects database, and automatically link to GeoQuery for a visual map display of locations.
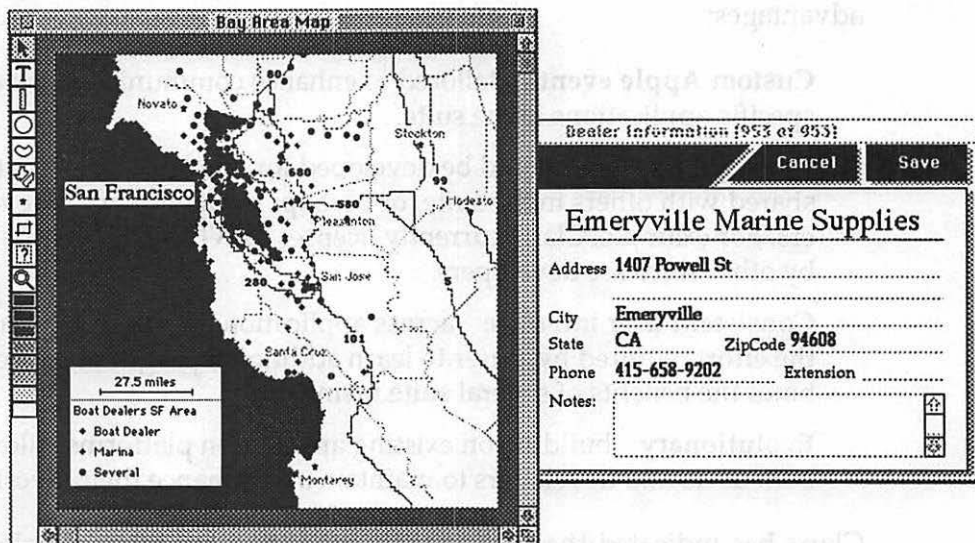
Figure 9-9. GeoQuery and 4th DIMENSION using IAC links.

Using Apple events, 4D launches GeoQuery and transfers data to it for mapping. The entire process is automatic. Once the map is displayed, the user could choose from a variety of GeoQuery tools to analyze geographic data patterns, such as determining the number of customers or prospects within a specified radius of a sales office. Because GeoQuery and 4D maintain live links, maps are automatically updated whenever information is changed in the database.

Working through custom Apple events, the two applications complement each other. 4D now offers a transparent method to graphically display address-based information, and GeoQuery extends its links to a powerful Macintosh relational database.

Another example of complementary applications is illustrated by Shana Corporation's Informed Designer and Informed Manager, which is paired with Softsync/BLOC's Accountant, Inc. Shana's software offers sophisticated forms design and information capture that is automatically linked to the Accountant, Inc. database. Figure 9-10 shows an invoice form created with Informed Designer.

Figure 9-10. An invoice form created with Informed Designer

Using custom Apple events jointly developed by Softsync/BLOC and Shana, the two applications work in concert to:

Validate data   links to the database perform automatic checks, such as verifying customer credit limits and inventory quantities, returning a notification if limits are exceeded.

Automatic lookups   for example, entering an item or customer number links to the database and automatically returning product description or customer addressing information.

Auto-increment numbers   such as invoice or purchase order numbers, which are usually maintained in sequence.

Links between the form and the database are established during forms design using dialog boxes, such as those shown in Fig. 9-11.
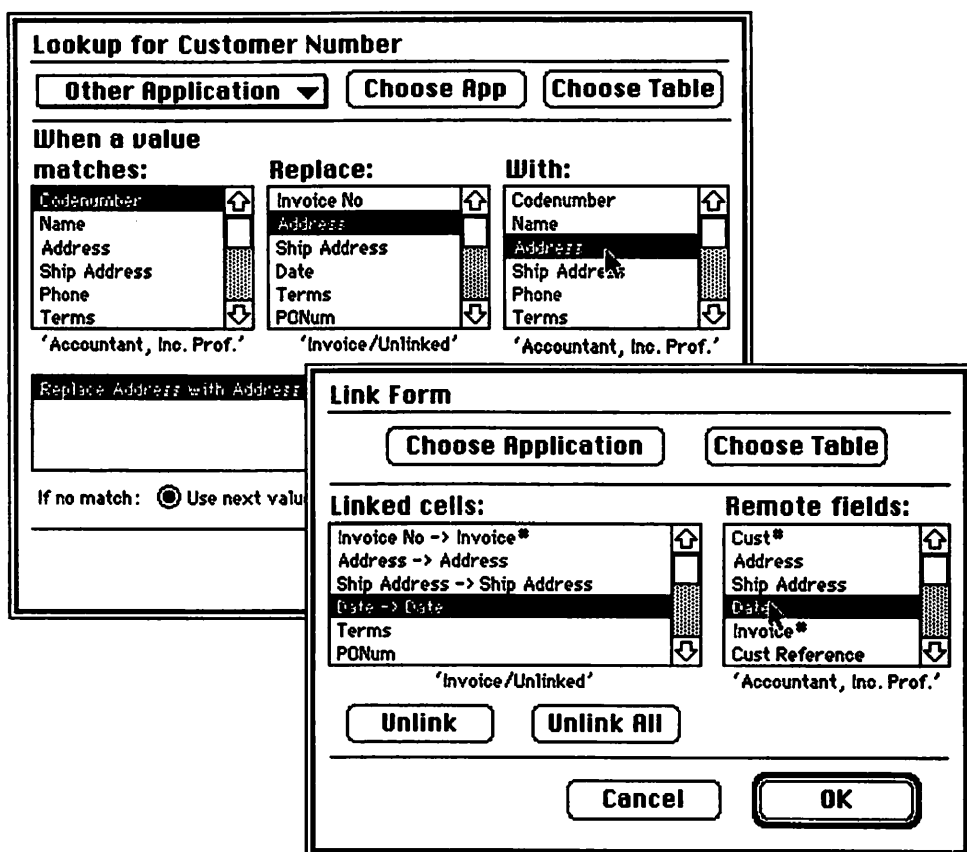
Figure 9-11. Dialog boxes to create links with Accountant, Inc.

Links work both ways—to look up information in the database and to deliver data from the completed form to the Accountant, Inc. package for further processing.

Shana has indicated that the same features will be available to work with other database products if developers adopt the custom Apple events created for this pairing. So what might begin as a dynamic duo could be expanded if this set of custom Apple events becomes a standard for linking data fields between two or more applications.

Networks and IAC

Because System 7's IAC features are designed to work over a network, an application on one Mac can easily link to a program or document on an-

other Mac. This means that any of the examples described thus far will function equally well over the network. Publish and Subscribe and application suites and pairs can all communicate between Macs on a network.

IAC's network abilities also introduce some further possibilities, such as:

> **Distributed processing**   sharing a processor-intensive task among several Macs on a network.

> **Workgroup applications**   that enhance productivity for collaborative efforts among several knowledge workers with a common task.

Distributed processing
Sharing a processing task among several Macs connected to a network could be particularly beneficial for applications that require a significant amount of computer horsepower. For example, a three-dimensional illustration package, such as Ray Dream Designer from Ray Dream, Inc., could use Apple events to farm out some of the processing tasks to other Macs and assemble the results on the originating Mac. By sharing the task with a more powerful Mac connected on the network, rendering a 3-D object might be completed in less time than if performed on a single Mac.

Workgroup applications
The concept of *workgroup-oriented applications* is a recent development, aimed at using the power of networked personal computers to help knowledge workers perform collaborative tasks more effectively. Although a relatively new concept, a few programs are beginning to appear. Some of these are compatible with System 7, but not dependent on it, while others require IAC to function.

ON Technology's Meeting Maker and Instant Update are two examples of workgroup applications that don't depend on IAC. Both programs can function with either System 6 or System 7.

In contrast, Inforum from FMX Software in Holland (distributed by MacVONK•USA) is groupware that depends on System 7's IAC. Inforum is a conferencing application that allows groups of users on the network to discuss topics or projects. Aimed at saving time and the logistical problems of face-to-face meetings, it makes use of PPC (described earlier) to create an electronic forum between users.

Summary

In chapter 9, we've explored IAC, System 7's new programming capability that encourages applications to talk to each other. IAC consists of:

Apple events   are a set of protocols for sending messages between programs. Apple has defined certain events, but software developers have the opportunity to define others.

Program-to-program communication (PPC)   is the foundation for all IAC activities. Programmers can use the PPC Toolbox to create special purpose links when a standard protocol isn't available or efficient.

Interapplications communications tools enable new features, such as:

Publish and Subscribe   offers an easy method to update portions of a document based on changes made to another document.

Application suites   are groups of programs, typically from the same developer, that use IAC features to share information and processing capabilities.

Dynamic duos   are pairs of programs from two different developers that have teamed up to extend their capabilities by linking applications with IAC.

Network links   between programs and documents are automatically available to new features built on IAC.

Distributed computing   describes a method used by some programs to share processing tasks between multiple Macs on a network.

IAC benefits include:

Personal productivity   is enhanced by automatic links that eliminate tedious steps to transfer information between applications.

Workgroup activities   benefit from new programs aimed at using IAC network links to help workers collaborate on common tasks.

Customized applications   are made possible by scripting and small component programs that are assembled based on user preferences.

Section IV

The Computer Islands
Exotic Ports of Call

Personal computing is sometimes characterized as a group of islands separated by open seas that make it difficult to share information. Without a network to quickly and easily convey information, collaborative tasks between individual PC users is severely limited. Although the Mac's built-in networking capabilities have always provided a foundation for bridging these gaps, System 7 provides the software tools needed to make collaborative efforts a reality.

Imagine what life was like before the telephone. With today's worldwide telephone network and the presence of phones in almost every conceivable location, virtually anyone can be reached in seconds. Yet the majority of PCs are isolated, without network connections that would allow them to converse easily with other computers. System 7's new networking capabilities are about to change all of that, at least for Macintosh users. And if history is repeated, the Mac's System 7 networking might just be the model that other computers will imitate.

Chapter 10 is a network tutorial to help remove some of the mystery surrounding computer networks and penetrate the *technobabble* often spoken by MIS professionals. Although chapter 10 is not essential to understand System 7's new networking features, it could clear up some confusion and help you develop an appreciation for how skillfully Apple has concealed many of the complexities of computer networking.

In chapter 11, we'll take an in-depth look at System 7's networking capabilities, such as file sharing and program linking. These new features offer many exciting possibilities for extending your reach beyond the desktop to other Mac users and to mainframe computers.

Finally, in chapter 12 we'll take a brief look at some of the features that could be included in future extensions to System 7.

Network tutorial—Spanning the 7 Seas

System 7's glamor and immediate appeal is available to all Mac users straight from the box. However, some of its most durable and important benefits come from System 7's extended network capabilities. Yet, to many Mac users, the mere mention of networking conjures up images of a complex jumble of wires surrounded by an impenetrable barricade of technobabble. Our goal in this chapter is to remove some of this network phobia by explaining how networks operate in easy-to-understand terms.

At their best, networks are invisible to the people who use them. Any one who has used a telephone has in fact used a network. Like most computer networks, the telephone system is comprised of miles of cable connected together in such a way that any person can make a connection with any other person. So in its simplest sense, a network is merely a method of connecting devices together in order to make communication between them possible.

Often a Macintosh user's first network experience is using a shared laser printer. Apple has taken great pains to ensure that networking is as simple and intuitive as the rest of the Macintosh experience. To connect your Mac to a laser printer is merely a matter of selecting it with the Chooser. Yet behind the scenes of any network are several important concepts that enable communications to take place:

Cable   some form of wire or fiberoptic cable is typically used to carry network conversations between devices on the network. Occasionally, networks will use broadcast signals in place of cable.

Network interface   each device needs an electronic component to translate conversations into a common format that can be understood by other devices on the network.

Protocol   is the native language spoken on the network. As with phone conversations, both parties must speak the same language or obtain a translator in order to achieve effective communication.

Topology   describes how devices are connected. For example, cables might be connected in a star or ring configuration.

In the following sections, we'll examine each of these concepts in a little more depth from the point of view of a typical Macintosh user. Then we'll take a look at what you can do when your Mac is connected to a network.

Unfortunately, not everyone has discovered the power and ease of use of the Macintosh, so you might need to communicate with different types of computers on other networks. And it's not just a microcomputer world. You might also need to retrieve information from a mainframe or mini-computer, located in your own department or across the country.

Again, Apple is striving to make these connections as easy as selecting a laser printer. In chapter 11, you'll see results of their efforts as we examine System 7's new networking features. In this chapter, however, we'll look behind the scenes and perhaps begin to appreciate Apple's skill in concealing many of the complexities of a network. The information in this chapter isn't necessarily required in order to use System 7's networking features, but it might help clear up some confusion and provide a stronger foundation for understanding System 7's networking benefits.

How to build a network

To begin, let's examine a simple networking situation. Suppose you have two Macs and you'd like to share some information between them. Using System 7's file sharing capabilities, you can set one of the machines up as a file server for the other. Order the correct cable, plug an end into each Mac, and congratulations—you're now the proud owner of a network! A network can be as simple as that, or it can be so complex as to require thousands of dollars of equipment and several people working full-time to maintain it.

As a Macintosh user, your first contact will likely be with a *local area network* or LAN for short. A LAN is merely a geographically limited network of computers and peripherals. It might be limited to a particular office or building, or it might even encompass a campus of related buildings.

In contrast to a LAN, a *wide area network* or WAN is typically composed of several local networks linked over a larger area. WANs can span a city, a country, or even the globe.

The components

Unfortunately, most networks are not quite as simple as a bunch of wires plugged into the backs of a few machines. Cables, hardware, software, and language protocols must all work together in harmony to achieve effective communication between devices on a network.

Cabling methods

Cables are perhaps the most obvious part of a network. In the Macintosh world, there are several types of cabling, including LocalTalk, PhoneNET, Ethernet, and Token-ring. Table 10-1 below lists some common network types and their capacity to carry information between attached devices.

Table 10-1. Common network types

Network type	Bandwidth
LocalTalk	230.4 Kbps (1 Kbps = 1 kilobyte per second)
PhoneNET	230.4 Kbps
Token-ring	4 Mbps (1 Mbps = 1 megabit per second)
	16 Mbps (not yet available for Macintoshes)
Ethernet	10 Mbps
FDDI	1000 Mbps
FDDI II	2000 Mbps

Cabling schemes are typically distinguished by their speed, sometimes referred to as *bandwidth.* The amount of capacity needed depends on the type of traffic expected on the network. Like a highway system, networks can experience traffic jams when the number of messages exceed the capacity (bandwidth) of the cables.

Some cabling is shielded with an outer layer of braided wire to protect network messages from interference that could garble the content. Another possible source of interference is the wires themselves. To minimize "cross-talk," wire pairs are sometimes twisted. Apple's LocalTalk wiring incorporates both techniques.

> **LocalTalk**   is a shielded, twisted-pair cabling scheme originally introduced with the first Macs and still in wide use.

PhoneNET   from Farallon Computing, is similar to LocalTalk, except that wires need not be shielded. Common twisted-pair phone wire is used, which means that PhoneNET can often take advantage of extra telephone wiring pairs that might already exist in a building.

IBM Cabling System   is a collection of various wiring schemes specified by IBM to support their Token-ring implementation. Unshielded twisted pairs can be used at the lower 4-Mbps rate, which can also support Apple's TokenTalk protocol.

Ethernet   is the oldest wiring scheme, originally introduced by Xerox in the 1970s. It is available in several different formats, including thick-wire (*thicknet*), thin-wire (sometimes called *cheapernet*), and more recently twisted-pair (commonly referred to as *10BaseT*).

Fiber-optic   using glass "wires" to transmit signals has grown in popularity as costs have declined. While it remains the most expensive cabling scheme, it offers significant advantages such as extremely high capacity over long distances, and is virtually impervious to interference. Because of its high capacity, lower-speed protocols such as LocalTalk, EtherTalk, or TokenTalk can operate over fiber-optic cables.

Selecting a wiring scheme for a Macintosh network involves balancing a number of different factors:

Traffic volumes   LocalTalk speeds might appear relatively slow when compared to the alternatives. However, LocalTalk is generally adequate for most work group situations, unless very large file sizes (> 1Mb) are frequently transmitted between devices.

Maximum distance   As signals are sent down a wire, they degrade or lose their strength, until they reach a point where the receiving device can no longer understand the message. Each cabling scheme has a maximum run length, ranging from a few hundred feet to several thousand. Sometimes, a signal boosting device can be inserted in a long run to amplify the signal and extend the effective distance.

Cost   While the cost of the actual cable should always be considered, it might not weigh as heavily as the labor required to install it. This accounts for the popularity of schemes like PhoneNET, which can utilize existing telephone wiring.

Connections   While basic LocalTalk connections are adequate within most work groups, a higher-capacity medium is generally considered

when connecting multiple work groups or linking to a mainframe. Typical backbone wiring choices include Ethernet and IBM cabling schemes.

Because every Macintosh includes built-in networking, it is relatively easy and inexpensive to begin connecting Macs. As your Macintosh network grows, you might consider some higher-capacity connections, either between work groups or for selected Macs that need to move large amounts of information.

Network interface cards

Unlike the Macintosh, most other computers do not include built-in network connections, which means that a special card or device must be installed before it can be plugged into the network. In contrast, every Mac ever produced has included LocalTalk, which is accessed by plugging a PhoneNET or LocalTalk connector into the printer port.

Token-ring and Ethernet connections are not quite as easy. For most Mac models, you'll need to purchase special network interface cards (NICs) which plug into a NuBus slot, a Processor Direct Slot (PDS), or into the SCSI port. Costs can range anywhere from $300 to $1000 per card. For some time, it has been rumored that Apple might eventually include Ethernet as a built-in feature on selected Macintosh models, such as the new 68040-based Macs expected before the end of 1991.

So why consider anything besides LocalTalk, given the added cost? The simple answer is added performance. Token-ring can move about 16 times as much data, and Ethernet can carry up to 40 times the capacity of LocalTalk. A Macintosh on an Ethernet network can access a file server almost as fast as it can its local hard drive. That's very nice if you access most of your software from a server. Furthermore, System 7's emphasis on networking and communication between processes running on different machines will tend to increase network traffic. Finally, if Apple does begin to migrate toward Ethernet as its networking standard, it wouldn't hurt to aim for compatibility with future machines.

Topologies

Network topology merely describes how machines are connected. There are three main types—bus, ring, and star—but variations and combinations of these types also exist.

Bus topology all devices connect directly to a main cable, called a *backbone* or *trunk,* as shown below in Fig. 10-1.
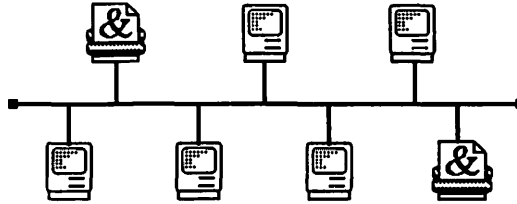
Figure 10-1. The bus topology

A bus topology can be used to connect other networks, such as in a star-bus configuration. Bus networks tend to be rather difficult to administer, because they lack built-in network management capabilities. However, they are robust in the event of a cable break. If a break occurs, the network is merely divided into two lower-performance segments. Ethernet is a classic example of a bus network , although it can also exist as a star. LocalTalk is always a bus, and PhoneNET can be as well.

Star topology as the name suggests, all devices connect to a central location or hub, as illustrated in Fig. 10-2.
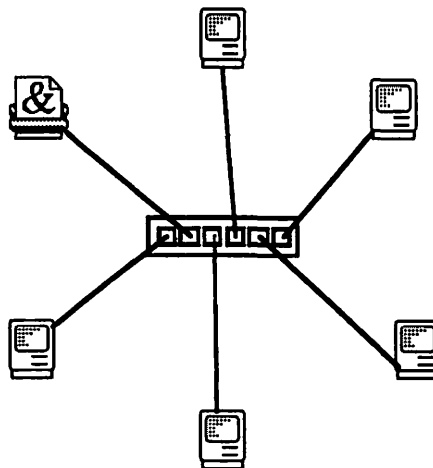
Figure 10-2. The star topology

While this requires more cabling, it tends to be easier to manage. In part, this is because hubs usually include built-in intelligence that monitors device performance and shuts down a connection if the device is creating unnecessary network noise.

Some hubs also include provisions for a Mac or PC to monitor network performance, and to shut down selected portions that might be causing problems. If there is a break in a star network, only one device or branch goes down, while the others remain blissfully unaware of its demise. On the other hand, if the hub goes down, the whole network is affected.

Star topologies are also easier to reconfigure because everything is controlled from a central point, such as a wiring closet or panel. When devices need to be reassigned to another part of the network, it's a simple matter of unplugging and reconnecting a line to another port.

PhoneNET is the most common star network in the Macintosh world, with 10BaseT Ethernet the most popular overall.

Ring topology   In this scheme, all devices are positioned on a cable loop, as illustrated in Fig. 10-3. To be functional, the ring must remain intact. Consequently, a method must be provided for detaching a device without disrupting network continuity. Otherwise, the entire network would go down in the event of a device failure or shutdown.
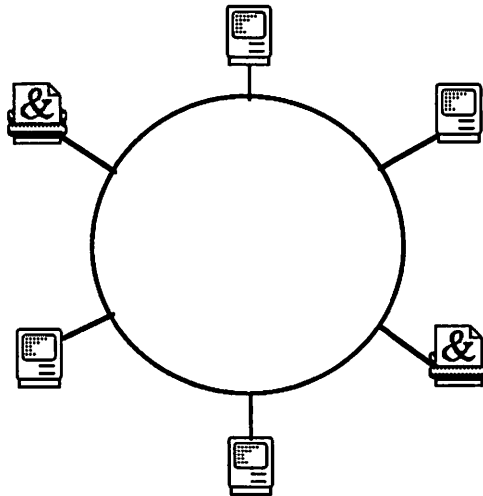
Figure 10-3. The ring topology

IBM's Token-ring is perhaps the most common example of this topology. Although logically a ring, it physically resembles a star in the way that it is wired. Every device has a cable back to a central hub, but at the hub, cables are connected in such a way as to provide a true ring configuration.

Access methods

In any of the network topologies, multiple devices are connected to a common set of cabling that is typically capable of supporting only one transmission at a time. What happens when two devices try to talk at the same time? There are two approaches to this dilemma—collision avoidance and token passing.

With the first method, each device listens for the presence of a signal on the network and begins a transmission when everything seems clear. However, it's possible for two devices to initiate a transmission at exactly the same instant. The result is a collision, which is sensed by the sending devices. Each device backs off and delays for a random interval before retrying. Both Ethernet and LocalTalk employ the collision avoidance method. As more devices are added to the network, the potential for collisions increases, with a corresponding drop in performance. This problem can be reduced by dividing a network into zones, separated by bridges that control traffic flow between segments of the network.

In contrast, token passing schemes such as IBM's Token-ring operate in a more controlled fashion. A token is constantly circulating on the network, stopping at each device long enough to ask if it has any information to send. If the answer is no, the token passes on to the next device. If the answer is yes, information is inserted in the token and sent to the destination device. While token passing networks can typically handle a larger number of devices, they are more complex and difficult to implement.

Packets

When computers communicate, they typically break information into discrete segments called *packets*. In addition to containing manageably sized portions of data, packets are like an envelope enclosing the data. The envelope includes addressing information identifying the source and destination, as well as the size of the packet. Addresses ensure that the packet is delivered to the appropriate recipient. Packet size enables the destination computer to verify that it has received the complete contents.

Network protocols

In common usage, the term *protocol* refers to a set of rules governing conduct under certain situations. For example, diplomats and heads of state follow established protocols to ensure that no one gets insulted.

A similar concept applies to networks. For example, network information packets must follow a predefined set of rules (protocols) to ensure that appropriate action is taken by the sender and the receiver. AppleTalk is the protocol most commonly used when Macs transmit information. When two devices on a Mac network follow the AppleTalk protocol, they are talking the same language. However, not all computers understand AppleTalk, and you're likely to encounter other protocol brands:

SNA   Systems Network Architecture is a proprietary protocol set developed by IBM, which has a hierarchical structure. Network traffic is ultimately controlled by a single machine, usually a mainframe.

TCP/IP   Transmission Control Protocol/Internet Protocol was developed in the 1970s for use on ARPANET, a network designed to connect centers of the Department of Defense's Advanced Research Projects Agency. It is the most widely used protocol today for connecting mainframes, minicomputers, and high-end workstations.

DECnet   is an implementation of Digital Equipment Corporation's DNA (Digital Network Architecture). It is found primarily on networks that cater to DEC machines, although there are recently introduced products that allow Macintoshes and PCs on a DECnet.

IPX   is the protocol used by Novell's NetWare, the most popular network system for DOS PCs. While this protocol isn't accessible to the Macintosh, Novell file servers have the capability of presenting themselves as AppleShare servers.

No matter which wiring scheme you use (LocalTalk, Ethernet, or Token-ring) AppleTalk is usually the language spoken between Macs. It is, however, possible for Macintoshes to speak in other protocols through the use of additional software, such as MacTCP for TCP/IP communications.

It's important to distinguish between three terms that sound very much alike, but mean different things:

LocalTalk   is one of several possible cabling schemes for connecting Macs

AppleTalk   is the language generally spoken between Macs on a network, regardless of which cabling scheme is used.

AppleShare   is both a protocol and the name of Apple's proprietary software that allows a Macintosh to be used as a dedicated file server.

Several third parties offer file server alternatives, which are Apple-Share compliant. By conforming to Apple's file service protocols, they look and behave the same as a genuine AppleShare server.

Connecting networks

By now, our hypothetical two-Mac network has grown to 25 machines. Downstairs, another work group has installed their own network, and everyone is growing a little weary of "SneakerNet" as a method for transferring files. The answer is to link the two networks together.

Internet is a term used to describe combinations of independent networks, linked together to form a larger network. However, the distinction between the terms *internet* and *network* are blurring as more networks are joined together. There are several methods available for linking independent networks that vary in complexity and cost, depending on the goals and types of networks to be connected.

Bridges and repeaters

For connecting networks that use the same cabling and protocols, there are two commonly used devices—the repeater and the bridge. A repeater is the least intelligent. It merely takes information from one network, amplifies it, and sends it on to the second network. On the other hand, bridges are a good deal smarter. They examine each packet and determine if it needs to be sent on to the second network.

When two networks are connected, it typically extends the distance between the two farthest devices, which might exceed the practical limits of the cabling scheme. Repeaters are ideal for this situation because they boost signal strength and extend the effective range of the cabling medium. When a repeater is placed between two networks, it simply creates a larger single network.

In contrast, a bridge allows each network to retain its separate identity, while also providing a link between the two. The bridge looks at the addressing information contained in the message packets (see earlier discussion). If the destination address is on the originating network, it does not pass the message to the second network. However, if the address indicates a recipient on the second network, the bridge passes it across. This technique reduces unnecessary traffic and keeps each network operating at maximum efficiency.

Bridges cost more than repeaters, because they incorporate computers that monitor and manage traffic. However, most bridges are designed to operate with a specific protocol, such as AppleTalk. Hayes and Shiva are two bridge manufacturers offering Macintosh network products.

Routers
Apple's Internet router is another solution, which uses software running on a Macintosh to control information exchange between networks. The Internet router can perform basic bridging functions, but offers additional capabilities as well. For example, a single Mac running Internet router software can provide links between LocalTalk, EtherTalk, and TokenTalk. The software compensates for the speed differences between these protocols and determines the best routing.

Internet router software can operate on an AppleShare file server to minimize hardware investment. However, operating both functions concurrently can negatively impact performance and might not be desirable in heavy use situations.

Several third-party firms also offer LocalTalk/Ethernet routers. Most are hardware solutions dedicated to the task. Some routers, such as Shiva's FastPath 4 and Cayman's Gatorbox include additional capabilities like TCP/IP support.

Gateways
Our hypothetical network is now doing quite well, having connected to the network downstairs. However, we have one more problem to solve. Many of the users would like to eliminate their old computer terminals and instead use their Macs to talk to the mainframe.

One solution would be to install special hardware and software that allows the Macs to emulate mainframe terminals. Then connect each Mac through a second network that links only to the mainframe. While this solution is certainly feasible, it requires maintaining two separate networks—one for the Macs to talk with each other, and the second to talk with the mainframe. A better alternative might be to link the Macintosh network directly to the mainframes, thus eliminating the need to maintain two networks.

A *gateway* is the only device smart enough to handle this task. It incorporates the same functionality found in routers and bridges, determining

which information packets should be passed on and adjusting to the differences in transmission speeds. However, the gateway adds one more critical function. It repackages information into envelopes understood by the mainframe.

To understand the process, consider the following analogy. Suppose you're sending a letter to a foreign country, such as Taiwan. You address the envelope in English, using a standard American addressing format. Unfortunately, the Taiwanese postal service uses a different format and doesn't know how to deliver your letter. Here's where the gateway comes in. It understands both addressing schemes. When the gateway receives your letter, it examines the address and creates a new envelope, using Taiwanese protocols. Your letter is removed from the old envelope and placed into the new one, now ready for safe delivery to its destination.

While information inside the packet has not changed, the envelope has been replaced with one that works in the new environment. AppleTalk packets are the standard on the Macintosh side, while another protocol (such as TCP/IP) is the delivery method on the mainframe side of the gateway. This is how Macs can continue to speak to each other in their native tongue, and send messages to a foreign country of mainframes.

Of course, the letter inside the envelope must also be in a language understood by our friend in Taiwan. If you don't speak Taiwanese, you'll need a translator to convert your words. The translator is special software, such as a terminal emulator, which is installed on each Mac. When you launch the emulation software, it opens another window on your desktop, in typical Macintosh fashion. However, the contents of the window look exactly like the old mainframe terminal screen. You're now ready to enter or request information from the mainframe.

Behind the scenes, the terminal emulation software prepares a letter in mainframe language and sends it off wrapped in a standard AppleTalk envelope. When it reaches the gateway, the AppleTalk envelope is discarded and replaced with a mainframe envelope, which is promptly delivered to the central computer. The mainframe processes the request and sends a letter back, stopping at the gateway again for repackaging. When the letter arrives on the Mac, the terminal emulation software reverses the translation and presents the results in English.

As you can see, a lot of activity is taking place behind the scenes. Fortunately, computers are very fast and most of this action is completed in a brief period of time.

So you have a network, now what?

As your network grows, it begins to offer more opportunities to share information within a group, as well as expand access to a wider range of resources. In this section, we'll discuss some of the things that are possible with an extended network.

Device sharing

Some computer devices are relatively expensive. Acquiring such devices for individual use might not be affordable. However, if they can be shared by several users, the cost could be more easily justified. For example, it might not be economical for everyone in your office to have his own modem or fax machine. However, by providing modem and fax facilities on the network, anyone can benefit from more convenient access. Other examples include sharing disk space with file servers, or sharing the use of a CD-ROM player over the network. In fact, System 7 enables sharing most devices attached to anyone's Mac on the network.

Another new System 7 feature will allow software packages to share the horsepower of other Macs on a network. Using interapplication communication services, one Mac might initiate a task and pass part of the processing to a second, more powerful Mac. Ray Dream Designer, described earlier in chapter 9 illustrates this principle. This approach could reduce the number of high-end Macs that might be needed for CPU-intensive tasks.

While device sharing offers certain economies, the ability to share information with others is perhaps the most important networking benefit.

Electronic mail

The growing use of electronic mail (e-mail) is rapidly becoming a standard method of communication in corporate America. E-mail systems can be LAN based or a service on a mainframe. In its simplest form, an e-mail system provides a method for keying in a text message and sending it to another person connected to the network. With some e-mail systems, the recipient need not be on the same network. Using an e-mail bridge, the system can transmit messages to another network, where the recipient

maintains an address (e-mail box). Behind the scenes, the message is stored on a computer until the person chooses to read his mail. As a result, e-mail messages generally reach people even when phone calls fail, eliminating the annoying and counter-productive game of telephone tag.

Most e-mail packages also allow attaching files to a message, which can then be stored on the recipient's local disk drive. For example, you might create a report or memo with your favorite word processor and attach it an e-mail message, so that a co-worker could review and comment on it.

Some e-mail packages offer even more exotic features, such as the ability to annotate a message with a voice recording or attach a picture. Future e-mail systems could even include video clips to really liven up a message. Other possibilities include fuzzy-name resolution, which means that if you don't know the precise name and address of the recipient, send it anyway! If the mail system is able to resolve the name, it will send the message to the correct person. If not, it will come back and ask for more information.

E-mail offers tremendous possibilities as a universal communications medium. Unfortunately, there are still a few obstacles to overcome before it can become as ubiquitous as the telephone system. One of these is the lack of a universal e-mail directory—a kind of worldwide phone book that would include an e-mail address for everyone who maintains an electronic mailbox. However, CCITT, one of the international standards organizations, is currently developing a new set of protocols called X.500, which should provide the foundation for solving this dilemma.

CCITT has already developed a related protocol known as X.400, which establishes a universal standard for e-mail addressing. Most e-mail packages are becoming X.400 compliant, which means they will be able to exchange messages with other e-mail systems.

Mainframe connections

Over the past few years, computer power has been steadily migrating from mainframes to micros. Knowledge workers prefer micros, because they are less intimidating and generally better suited for personal tasks, such as text processing and spreadsheets. However, mainframes are very good at certain other tasks, such as maintaining a large database of information. Consequently, they are likely to continue to play an important role for quite some time.

All micro users, including Macintosh fans, face the same dilemma—how to access and retrieve information stored on mainframes. Actually, there are several methods available, some of which are more advanced.

Terminal emulation   As described earlier, a gateway is one method of providing terminal emulation services to Mac users. In this mode, the Mac replicates the actions of a so-called "dumb" terminal. While this method allows a Mac user to perform usual mainframe activities, it offers limited ability to actually extract information from the mainframe and store it on the Mac's disk drive. Most emulation software allows a Mac user to copy the contents of a screen to the clipboard. From there, it can be pasted into the Scrapbook or a document.

While this approach is more convenient than hand recording information from the screen, it generally lacks the ability to paste data in a useful format. For example, copying a screen of numbers and pasting it into a spreadsheet does not segment the values into separate cells.

File transfer   With special software on the mainframe, it is possible to request a selected set of information be extracted from a mainframe database, which can then be transferred to the Mac in a more useful form. Such a request is usually generated while in terminal emulation mode. The actual transfer, however, could occur separately using other software utilities.

Depending upon the capabilities of the mainframe file transfer utility, it might be possible to specify one of several formats, such as a text file or a standard spreadsheet format. When the file is received from the mainframe, it can be opened with a word processing or spreadsheet package.

SQL   Structured Query Language is the defacto standard for extracting information from mainframe databases and some file server databases. Unfortunately, it is an arcane language not easily written by an average user. Moreover, it requires some understanding of the database structure, such as field names, which are often equally arcane. Consequently, it is more often used by programmers. However, it does offer a method of extracting data, which can then be transferred with utility software to a Mac for further processing.

Data Access Manager   DAM is Apple's answer to the data access and extraction dilemma. Application programs that are upgraded to

use DAM will greatly simplify the process. In essence, they will create an SQL script based on user-supplied information and send it via DAM to the mainframe, which will extract the data and return it to the Mac. We'll take a closer look at this new System 7 feature in chapter 11.

Accessing information from other computers is one of the most useful benefits of an extended network. System 7 makes it much easier to share information between Macs, and lays the foundation for extracting mainframe data as well.

So far, our discussions have been focused on local area networks (LANs), but it's time to expand our horizons and begin exploring the world outside.

Wide area networks

As suggested earlier, wide area networks (WANs) extend the reach of your Mac beyond a campus, building, or office setting. Connecting to a WAN involves many of the same issues described for LANs. Protocols, languages, hardware, and software must mesh smoothly to achieve effective communication. However, there are a few differences between LAN and WAN communications:

Distances   in practical terms, the limits of a LAN are set by how far the cabling system can extend. Beyond a certain distance, it generally becomes too costly for an enterprise to maintain a locally controlled high-speed private network. At this point, a public network service is typically employed to provide links to other locations.

Transmission speeds   are generally much slower than those available on a LAN. This is primarily a cost consideration, because it is possible to rent high-speed lines from any one of several network service organizations. In some cases, the amount of network traffic between locations might be sufficient to justify a dedicated high-speed link that more closely approximates LAN performance.

Error recovery methods   are not a significant issue on a LAN, but become more important when voice-grade telephone lines are used over long distances. Consequently, different transmission protocols are generally used to verify that data is transmitted accurately.

There are several methods available to establish WAN connectivity. In this section, we'll examine some of the more common techniques to extend the reach of your Mac network.

Modem bridges

In most situations, the lowest-cost method of linking two geographically remote networks is through standard telephone lines. A modem is required on each end of the line to convert network signals into a format understood by the phone system. Unfortunately, most modems cannot be directly attached to the network because they are designed to plug into a single micro computer. There are two solutions to this problem:

> **Serial server**   is another device that acts as an intermediary between the network and the modem. It merely converts network signals into a format expected by the modem.

> **Network modem**   is a special type of modem with built-in conversion capabilities. It can talk directly with the network, as well perform the usual modem functions. Shiva's NetModem is one example.

Either the serial server/modem combination or the net modem will provide the necessary hardware to link two remote networks, as illustrated below in Fig.10-4.
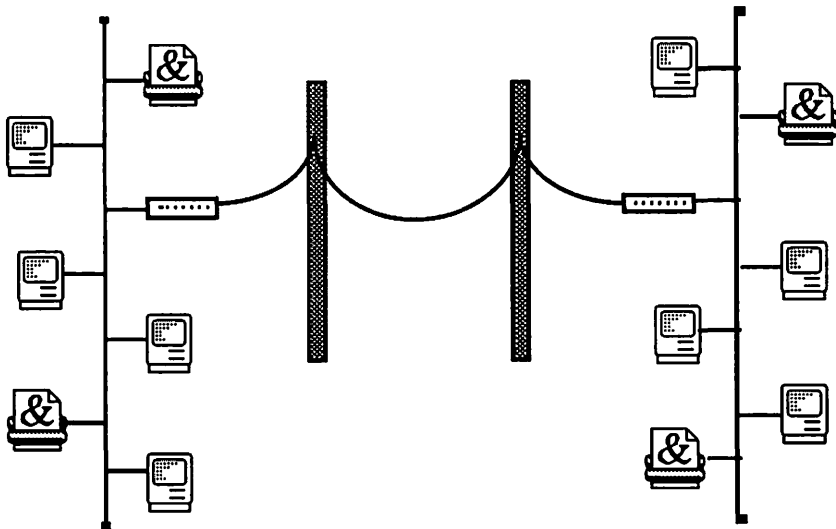
Figure 10-4. A modem bridge

The primary limitation of this arrangement is speed. Under ideal conditions, the fastest rate possible is less than one-tenth the speed of LocalTalk. In actual practice, it's likely to be even less because standard phone lines are often noisy. In a voice conversation, you probably wouldn't notice the noise unless it was really severe. However, a data transmission is much more sensitive. When a modem detects an error, it resends the information until the receiving modem acknowledges that it was delivered intact. If an excessive number of error/retries occur, most modems will automatically reduce the transmission rate until an acceptable error rate is achieved. In any event, the effective transmission rate is often lower than the maximum or ideal rating of the modem.

Public packet switched networks

One alternative to modem bridging is a public data network, such as Telenet. These networks use a packet switching technique based on a standard protocol know as X.25, which is designed for data transmissions. A typical configuration is shown below in Fig. 10-5.
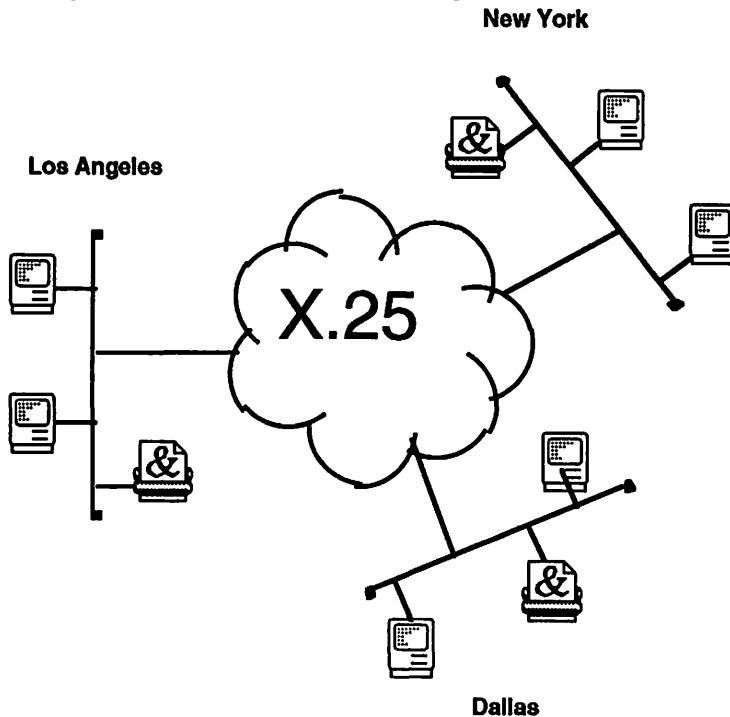
Figure 10-5. WAN capabilities via a public packet switched network

Public data networks are often represented by a cloud, which signifies the presence of various network services, as well as multiple access points. In Fig. 10-5, the cloud performs a three-way switching service to connect LANs in Los Angeles, Dallas, and New York. Each LAN is connected to the cloud through a device known as a PAD, which substitutes for the net modem in the earlier example. Public networks typically have access points in most major U.S. and foreign cities. The LAN is generally linked to the nearest access point through a dedicated phone line, which has been conditioned to meet data transmission specifications.

Public data networks are generally more reliable and offer greater flexibility than a modem bridge. Fees can be more expensive, and are typically based on usage, such as the number of packets transmitted through the cloud. As a result, it's important to link your LAN through a router, which prevents unnecessary packets from reaching the cloud.

Private networks

When there is a high volume of traffic between two or more locations, it could be cost effective to create a private wide area network. High bandwidth lines, such as AT&T's T1 service (rated at 1.544 Mbps) can be leased, typically at a cost of several thousand dollars per month. These lines are usually very high quality (low noise), using fiber-optic cabling. Because of the high bandwidth, it is possible to achieve near-LAN speeds. For example, LocalTalk rates are well within the T1 range. In fact, a single T1 line could be multiplexed to provide several concurrent channels, some dedicated to voice and others to data transmissions.

Private networks are usually implemented by a large enterprise, one that has the experience and resources needed to manage a complex and expensive network.

Remote network access

So far, we've examined methods for linking two or more LANs. However, there are a growing number of situations where a single Mac might need access to a remote LAN. For example, you might have a Mac in your home and want to connect it with the LAN in your office at work. The solution is similar to the modem bridge illustrated earlier in Fig. 10-6. All you need is a modem connected to your Mac at home, and the appropriate software to dial up the office network modem. Using a software package such as Farallon's Timbuktu/Remote™, you can connect your home Mac with anyone on the office network.

Of course, with a modem connected to your home Mac, you could expand your horizons well beyond the office network. You might try connecting to a private bulletin board system (BBS). There are literally hundreds to pick from, offering all types of interesting opportunities to electronically browse or chat with other users. Contact your local user group for a list of nearby BBSs.

With a home modem, you can also open up an account with one of the online services, such as America Online or CompuServe. They offer a broader range services and topics than you might find on a local BBS.

Summary

If you've made it this far, you probably have learned more about networks than you might have thought possible. In this chapter, we've taken a survey of the primary concepts and terms used to describe networks.

Network components   cabling schemes, topologies, and protocols are the pieces that make up a network. Hardware and software must operate harmoniously with all the components to achieve effective communications.

Connecting networks   most networks begin as small independent LANs that are ultimately joined with bridges, routers, and gateways, forming a useful fabric of integrated workers.

Network uses   extend your productivity by sharing networked devices, reducing telephone tag and e-mail messages, and connecting with mainframes in order to extract information and download it to your Mac.

Wide area networks   local area networks bridge the gap between workers in an office, building, or campus. WANs extend your reach across the city or across the globe. Links with other computer networks expand your horizons and broaden the opportunities for more effective communications and learning.

Our goal has been to establish a foundation that will enable a deeper appreciation of System 7's new networking features. In chapter 11, we'll examine how networking is easy and intuitive with System 7.

System 7 networking—
No Mac is an island

A computer without networking is an island in a sea of data. It's much easier to retrieve and transmit information when your Mac is linked to the rest of the world.

Even before System 7, a relatively high percentage of Macintosh computers were networked because every Mac includes built-in LocalTalk. Consequently, many Mac users are accustomed to the advantages of electronic mail, printer sharing, and even exchanging files over the network. As with other System 7 features, networking has been extended with elegant new capabilities that build on the existing framework.

> **File sharing** any Mac can share information directly with other Macs, across the room or across the globe.

> **Program linking** allows applications to communicate with each other across the network.

> **Publish and Subscribe** operations function across a network.

> **Data Access Manager** eases access to database information on many different computer platforms.

These features can take your Mac on even more productive and exotic travels. Among System 7's many new features, networking is one of its brightest and most promising advances.

A typical situation

Imagine you're working on next year's budget with employees from other departments. Accounting, Personnel, and Market Research all contribute to the budget, and you need to share information with each of them. Everyone working on the budget needs access to current and accurate data. For example, when Market Research forecasts new sales projections, everyone needs to receive the updated figures. In addition, you might need to retrieve historical data from the company mainframe or minicomputer. System 7's network tools can help with each of these tasks.

Networking tools

System 7 includes a collection of network tools that help you share information on your Mac and communicate with other computers on the network. Table 11-1 provides a quick overview of the primary tools used to control network access.

Table 11-1. Network controls

Icon	Name	Location	Purpose
	Network	Control Panels	• Select the type of network connection (LocalTalk, EtherTalk, or TokenTalk).
	Sharing Setup	Control Panels	• Identify your Mac and your own name and password. • Turn file sharing on or off. • Turn program linking on or off.
File	Sharing command	File menu (Finder)	• Activate sharing for selected disks/folders, and set access privileges.
	Chooser	● menu	• Activate AppleTalk. • Select a file server. • Select a printer or other shared network resource.
	File Sharing	Chooser	• Select volumes to mount. • Connect as registered user or guest.
	Users and Groups	Control Panels	• Name who can share information on your Mac, and optionally set their passwords. • Create groups of users.
	File Sharing Monitor	Control Panels	• Monitor who is currently sharing information on your Mac. • Disconnect users who are currently sharing information.

In this chapter, we'll examine each tool individually and learn how to use them together. You might want to refer back to Table 11-1 as a quick guide to locate a particular network feature or function.

Connecting to the network

In chapter 10, we described several methods of connecting a Macintosh to a network. If your Mac is located in an office with other Macs, there's a good chance that it's already connected to a network. The type of network connection might be Ethernet or Token Ring, but it's more likely to be LocalTalk, because that's what is built into every Macintosh. And if this is your first network connection, LocalTalk is the easiest to install.

To communicate with other computers, your Mac needs both hardware and software. The hardware provides the physical connection, and the software provides the language necessary for the computers to understand each other.

Network hardware connections

LocalTalk is often described as "plug-and-play" because it's no more difficult to install than connecting the components of a stereo system. To connect two or more Macs with LocalTalk, you'll need some form of an adapter that converts signals coming through the printer port on the back of the Mac. Apple offers LocalTalk connectors and cabling, but third-party alternatives are typically less costly, and in most situations work as well as the official versions. PhoneNET connectors from Farallon are the most popular alternative, allowing use of standard twisted pair phone wiring between Macs.

Simply plug the adapter into the Mac's printer port, and then connect the adapters with the appropriate cables. For small networks, Macs are often daisy chained. Larger networks generally use a star topology (see chapter 10), with cables running from each Mac to a central point, such as a wiring closet, where they are connected to a patch panel.

Ethernet and Token Ring connections require a special card installed in the Mac. Both of these options offer higher transmission rates than LocalTalk. You might consider these options when very large amounts of data need to be communicated between nodes on the network.

A node is any device connected to the network that can send and receive information. For example, a node could be a Mac, a laser printer, a file server, or a special-purpose device like a network modem. Keep in mind that not all devices include built-in LocalTalk, and most do not have built-in Ethernet or Token Ring connections. However, if the device has a stan-

dard serial port, it can generally be connected through a converter, such as Shiva's NetSerial box.

Network software

System 7 includes network software for LocalTalk, Ethernet, and Token Ring connections. In most cases, the appropriate network drivers are installed along with other system software. However, you might need to install additional network software if it was omitted during the initial System 7 installation. Additions are not a major problem. Refer to chapter 4 and use the customize options to select and install the missing software.

To confirm that your Mac has the appropriate network software, you'll need to check a few of the network controls outlined in Table 11-1. First, check the Network control panel. You should see one or more of the icons displayed in Fig. 11-1. LocalTalk will always appear because it's built-in. On the other hand, EtherTalk and TokenTalk will appear only if the appropriate card(s) are installed, or your Mac includes built-in Ethernet.
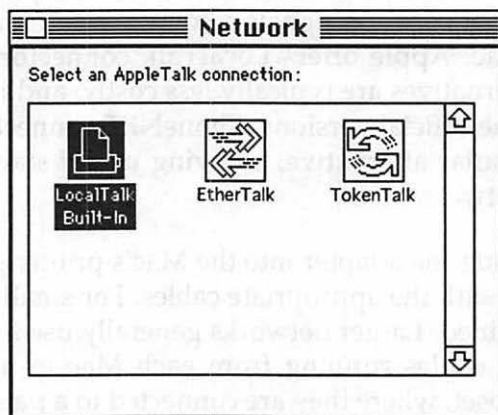
Figure 11-1. Selecting a network connection

If you're certain that an Ethernet or Token Ring card is installed, but the corresponding driver icon doesn't appear in the Network control panel, you'll need to install it from the System 7 installation disks.

It's also a good idea to open the Chooser and make sure the AppleShare icon appears. In addition, look for the Sharing Setup control panel, open it, and verify that the File Sharing option is available. If any of these features are missing, use the System 7 Installer's customize options to add them.

Naming your Mac

You should also identify your Mac and its owner before you begin to use System 7's networking features. Figure 11-2 illustrates the Network Identity portion of the control panel, which is where you enter the required information.

```
▤▯▤▤▤▤▤▤▤▤▤▤ Sharing Setup ▤▤▤▤▤▤▤▤▤
┌─────┐
│ �... │  Network Identity
└─────┘
   Owner Name :      Gordon Campbell
   Owner Password :  ●●●
   Macintosh Name :  CAMPBELL's IIfx
```
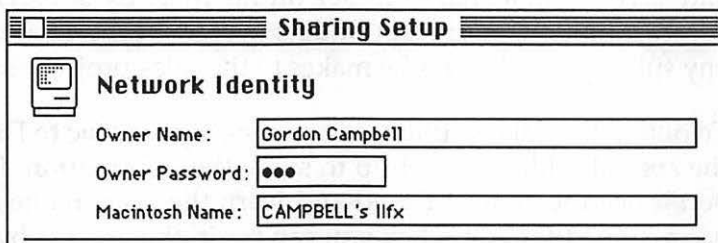
Figure 11-2. Identifying your Mac to the network

The label you enter as the **Macintosh Name** will appear in the Chooser of other Macs on the network, so you should select a name that will make it easy for others to identify this particular Mac. If you're the exclusive user, it's appropriate to include your own name. On the other hand, if this Mac is shared by several people, you might want to use a descriptive name, such as Marketing II or DTP-1. Avoid generic names like Mac Classic, which could easily cause confusion, especially when there are more than one Mac Classics on your network.

You also need to identify the **Owner Name** and enter a secret password, which can be up to eight characters in length. If you're the exclusive or primary user of this Mac, enter your own name. This is the name that will automatically appear when you connect to another Mac or file server from this Macintosh. To make it easier for everyone, a standard naming convention should be established. On a small network (10 to 15 Macs), first names are probably sufficient. However, on larger networks, first name or initial and last name might be needed to avoid confusion.

Although you need to enter this information only once, it can be changed at any time by opening the Sharing Setup control panel and reentering the desired information. For example, if you want to change your password, simply retype a new **Owner Password**. When you connect to your Mac from another computer on the network, you must enter your name and password. Upper- and lowercase letters must match for a password, but not for the owner's name. It's a good idea to select a password that can't be easily guessed by someone else.

Visiting other Macs

Returning to our earlier example, your first step in preparing the budget is to obtain the latest sales projections from Market Research. David Cook, the research analyst, has published an edition from his spreadsheet and saved it in a shared folder on his Mac. By subscribing to the Sales Forecast edition, your Dept Budget spreadsheet will automatically reflect any subsequent changes he makes to the sales projections.

To obtain the data, you'll need to connect your Mac to David's, and access the special folder he's set up to share the information. Before you begin, you'll need to contact David and learn the exact name and password he has assigned for you. Then you can begin the process by locating David's Mac in the Chooser.

The Chooser

As its name and icon suggest, the Chooser allows you to select a network resource, such as a printer, modem, or a shared disk, as illustrated below in Fig 11-3.
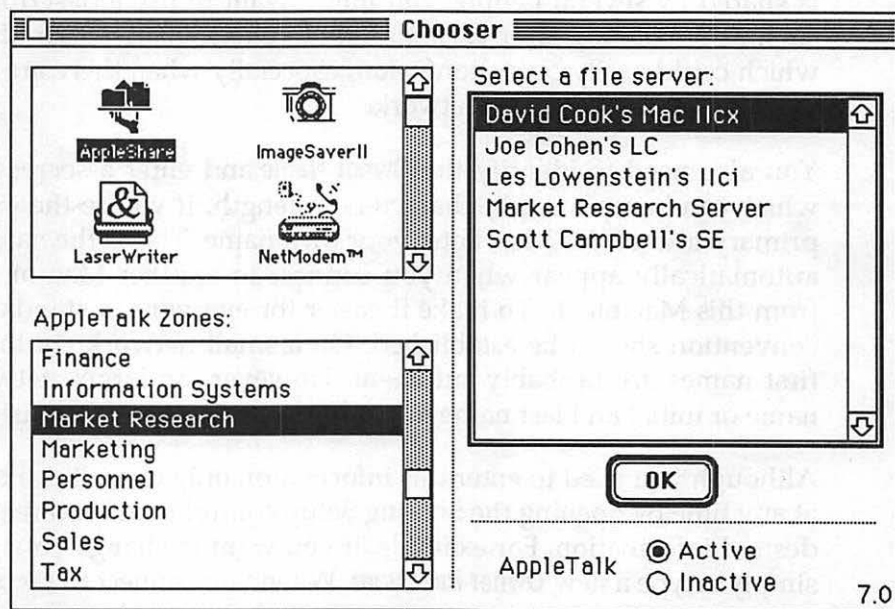
Figure 11-3. Selecting a file server from the Chooser

To access a file server, first make sure AppleTalk is **Active**, then click on the **AppleShare** icon. If your network is divided into zones, the next step is

to click on the name of the zone where David's Mac is located—in this case **Market Research**. On a single-zone network, the AppleTalk Zones scroll box will not appear, and you can select the file server directly. If you don't see the Mac or file server you're looking for, it could be because you've selected the wrong zone or because the Mac's owner doesn't have file sharing turned on.

Entering your name and password

After you've located and selected the desired file server, click **OK**, which will display the Connect dialog shown in Fig. 11-4. The Owner Name you entered previously in the Sharing Setup procedure will automatically appear in the Name field. However, it might not be exactly the same as the name provided by the owner of the file server. If necessary, retype your name and then enter your assigned password. Only bullets will appear on the screen as you key in your password. This conceals your password, just in case someone happens to be looking over your shoulder. Remember that passwords are case sensitive; *Blitz* is different from *blitz*.

```
┌──────────────────────────────────────────┐
│  ╔═╗                                       │
│                                            │
│     Connect to the file server "David Cook's IIcx" │
│     as:                                    │
│        ○ Guest                             │
│        ◉ Registered User                   │
│                                            │
│     Name:     │Gordon Campbell          │  │
│     Password: │●●●│    (Two-way Scrambled)  │
│                                            │
│     ( Cancel )  ( Set Password )  (( OK ))  │
│                                     v7.0    │
└──────────────────────────────────────────┘
```
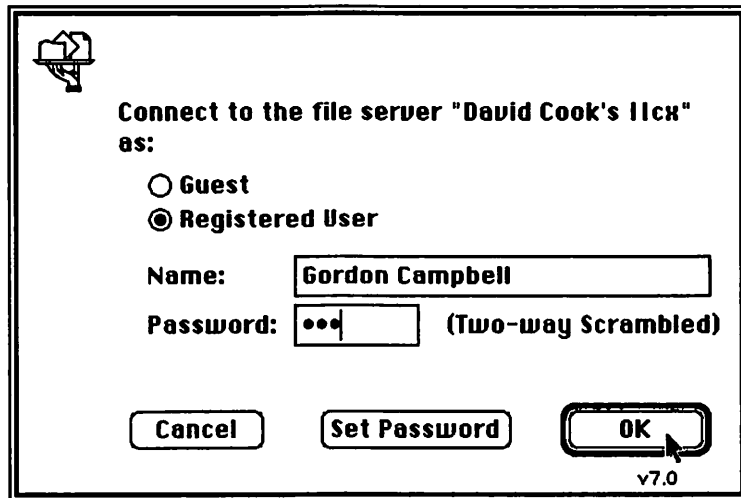
Figure 11-4. Entering your name and password in the Connect dialog

If the file server owner has allowed you to change your password, you might want to click the **Set Password** button and select a password that is convenient for you to remember. Also, it's much easier to remember the exact format of your name if everyone agrees to a consistent naming convention. For example, assigning names exactly as they appear in the company phone directory provides a common reference for everyone.

In some cases, you might be able to connect to a file server as a Guest, which doesn't require a name or password. This feature will be available only if the owner has allowed guest privileges.

Selecting an item to use

To complete the process, click **OK** in the Connect dialog (Fig. 11-4), which will display the Item Selection dialog, illustrated below in Fig. 11-5.

Figure 11-5. Item Selection dialog box

If the owner has shared more than one folder, you might have several items to choose from. In our example, however, David has shared only one item. Click on the title of the item to highlight it.

If you plan to access the same shared item every day, click the box at the end of the title. This will reveal the options displayed below the item selection box, as shown in Fig. 11-5. When an item is checked, it will appear on your desktop each time you start your Mac, assuming the file server is turned on and available on the network. You also have the option of saving your **Name Only** or your **Name and Password**. Choosing the first option will automatically open the Connect dialog (Fig. 11-4) during startup. You'll need to enter your password or cancel. Generally, this is the best option because it prevents someone else from starting your Mac when you're not around and signing onto a file server under your name. If you choose the second option to save your name and password, you should make sure that no one else can startup your Mac without your approval.

When you click **OK** in the Item Selection dialog (Fig. 11-5), the connect process is complete, and a server icon will appear on your desktop. Double-click the server icon to open the item, as illustrated below in Fig. 11-6.
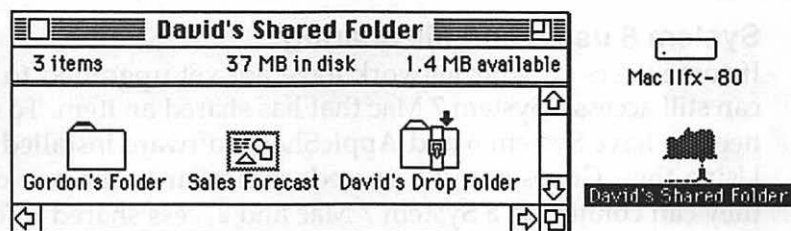
Figure 11-6. A shared item on your desktop

You can now subscribe to the Sales Forecast edition, just as if it were located on your own hard drive.

Using an alias for quick access to a file server

Alias

Once you have established the first connection to a file server, you might want to make an alias of it, for easier access the next time you need to connect. Select the file server icon and choose **Make Alias** from the Finder's File menu. Store the alias on your desktop, in the Apple Menu Items folder (to appear under the menu), or some other convenient location. Later, when you open the shared item's alias, it will bypass the Chooser and go directly to the Connect dialog (Fig. 11-4). Enter your password, click **OK**, and the item will automatically appear on your desktop.

Creating a folder on another Mac

If the owner of the file server has allowed you to make changes, you could create your own folder directly on his Mac. For example, Gordon's Folder in Fig. 11-6 is owned by the person connected to David's Shared Folder. The small dark tab at the top of the folder indicates you own the item and can set access privileges, such as who can see, open, and make changes to it. Setting access privileges is described later in this chapter. You should be aware, however, that the owner of the file server can always override your settings and take ownership if they choose to do so.

Disconnecting from a shared disk

When you are done using the information in a shared item, you should disconnect your Mac from the file server. This will reduce desktop clutter on your Mac and perhaps improve performance on both your Mac and the file server. To disconnect from the file server, simply drag the server

icon to the Trash or select the server icon and choose **Put Away (⌘-Y)** from the Finder's File menu. If you've made an alias of the shared item as suggested earlier, you can connect quickly whenever you need access again.

System 6 users and file sharing

If some users on your network have not yet upgraded to System 7, they can still access a System 7 Mac that has shared an item. To do so, they will need to have System 6 and AppleShare software installed on their Macs. Using their Chooser and a procedure similar to the one outlined above, they can connect to a System 7 Mac and access shared information. They cannot, however, share a folder or disk on their own Mac with others on the network.

Accessing your own Mac from another location on the network

Occasionally, you might be visiting another department and find it convenient to access your own Macintosh. As the owner of your Mac, you can connect from a remote Mac and access everything that is contained on any hard drive or CD-ROM disc attached to it. Of course, your Mac needs to be turned on and file sharing activated for this to work. You must also have named your Mac and designated yourself as the owner (see Naming your Mac earlier in this chapter). However, it does not require any other special sharing setup, such as sharing each hard drive.

To access your Mac from another location, open the Chooser and select the appropriate zone and server name (the name of your Macintosh). Type in your own name and password in the Connect dialog (Fig. 11-4), click **OK**, and then select the disk volumes you want to access. You now have complete access to all folders, files, and programs, just as if you were sitting at your own desk.

While you're remotely signed-on to your own Mac, you might want to create an alias of each disk volume and save it on a floppy disk. Carry the floppy disk with you when you leave your office, and you'll always have quick access to your own Mac. This "office on a disk" technique can save time and provide convenient access to important information.

Visiting other Macs is only the first component of network operations. After signing onto other machines, you might want to set up your own Macintosh so that other users can share some of your files. In the next section, we'll explore System 7's tools and methods that allow you to share selected information with others on your network.

Sharing items on your Mac

Returning to our example, the Accounting department is responsible for consolidating everyone's budget. At some point, you will need to share the results of your Dept Budget spreadsheet with them. Again, the most convenient method to maintain accurate and up-to-date information is to share a published edition from your spreadsheet. By saving this edition in a shared folder on your Mac, the Accounting department can retrieve the latest information whenever they want to consolidate.

What to share

With System 7's file sharing features, you could simply share everything on your hard drive, including the published edition from your spread-sheet. However, you might have some items that are confidential, or others that you might not want to share with everyone. Instead of sharing your entire hard drive, you can share one or more selected folders. This approach is easier to manage because access is limited to a specific group of items. In fact, other users can see only those items that you identify as shared.

You can select up to 10 folders to share, not counting those stored inside a folder that is already shared. However, you can't share an individual file unless it's stored inside one of your shared folders, or on a hard disk with the entire drive shared.

Starting file sharing

Folders or disks on your Macintosh will not be shared until you turn on file sharing and select the items you want to share. Once file sharing is turned on, it remains on until you specifically turn it off. Even if you shut down, file sharing will resume the next time you restart the Mac.

There are four basic steps to set up file sharing on your Macintosh:

Turn on file sharing   with the Sharing Setup control panel.

Identify users and groups   that you want to share items with, using the Users and Groups control panel.

Select items for sharing   and choose the Sharing command from the Finder's File menu.

Set access privileges   for each shared item.

Turning file sharing on and off

File sharing is turned on and off in the Sharing Setup control panel. To activate sharing, open the control panel and click the File Sharing **Start** button. During the startup process, the File Sharing Status message will indicate that startup is in progress, as illustrated below in Fig. 11-7. If you change your mind and want to terminate startup, click **Cancel**.
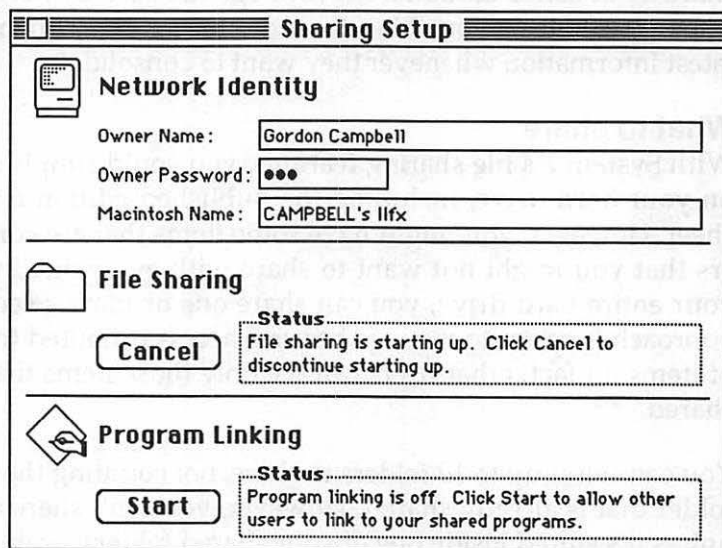
Figure 11-7. Turning on File Sharing in the Sharing Setup control panel

File sharing remains on until you specifically turn it off. To shut down file sharing and disconnect all current users, open the Sharing Setup control panel. The File Sharing portion will appear, as shown in Fig. 11-8.
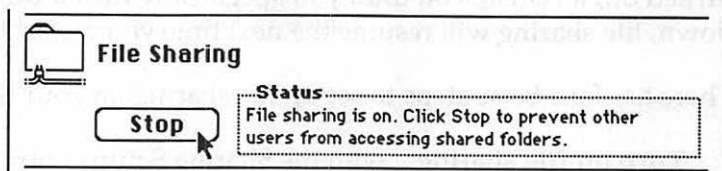
Figure 11-8. Turning File Sharing off

Click the **Stop** button to turn off File Sharing. If other users are connected when you turn File Sharing off, another dialog box will appear, as illustrated in Fig. 11-9. As a courtesy to others, you should enter a number that will allow them a few minutes to save their work and disconnect from your Mac.
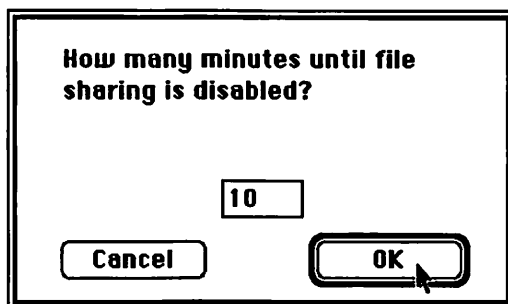
Figure 11-9. Shutdown Delay dialog box

When you click **OK**, a message will be sent to anyone connected to your Mac, as shown below in Fig. 11-10.
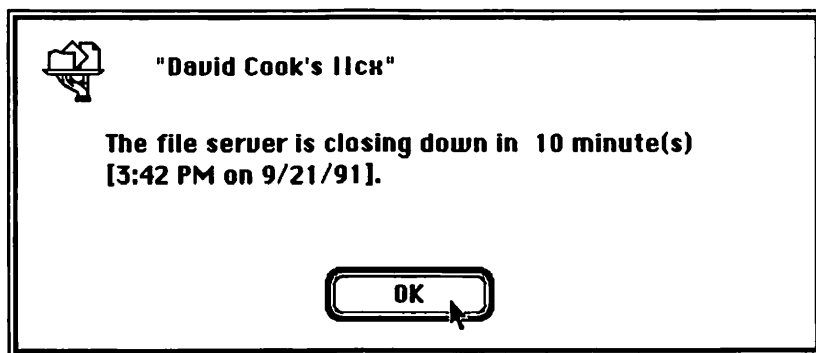
Figure 11-10. File Server Shutdown warning message

The message will appear as the topmost window, in front of an active application, so that users are notified immediately. If they remain connected, additional warning messages will appear at preset intervals.

If you change your mind and want to cancel the shutdown procedure, simply reopen the File Sharing control panel and click **Cancel**, as illustrated below in Fig. 11-11.
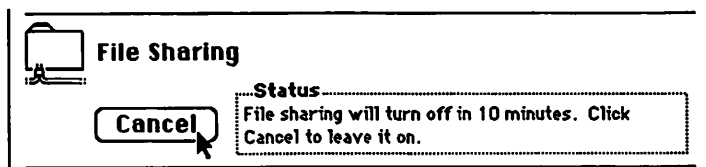
Figure 11-11. Canceling the shutdown procedure

Users and Groups

With File Sharing activated, you could go directly to sharing a folder or disk, using the Sharing command in the Finder's File menu. However, you won't be able to limit access to a particular person or group until you first identify them in the Users and Groups control panel.

There are four types of icons found in the Users and Groups control panel, as illustrated in Table 11-2.

Table 11-2. Users and Groups icons

Icon	Type	Creation and naming
	Owner	Created automatically and assigned the Owner Name previously entered in the Sharing Setup dialog (see Fig. 11-2).
	<Guest> or Registered User	The <Guest> icon is created automatically. Registered Users are created by choosing the New User command (⌘-N) from the File menu, and assigning a name of your choice.
	Group	Created by choosing the New Group command from the File menu and assigning a name of your choice.
	Group Member	Created by dragging the icon of a Registered User over a Group icon. Group members are displayed by double-clicking a Group icon.

When you first open the Users and Groups control panel, two icons will appear automatically. The owner icon is distinguished by its bold outline; its name comes from the Owner Name provided in the Sharing Setup dialog. The <Guest> icon represents a generic class of users who can connect without entering a specific name and password.
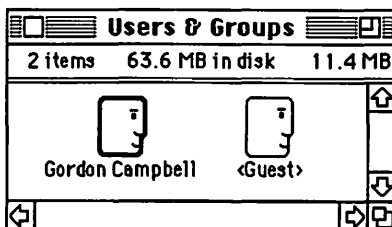
Figure 11-12. Users & Groups control panel window

Creating registered users

You might not need to add any registered users if you want everyone on your network to have equal access to your shared items. However, it's more likely that you'll want to restrict access to certain folders to a select group of users. For example, you might want to limit access to the published edition of your Dept Budget to members of your budget team and to certain people in the Accounting department. Before you can assign users to a group, you need to identify each user.

To create a new registered user, select the **New User** command (⌘-N) from the File menu, as illustrated below in Fig. 11-13. This command is available only when the Users & Groups control panel is open.
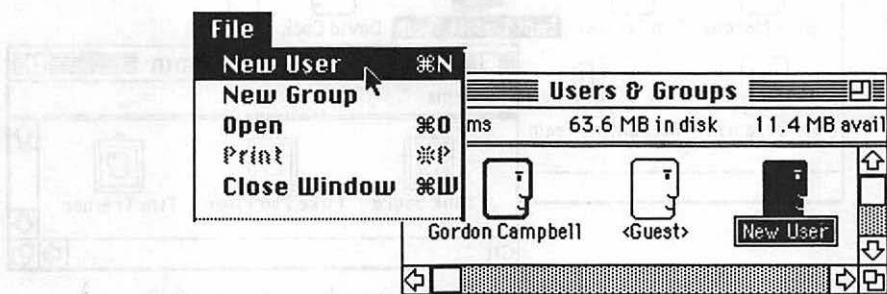
Figure 11-13. Adding a new user

Rename the new user icon to identify someone that you intend to have special access privileges. As recommended earlier, it's easier for everyone if you follow a predefined naming convention, such as assigning names exactly as they appear in the company phone directory or e-mail list.

System 7 allows you to create up to 100 users and groups combined, but it's recommended that the number be limited to 50 for optimal performance.

Creating groups of users

New groups are created in a similar fashion. With the Users & Groups control panel open, select the **New Group** command from the File menu. Rename the group to reflect its purpose or function. For example, in preparing your annual budget you might want to establish two groups. The Dept Budget Team could include the managers who are assisting in preparing or reviewing the budget, while the Accounting Team would contain the people responsible for consolidating everyone's budget.

You can add members to a group by simply dragging their user icons onto the group icon. To review who belongs to a group, double-click the group icon, as illustrated below in Fig. 11-14. Notice the difference between the registered-user icon (the face) and the small picture frame containing a face, which signifies a group member.
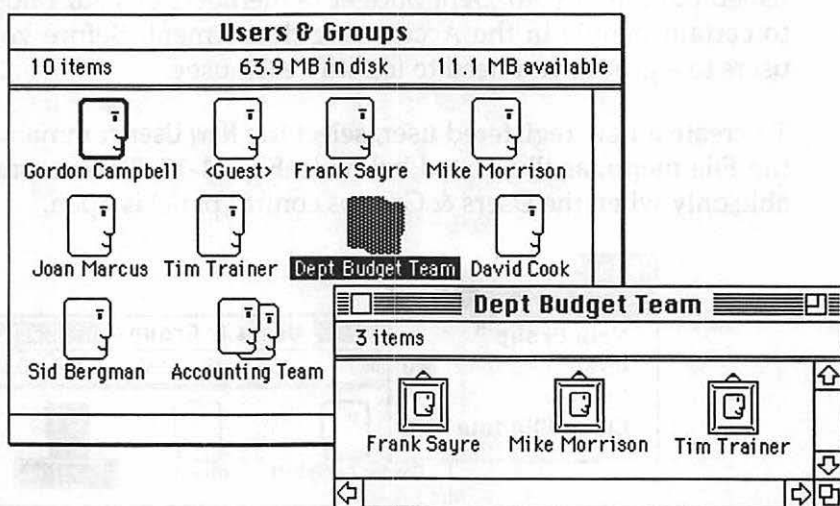
Figure 11-14. Reviewing members of a group

Registered users can belong to several groups or none at all. For example, you might want one of the members of the Dept Budget Team to also belong to a special task-force group. Because a registered-user icon remains in the Users & Groups window, you can drag it to as many groups as you want.

It's unnecessary to include your owner icon in any group because you automatically have access to everything on your Mac. There is also no need to include the <Guest> icon in any group because guest privileges are set separately, as described later in this chapter.

To remove a member from a group, simply drag his (picture frame) icon from the open group window to the Trash. If you drag a registered-user icon (face) to the Trash, it will automatically remove that person from all groups he belongs to. Be careful to distinguish between these actions because there is no warning message. Fortunately, you can rescue a user by dragging his icon from the Trash before you empty it. You can also delete an entire group by dragging the group icon to the Trash.

Setting registered user password and privileges

Double-clicking either a registered-user icon (face) or a group-member icon (picture frame) will open the User Information window, as shown below in Fig. 11-15.
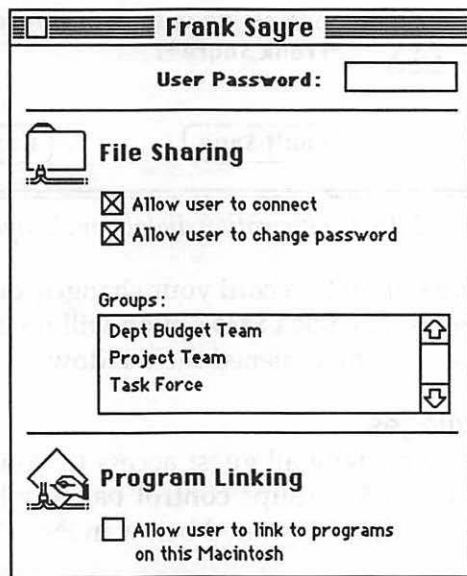
Figure 11-15. The User Information window

You can assign a user password by keying up to eight characters in the space provided. Be sure to notify users of the exact password. Otherwise, they will not be able to connect to your Mac. If you permit users to change their password, they can replace the one you've initially assigned. Creating an initial password is optional. If you leave this field blank and enable users to change their password, they can create their own. Some form of password protection is generally desirable to prevent unauthorized access to your shared items.

Once a password is set, only bullets will be displayed and it cannot be read in the User Information window. If you and the user forget the password, you'll need to delete the old password and enter a new one.

To prevent a specific user from signing on while you have file sharing active, click the **Allow user to connect** box and remove the checkmark. The user information window also automatically displays the groups that the user belongs to and enables program linking, which is covered later in this chapter.

Once you've selected all desired options in the User Information window, close the window. As shown below in Fig. 11-16, a dialog box will ask you to confirm your choices.
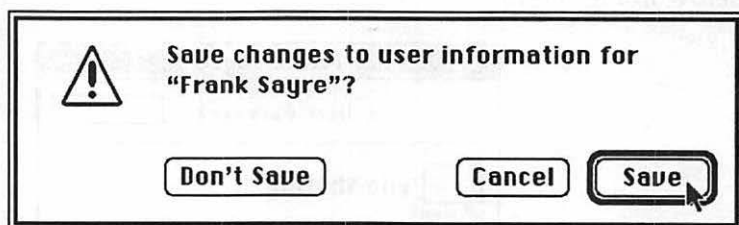
Figure 11-16. Confirmation dialog for changes to user information

Click the **Save** button to record your changes, or the **Cancel** button to make further changes. The **Don't Save** option will revert to the settings that were in effect when you first opened the window.

Guest privileges

You can allow or deny all guest access to your Mac. Open the <Guest> icon in the Users & Groups control panel, which will reveal the Guest Information window illustrated below in Fig. 11-17.
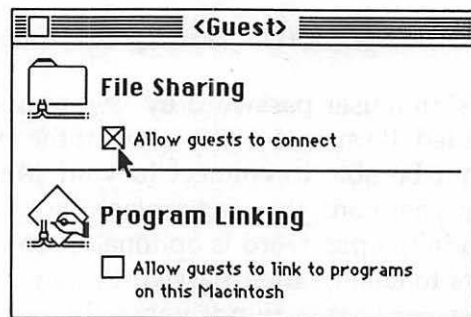
Figure 11-17. Guest access privileges

To deny guest access to your Mac, click the **Allow guests to connect** option, which removes the checkmark. Clicking this box again will turn on guest access. You can also turn the Program Linking feature on or off in this window. A checkmark in the box indicates the feature is on.

Sharing selected items

After you've established your list of registered users and groups, you're prepared to share selected items and set access privileges for each of

them. To share an item, first click the folder or disk to select it, and then choose the Sharing command from the Finder's File menu. If you have not already turned on file sharing in the Sharing Setup control panel, a dialog box will prompt you, as shown below in Fig. 11-18.

⚠ **Folders can not be shared until file sharing is turned on using the Sharing Setup control panel. Do you want the control panel opened now?**

Cancel   OK
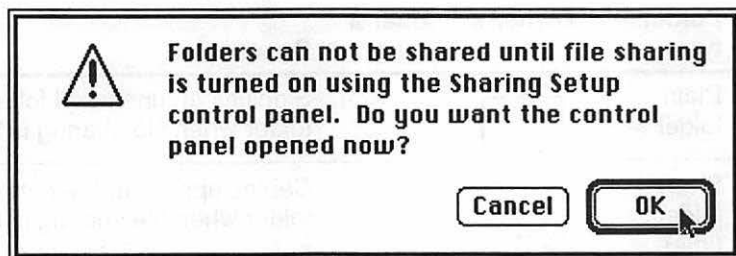
Figure 11-18. Prompting dialog to turn on file sharing

Click **OK** to automatically open the Sharing Setup control panel. After turning file sharing on (as described earlier in Fig. 11-7), close the Sharing Setup window and reselect the item you want to share. Return to the File menu and choose **Sharing**. The Access Privileges window will open automatically, as illustrated in Fig.11-19. To activate sharing for the selected item, you must click the **Share this item and its contents** checkbox.
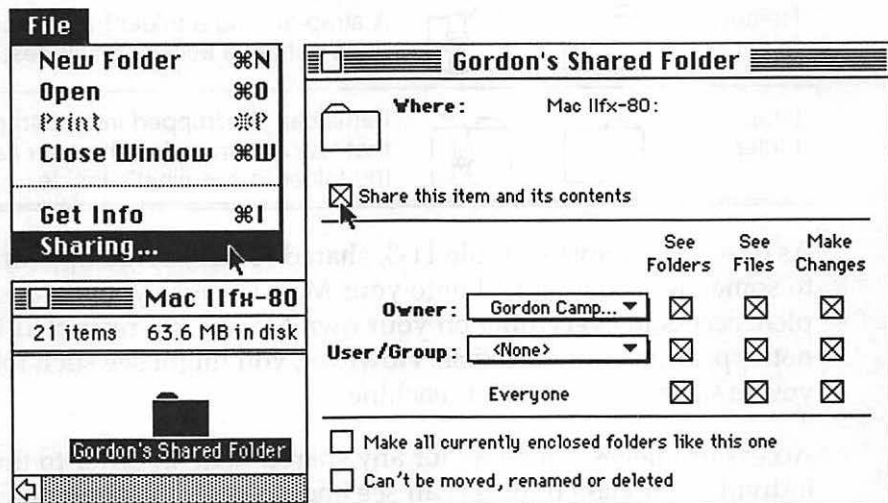
Figure 11-19. Sharing an item and the Access Privileges window

Shared items

After you close the Access Privileges window, sharing is activated for the designated folder and users will be able to connect to your Mac. When a

folder is shared, the appearance of its icon changes, as illustrated below in Table 11-3.

Table 11-3. Folder icons with file sharing

Folder type	Owner's view	User's view	Description
Plain folder			Signifies an unshared folder, or a shared folder when file sharing is turned off.
Shared folder (idle)			Cables appear at the bottom of a shared folder when file sharing is turned on. Folders contained inside a shared folder do not have cables.
Tabbed folder			A tab appears at the top of folder to signify ownership. The same folder will appear without the tab on a user's machine.
Shared folder (in use)			When a user signs on to a shared folder, faces appear inside the icon. To the user, all shared volumes appear as a file server icon.
Restricted folder			A strap around a folder indicates the user does not have access privileges.
Drop folder			Items can be dropped into a strapped folder that has an arrow, but the user can't open the folder to see what's inside.

As described above in Table 11-3, shared folders could appear differently to someone who is signed onto your Mac. Because you always have complete access to everything on your own Macintosh, restricted folders will not appear on your hard disk. However, you might see such folders when you're signed onto another machine.

Access privileges can be set for any shared item in order to limit what an individual or class of users can see and do with the contents. In the next section, we'll describe how to set access privileges and the effect it has on how folders appear to a user.

Access privileges

You can set access privileges for any shared item on your own Mac or for folders that you own on another computer. When you first share an item, all access-privilege boxes are checked, as shown below in Fig. 11-20.

		See Folders	See Files	Make Changes
Owner:	Gordon Camp... ▼	☒	☒	☒
User/Group:	‹None› ▼	☒	☒	☒
	Everyone	☒	☒	☒

Figure 11-20. Initial access privileges

You can turn any access privilege on or off by simply clicking the checkbox. An X in a box indicates the privilege is turned on. Different access levels are available, corresponding to the user class—Everyone, Owner, and User/Group. At each level, you can change their ability to see folders, see files, or make changes to the contents of a shared folder.

Who can share an item

A shared item might be used by its owner, by an individual registered user, by a designated group of users, or by a guest. System 7's file sharing provides for three classes of users:

> **Owner**   The owner of an item is typically the person who created it, unless he has delegated ownership to someone else. The owner is the only person who can change access privileges. If someone else owns a folder on your Mac, you can always see and change anything, including access privileges.
>
> **User/Group**   Generally refers to a single user or a group that the owner has designated to use the folder. The user or group must already exist on the Mac where the folder resides.
>
> **Everyone**   Refers to anyone who can connect to the Mac that is sharing the item. This includes any registered user or a guest.

As the owner of an item, you could assign ownership to someone else by entering their name in the **Owner** box. If you're the owner of a folder on someone else's Mac, you'll need to key in the name. However, to change

ownership on your own Mac, you can select a name from a pop-up list, as shown below in Fig. 11-21.
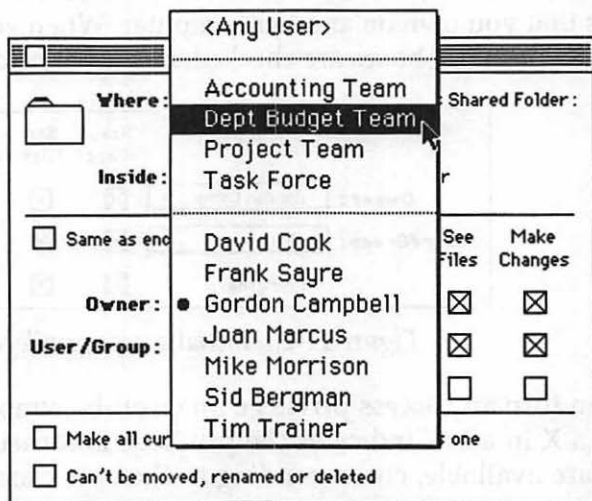
Figure 11-21. Assigning ownership with the pop-up list

In a similar fashion, you can assign access privileges to a specific individual or a group using another pop-up list. User/Group privileges can be assigned to only one group or one person. If you want to share items with a different group or individual, create another folder and assign him user privileges.

What a user can see or do

For each class of user, you can grant specific access privileges that affect the contents of the folder.

See Folders Allows users to see the folders contained inside a shared folder. When this option is turned off, contained folders will be invisible to the user.

See Files Allows users to see files that are stored inside a shared folder. Without this privilege, files will be invisible and the user will not be able to open or copy them.

Make Changes Allows users to make changes within the shared folder. New items can always be added when this feature is turned on. However, a user can copy, delete, or change an item only if they have also been granted the ability to see files or see folders.

Other access-privilege checkboxes

The remaining checkboxes in the Access Privileges window provide convenient features that apply to all classes of users. When a folder is enclosed in a shared folder, three other checkboxes are available, as shown below in Fig. 11-22.
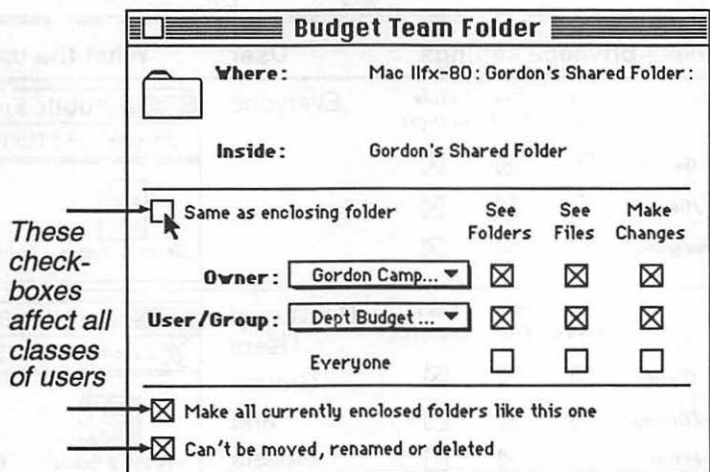
Figure 11-22. Other access privilege checkboxes

Clicking the checkboxes for these options has the following effect:

Same as enclosing folder   This folder adopts the same privileges that are currently in effect for the shared folder containing it. When this feature is turned on, user-class privileges are dimmed, meaning they cannot be changed. To make changes affecting only this folder, click the checkbox until the X disappears, which will allow you to alter any of the user-class privileges.

When you create a new folder inside this one, it will automatically adopt the same privileges.
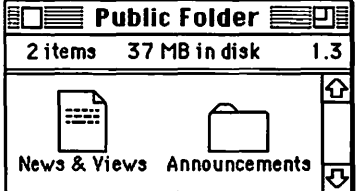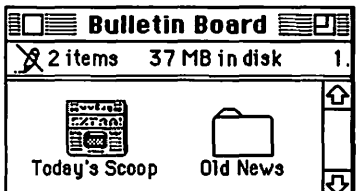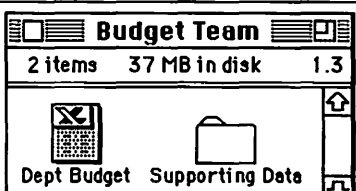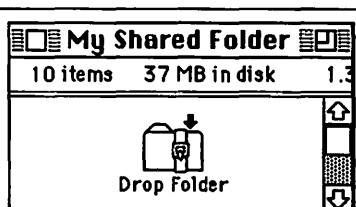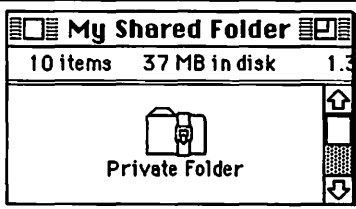
Make all currently enclosed folders like this one   Automatically causes all enclosed folders to adopt the same privilege set for the current folder. This feature can come in handy when you want to make all enclosed folders consistent with the current settings.

Can't be moved, renamed, or deleted   Prevents anyone from moving, deleting, or changing the name of this folder. Turn this option on to ensure a shared folder remains where you put it.

Common access-privilege settings

Although any combination of access-privilege checkboxes can be turned on or off, some configurations are more useful than others. Table 11-4 summarizes some commonly used techniques.

Table 11-4. Commonly used privilege settings

Access-privilege settings				User	What the user sees
Full access		See Folders	See Files	Make Changes	Everyone	**Public Folder** — 2 items, 37 MB in disk, 1.3 — News & Views, Announcements
	Owner:	☒	☒	☒		
	User/Group:	☒	☒	☒		
	Everyone:	☒	☒	☒		
Bulletin board		See Folders	See Files	Make Changes	Registered Users Groups and Guests	**Bulletin Board** — 2 items, 37 MB in disk, 1. — Today's Scoop, Old News
	Owner:	☒	☒	☒		
	User/Group:	☒	☒	☐		
	Everyone:	☒	☒	☐		
Group or individual access		See Folders	See Files	Make Changes	Assigned User or Group	**Budget Team** — 2 items, 37 MB in disk, 1.3 — Dept Budget, Supporting Data
	Owner:	☒	☒	☒		
	User/Group:	☒	☒	☒		
	Everyone:	☐	☐	☐		
Drop folder		See Folders	See Files	Make Changes	Registered Users Groups and Guests	**My Shared Folder** — 10 items, 37 MB in disk, 1.3 — Drop Folder
	Owner:	☒	☒	☒		
	User/Group:	☐	☐	☒		
	Everyone:	☐	☐	☒		
Private folder		See Folders	See Files	Make Changes	Registered Users Groups and Guests	**My Shared Folder** — 10 items, 37 MB in disk, 1.3 — Private Folder
	Owner:	☒	☒	☒		
	User/Group:	☐	☐	☐		
	Everyone:	☐	☐	☐		

Public folder   If guest access has been granted (see Fig. 11-17), then anyone on the network will be able to see, open, read, or change whatever is stored in this folder. On the other hand, if guest access is not on, only registered users and groups will have these privileges.

Bulletin board   This setting allows all people with access to your Mac to open and read the contents of the folder, but they won't be able to delete or change any items.

Group or individual access   This is the usual setting to restrict access to a specific person or group. Anyone who is not a member of the authorized user/group will not be able to open this folder. In fact, it will look like a private folder to anyone without access privileges.

Drop folder   A file or a folder can be copied to this folder, but no one except the owner can open it and examine the contents. It works just like a locked postal drop box. Once an item is dropped in the folder, it cannot be retrieved by anyone except the owner. A drop folder is a convenient method to receive items from others while maintaining complete privacy of the contents.

Private folder   Can be accessed only by the owner. Other users can't see the contents nor drop items into this folder. This setting is used primarily when you create a personal folder on someone else's machine. On your own Mac, not sharing a folder accomplishes the same thing.

Knowing what privileges you have on another Mac

While signed onto another network computer, you might attempt to open a folder where your access privileges are limited. If you can't open the folder, a warning message will appear, as shown below in Fig.11-23.

> The folder "Budget Team" could not be opened, because you do not have enough access privileges.
>
> **OK**
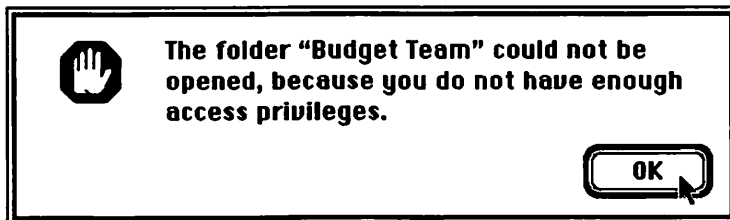
Figure 11-23. Warning message indicating you can't open the folder

To determine exactly what your access privileges are for a particular folder, select its icon and choose the **Sharing** command from the Finder's

File menu. The Access Privileges window will open automatically, as illustrated below in Fig. 11-24.
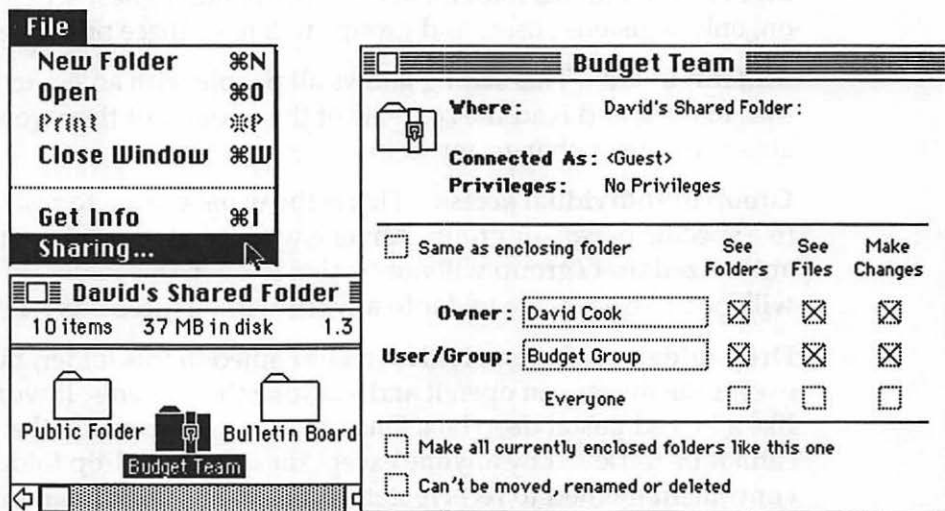
Figure 11-24. Access Privileges window for a shared folder on another Mac

The window lists all of your privileges for the selected folder, and displays the name you used to connect. The user-class section is dimmed, indicating you can't make any changes. However, you can see the owner and group names. In this example, you signed on as a guest, which limits your access to certain items, such as the Budget Team folder. If you sign off by dragging the server icon to the Trash and then connect using your registered user name, your access privileges might be different.

For shared folders that you are able to open, small icons in the upper left corner below the title bar provide a quick reference indicating the privileges you do *not* have, as illustrated below in Fig. 11-25.
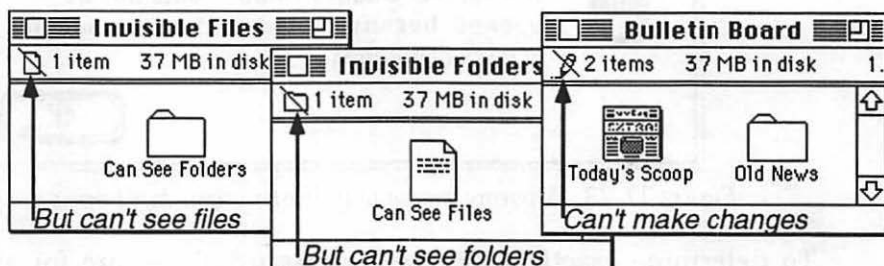
Figure 11-25. Access limitation icons in a shared folder

Managing file sharing

System 7 offers a significant number of options that allow you to tailor file sharing to your specific needs. You could choose to share everything on your Mac or limit access to a select group of users and folders. You might even decide to leave file sharing turned off until you have a specific need to share something. With sharing turned on, however, System 7 offers another feature that allows you to monitor sharing activity.

File Sharing Monitor

The File Sharing Monitor control panel provides a quick view of who is signed onto your Mac and the items currently being shared, as shown below in Fig. 11-26.
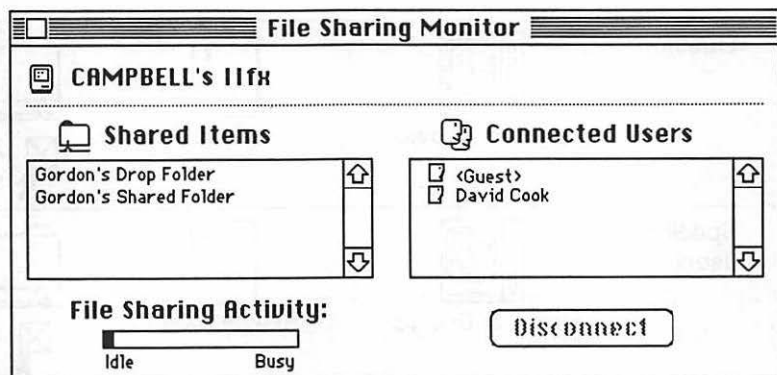
Figure 11-26. File Sharing Monitor control panel

Only the top layer of folders or disks are displayed in the Shared Items scroll box. Folders and files nested inside these items are not displayed, but they do affect sharing activity. The bar located in the lower left part of the window indicates the current level of activity on your Mac. When someone makes changes to a shared item or copies a file, the sharing-activity level might increase. You might also notice a small set of arrows flash in the menu bar adjacent to the icon whenever someone is accessing your Mac. This is a normal indicator of file-sharing activity, for both System 7's file sharing and access to a dedicated AppleShare server.

In addition, the File Sharing Monitor provides a quick method to disconnect a specific user. Simply select the user name and click the **Disconnect** button. As described earlier (see Fig. 11-9), a series of dialog boxes will ask you to specify the number of minutes until the user is disconnected.

Quick guide to access control

With the number of options available, file sharing might at first seem a little confusing. However, there are some quick methods to control access to your Mac, as summarized below in Table 11-5.

Table 11-5. Quick guide to access control methods

To control access by	Control Panel	Select this option to control access to all shared folders	Access control
All users	Sharing Setup	**File Sharing**	Start / Stop
Guests	Users & Groups / <Guest>		**File Sharing** ⊠ Allow guests to connect
Specific users	Users & Groups / Reggie User		**File Sharing** ⊠ Allow user to connect

To quickly prevent access to all shared folders on your Mac, use the following steps:

To disconnect all users   Open the Sharing Setup control panel and click the **Stop** button in the File Sharing section.

To disconnect guests   Open the Users & Groups control panel and click the **Allow guests to connect** checkbox to remove the X.

To disconnect a specific user   Open the Users & Groups control panel, double-click the user's icon and click the **Allow user to connect** checkbox to remove the X.

Of course, any of the above steps can just as easily be reversed to enable a specific user, guest, or all users to access the items you have designated as shared on your Mac.

Managing shared folders and files

While System 7's file sharing opens a whole realm of new ways to exchange information with others, it also introduces additional responsibilities to manage items stored in shared folders.

Organization Because other users are sharing your workspace, files should be stored in folders that are organized and labeled in an easily understood fashion.

Privileges It's important to understand that access to a particular file can be controlled only by the privileges granted for the folder containing it. Avoid placing confidential information in a file shared by someone that shouldn't see it.

Housekeeping on your Mac Some items in your shared folders might belong to others. Although you have complete control over all items stored on your Mac, you might consider notifying other users before deleting a shared file.

Housekeeping on another Mac When you create a shared folder on someone else's Mac, avoid abusing the privilege by deleting items that are no longer needed and keeping files and folders organized.

Regular backups Because other users might be depending on information stored on your Mac, routine backups become even more important.

Other network management issues

As System 7's new file-sharing capabilities gain acceptance, network usage is likely to increase, raising the importance of some related issues:

Network traffic As files are accessed or copied between Macs, the volume of traffic could increase and affect the performance of other network tasks, such as printing. You should be aware of this and work with your network administrator to resolve problems.

Security Although System 7 provides various methods to protect access and maintain confidential information, it's up to each user to ensure that these techniques are properly employed. Learning how these techniques work is the first step toward appropriate application.

Virus protection Safe computing practices become even more vital with the opportunity for many users to access your Mac. Protect your Mac with one of the many good antiviral programs.

Program linking

In chapter 9 we described how some System 7 savvy application pairs use program linking to extend the features of each program in a complementary fashion. For example, Shana's Informed Manager can be linked to Softsync/BLOC's Accountant, Inc. These links can be established on a single Mac or between two Macs over the network. In this section, we'll examine the steps required to set up program linking on the network.

There are three steps to set up your Macintosh so other users can link to your programs.

Turn on Program Linking   with the Sharing Setup control panel.

Identify applications   you want to share using the Sharing command on the File menu.

Grant user permissions   to link to your programs from the Users & Groups control panel.

Like file sharing, program linking is a two-way street. You can link to other user's programs and they can link to your programs. However, both programs must have linking capabilities for this feature to work. Although few applications currently support program linking, more will become available as software vendors enhance applications to be System 7 savvy and use Apple events that enable programs to talk directly.

Enabling program linking

To start up program linking, open the Sharing Setup control panel and locate the **Start** button in the section at the bottom of the window. Click the button to turn on program linking, as shown below in Fig. 11-27.
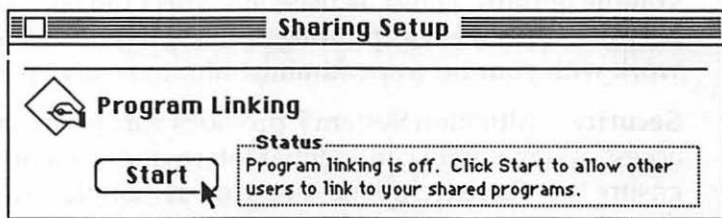
Figure 11-27 Activating program linking in the Sharing Setup control panel

When linking becomes active, the button will change to Stop. To turn program linking off, simply click the **Stop** button.

Selecting applications for program linking

After starting up program linking, you must also activate linking for each application that you intend to share over the network. Select a program icon and choose **Sharing** from the File menu, as illustrated in Figure 11-28.
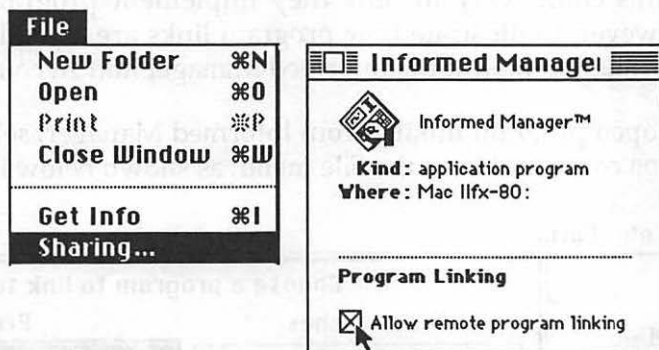
Figure 11-28. Program Linking window for an application

Click the **Allow remote program linking** checkbox to activate linking for the selected application.

Allowing other users to link to your programs

Finally, you must specify which network users are allowed to link to your programs. You can allow everyone to link or only selected users.

Open the User & Groups control panel. If you want any network user to be able to link to your programs, double-click the <Guest> icon and click the **Allow guests to link to programs** checkbox, as shown in Fig. 11-29.
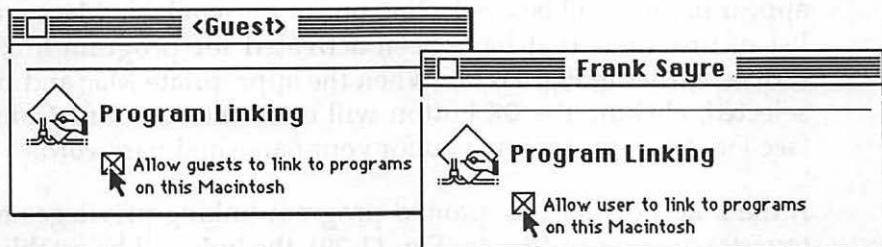
Figure 11-29. Turning program linking on

On the other hand, if you prefer to limit program linking to specific users, select each person's icon, double-click to open the User Information window, and click the **Allow user to link to programs** checkbox.

Linking to other programs

As described earlier in chapter 9, program-linking standards are being developed by software developers such as Shana and Softsync/BLOC. Because this is an emerging technology and not yet standardized, programs could vary in how they implement program-linking features. However, to illustrate how program links are actually established, we'll take another look at the Informed Manager and Accountant, Inc. pairing.

To open program linking from Informed Manager, select the **Link to Application** command from the File menu, as shown below in Fig. 11-30.
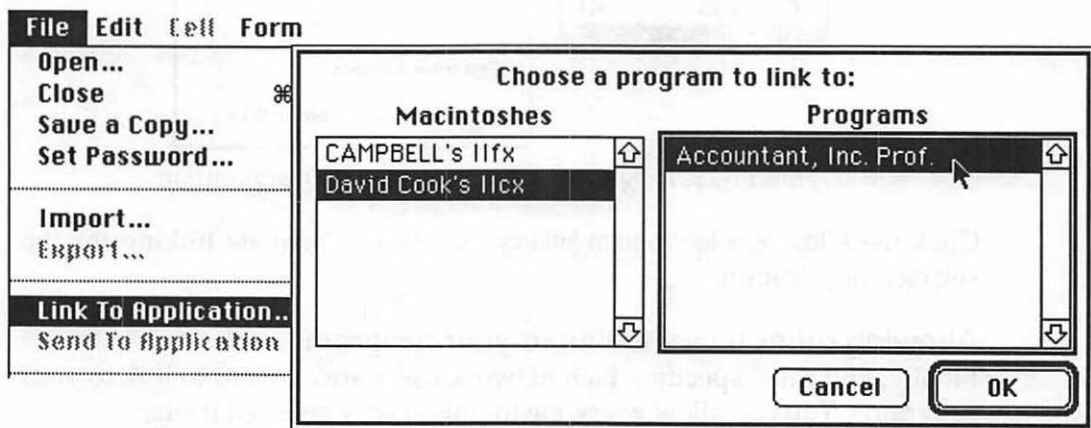
Figure 11-30. Program Linking dialog box

A dialog box opens with a list of Macintoshes on the left and programs on the right. Only Macs with program linking turned on (see Fig. 11-27) will appear in the scroll box. Selecting one of the available Macs will display a list of programs that have been activated for program linking (as described earlier in Fig. 11-28). When the appropriate Mac and program are selected, clicking the **OK** button will open the standard Connect dialog (see Fig. 11-4), prompting you for your name and password.

If the Mac's owner has granted program-linking privileges to everyone (guests) or you specifically (Fig. 11-29), the link will be established. What appears next will depend on how the software developers have implemented program linking. In the Informed Designer and Accountant, Inc. illustration, two more dialog boxes display lists of fields that need to be linked. These dialog boxes are shown in chapter 9 (Fig. 9-11).

Like Publish and Subscribe, program linking provides a technique for two applications to share information in an easier fashion than traditional copy-and-paste methods. However, because program linking is based on custom Apple events, information can be transferred directly between programs rather than requiring an intermediate step, such as the edition file used by Publish and Subscribe.

Once links are defined for a specific use, they can perform automatic data transfers behind the scenes. For example, Shana's Informed Manager uses the links defined with their Informed Designer package to send data to the Accountant, Inc. program. When a product number is entered into an invoice form, Informed Manager automatically sends it to Accountant, Inc., which then looks up and returns additional information such as a product description, price, and the quantity available from inventory, as shown below in Fig. 11-31.
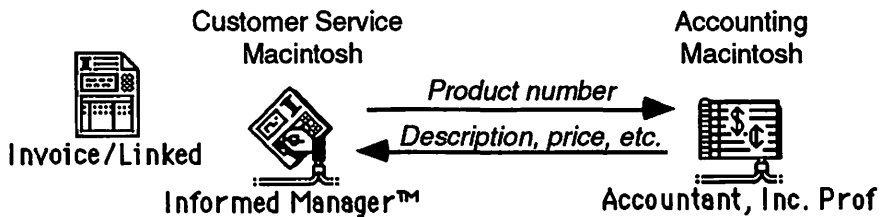
Figure 11-31. Program-linking example

With System 7's program linking, the connections are made across the network. For example, the invoice information could be entered on a Mac in the Customer Service department, while the product information is stored on another Mac located in the Accounting department.

This technique offers great promise when applications software works on Macintoshes connected over the network. However, many organizations maintain certain key information in databases located on other platforms, such as mainframe and minicomputers. If that's the case, System 7 offers another new feature to aid in extracting data and transferring it to a Macintosh, where you can apply powerful analysis and presentation tools.

Data Access Language

With System 7's integration of the Data Access Manager (DAM) and Data Access Language (DAL), information located on minicomputers, mainframes, and file servers is more easily accessible. Historically, it has been

difficult for knowledge workers to access this data without direct assistance from MIS professionals, who typically had to wire together several hardware and software components to make it work.

DAM provides the foundation for easier data access by offering a consistent method to retrieve information from any database management system (DBMS) that supports SQL (Structured Query Language). Although it might still require a professional to initially create an SQL query, you could launch the process with a simple command from an application that supports DAL features. DAM and DAL make it easier for software developers to include this capability in a program and for MIS professionals or experienced users to create the accompanying scripts.

What's needed for DAL
Although System 7 includes the basic system extensions for DAL, you'll need several additional components to make it work:

> **Applications software** At a minimum, you'll need a program like Microsoft Excel 3.0, which supports DAL. Other programs, such as Andyne's Graphical Query Language (GQL), provide a more flexible and user-friendly method of customizing queries once the initial database structure is defined.

> **DAL on the host computer** The computer that houses the data must also have DAL software to interpret requests and pass them along for processing by the DBMS.

> **Host connections** As described earlier in chapter 10, your Mac needs hardware and software links so that it can communicate with the host computer.

Even with all of these components in place, you still need a query script that's been customized for the particular database containing the information you want to access.

Query documents
Applications that support DAL rely on query documents to process and retrieve mainframe data. A query document is a special file containing the DAL script that is sent to the host computer for processing your request. Writing a DAL script requires knowledge of both the SQL language and the structure of the particular DBMS database you want to access. Typically, such scripts are written by an MIS support person.

Scripts can be written for a very specific purpose such as extracting a pre-defined set of records, or in more general fashion that allows you to qualify the request at the time you issue it. Programs like Andyne's GQL, Brio Technology's DataPrism and DataPivot, and Fairfield Software's Clear Access help to make it easier to extract information from the host.

For example, Andyne's GQL provides a user-friendly point-and-click interface to launch queries. Results are presented in a familiar tabular format, as shown below in Fig. 11-32.
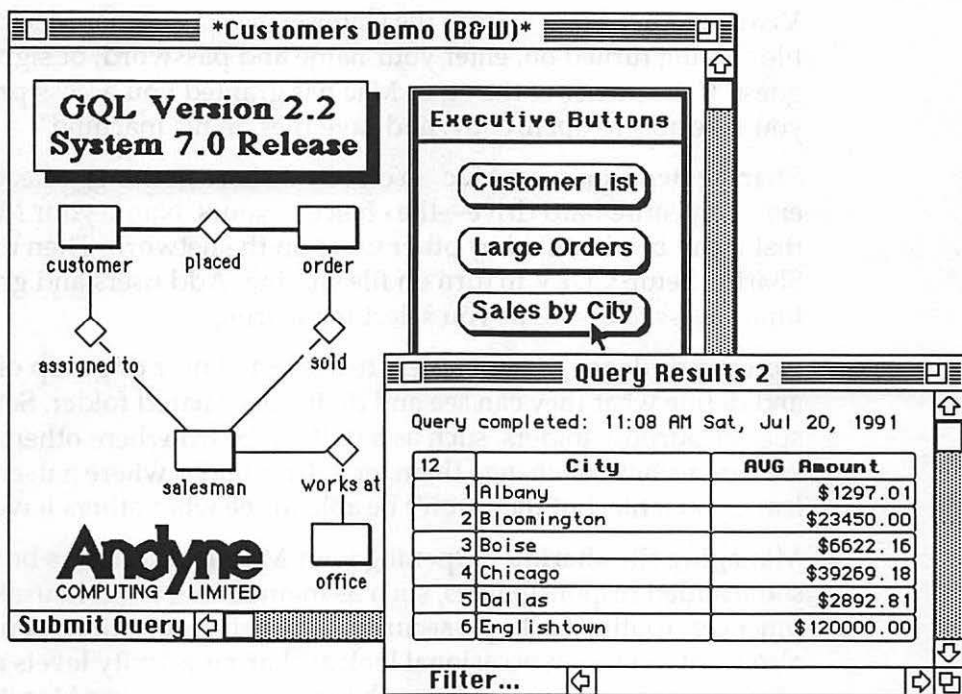
Figure 11-32 Andyne's GQL provides user-friendly access to DAL

GQL offers some basic tools to analyze the results of a query, such as sorting lists, averaging, and summing numerical data. However, data can also be published to a spreadsheet like Microsoft Excel or Claris Resolve for more sophisticated analysis and graphical presentation.

GQL's real power lies in its ability to conceal the arcane SQL language and allow users to customize queries once the database structure has been defined. Separate modules help an MIS support person to prepare the required definitions, allowing the user to concentrate on his queries.

Summary

In this chapter we've taken an in-depth look at System 7's new networking features, which are destined to extend your reach beyond the desktop. Some of the highlights include:

Connecting to the network You can choose from built-in LocalTalk or optional EtherTalk or TokenTalk for easy access to other Macs as well as minicomputers and mainframes.

Visiting other Macs From the Chooser, select another Mac that has file sharing turned on, enter your name and password, or sign on as a guest. If the owner of the other Mac has granted you access privileges, you'll be able to open, copy, and save files on his machine.

Sharing items on your Mac You could share nothing, selected folders or an entire hard drive—the choice is yours. Name your Mac so that it can be identified by other users on the network. Then use the Sharing Setup CDEV to turn on file sharing. Add users and groups to limit access to the items you select for sharing.

Access privileges Grant access to a selected user or group of users, and define what they can see and do in each shared folder. Set up special-purpose folders, such as a bulletin board where others can read items but not change them, or a drop folder where a user can leave you a file, but they won't be able to see what others have left.

Managing file sharing Opening your Mac to other users brings some added responsibilities, such as maintaining good housekeeping practices, routine backups, security, and virus protection. You might also want to take an occasional look at sharing-activity levels and who's signed on to your Mac with the new File Sharing Monitor.

Program linking Certain new System 7 savvy applications can use this feature to exchange information, such as requesting a program located on someone else's Mac to perform a task and return the results to your machine.

Data Access Language DAL and DAM are built into System 7, providing a consistent framework for accessing data stored in relational DBMS files on a mainframe, minicomputer or server.

System 7's new networking features offer the basic tools to span the gap between islands of computing, bringing Macintosh users closer together.

Future cruises on the AMS7—
More fun ahead

Although System 7 represents the most dramatic set of improvements since the original 128K Mac was introduced in 1984, it is by no means the end of the story. System software evolves and grows over time, sometimes in major steps like System 7.0, but more often as smaller incremental improvements.

In our final chapter, we'll take a brief look at some of the improvements that might be added to System 7. Some of these are speculative, while others are based on announcements made by Apple during the months since System 7.0 was introduced in May 1991.

System software release numbering

Before we begin to describe specific enhancements, it might be helpful to understand how software releases are typically numbered. You can generally determine something about the type of enhancement by looking at the release version number. For example:

> **Minor release**   System 7.0.*x* could signify a minor change, such as an upgrade to support new hardware or to fix known problems. System 6 had several releases of this type.

> **Feature release**   System 7.*x* might be reserved for a release that adds one or more significant new features. Of course, any new release can also include bug fixes or support for new hardware.

> **Major release**   System 8.0 would signal a major new set of features. These changes, however, might not be quite as dramatic as the ones introduced with System 7.0, which is generally regarded as the most significant change in Mac system software since its inception.

Of course, only Apple will ultimately determine how they choose to number new versions of the Mac's operating system. As we write this final chapter, we expect version 7.0.1 will be released with Apple's new hardware platforms, sometime before the end of 1991. When it is released, it's likely that Apple will indicate whether users of other Mac models should upgrade to the new version or remain with System 7.0. Typically, this will

depend on whether the release includes any improvements that would benefit other users, or if it is strictly intended to support new hardware.

Announced enhancements

During the months since System 7's initial release, Apple has made a few official announcements concerning future upgrades to the Mac's operating system software.

Dirty ROM fix—MODE32

As described earlier in chapter 2, some Macintosh models (SE/30, IIx, IIcx and II with PMMU) were limited by early ROM chips that do not support 32-bit operation. This meant that owners of these models could not use more than 8Mb of physical memory (RAM) and were limited to 14Mb of virtual memory under System 7.

Connectix Corporation's MODE32 described in chapter 2 is a control panel device that fixes the problems of dirty ROM chips. In September 1991 Apple announced it had licensed MODE32 and intended to distribute it widely for use by Mac owners of the affected models. They also announced that a future release of system software would incorporate capabilities similar to MODE32.

MODE32 allows Macintosh IIx, IIcx, and SE/30 models to access up to 128Mb of physical RAM with System 7 and Mac II models up to 72Mb, as well as extending virtual memory to the same 1Gb available on the IIsi, IIci, and IIfx. Until these features are integrated into a new release of System 7, Apple indicated they will make MODE32 available at no charge through Macintosh resellers, user groups, and certain bulletin-board services such as AppleLink, America Online, and CompuServe.

Adobe Type 1 support

Although System 7 includes TrueType, Apple has also announced their intent to incorporate support for Adobe Type 1 font technology in a future release of system software. As described earlier in chapter 7, Adobe's ATM software can produce results similar to TrueType. ATM requires separate Type 1 outline font files and at least one bit-mapped size for each family.

System 7.0 already allows use of both ATM version 2.0 and TrueType, provided you also have the ATM software and some Type 1 fonts. Under

the planned agreement with Adobe, Apple expects to incorporate the Type 1 rasterizer directly into future systems software. We expect this to minimize the potential for conflicts between the two font technologies and make it easier for users to enjoy the benefits of both.

Until Type 1 technology is integrated with system software, Apple expects to make the ATM rasterizer and some Type 1 fonts available to purchasers of Macintosh systems and printers through an interim offer. As of this writing, however, they have not yet announced any specific details of the offer.

Printing enhancements
New printer drivers for the Personal LaserWriter LS and the StyleWriter were released in August 1991. The new drivers are designed to improve printing speeds for both graphics and outline fonts on these printers.

Potential enhancements

When System 7 was originally announced in 1989, it included some features that were eventually postponed to a later release. While Apple typically does not comment on these type of enhancements, some have been widely discussed in popular Macintosh publications.

QuickTime
Of all the potential system extensions, QuickTime is perhaps the most exciting. QuickTime adds motion, or so called time-based events, to the Mac's vocabulary. Just as System 7 includes the ability to copy and paste sounds, this new extension will add video or animated sequences to a document. Imagine a presentation or memo that includes one or more 10-second video clips to emphasize or illustrate an important point. Or better still, imagine your favorite magazine published in an electronic form that includes animated sequences of the "how to" sections.

Adding video and sound capabilities that will run on any color Mac is a major step forward. QuickTime includes sophisticated new techniques for compressing and decompressing digitized images that would otherwise be too large to fit on anything but a CD-ROM disk. The amount of storage space required depends on several factors, including the compression ratio, image size, color depth, and the number of frames per second (fps). For example, 10 to 20 seconds of compressed video might consume one megabyte (Mb) of disk space.

An audio/video sequence is called a *movie* in QuickTime parlance, which can contain one or more tracks of *media* information. Media can be sound, video, or a sequence of images. To create your own movies, you'll need special hardware and software to capture images from a video source, such as a video camera, VCR, or video laser-disc player. However, playing back a prerecorded movie should be possible on just about any color Macintosh, although image quality might vary because decompression is dependent on the speed of the processor.

AppleScript
As described earlier in chapter 9, a standard scripting language is needed to more fully realize the promise of IAC. It has been rumored that Apple-Script is under development and might possibly be included in some future release of system software.

Messaging engine
Originally called AppleMail, this feature could provide message handling capabilities based on newly defined Apple events. Incorporating message store and forward capabilities in system software would establish a standard that could be used by software developers to enhance existing products and perhaps develop entirely new applications. While e-mail packages might be the obvious candidates for using this technology, many other products will benefit, such as collaborative application pairs, groupware, and even DAL software for accessing mainframes.

Summary

System 7 offers the most significant set of new features since the Mac was originally introduced in 1984. From one perspective, it represents the culmination of a major effort that began in 1988. Yet, from another viewpoint, it is the beginning of a new era for the Macintosh. Software developers are just starting to tap the potential of new system features like networking and IAC. While they are busy exploring new ways of applying these technologies, Apple's system software engineers are also at work with the next generation of innovations.

QuickTime and other system enhancements will provide the tools for developers to create even more dramatic advancements. And in an era when changes seem to occur at a blinding pace, perhaps *QuickTime* is even more symbolic of a term than might have been intended by those who coined it.

Hardware upgrades

Apple estimates that 40% to 50% of installed Macs are System 7 ready and most of the remaining units need only a memory upgrade. System 7 requires a minimum of 2Mb of RAM, a hard disk drive, and at least a Mac Plus model. If your Mac fits these specs, you should be able to install System 7 today. On the other hand, if your Mac is not quite up to these minimums, you'll need to upgrade your hardware before you can begin working with System 7.

Even after installing System 7, you might find you'd like to enhance your hardware configuration. By upgrading certain components, you can take advantage of more System 7 features, or simply improve your productivity. There are four types of upgrades to consider:

Memory   Installing additional RAM is the easiest and least costly way to enhance your Mac. With more memory you can concurrently open more applications with System 7's full-time MultiFinder. Also, some applications perform better if you increase the amount of memory allocated to them.

Hard disks   System 7 won't run from a floppy disk, so you need to have at least one hard disk drive. If you intend to use virtual memory (VM), plan on reserving a significant chunk of hard disk space—equivalent to physical memory plus VM. Also, there is a growing trend among software developers to create large applications that quickly eat up disk capacity.

Model upgrades   For some Mac models, Apple offers upgrade kits that replace the motherboard and possibly the floppy drive. Some of these upgrades include the appropriate chips to take advantage of System 7's virtual memory and 32-bit mode.

Accelerators   You can boost the performance of your existing Mac by adding a card that might include a faster CPU chip or special high-speed memory (cache). However, this won't necessarily overcome the limitations of Apple's proprietary ROM chip in older Macs unless you also add software like Connectix's MODE32 or Virtual.

Memory upgrades

Table A-1 indicates possible memory configurations for each model. Memory upgrades can be obtained from Apple or from third-party suppliers. Faster chips (lower ns values) can be used in low-end Mac models, but not the reverse. Although 16Mb SIMMs are becoming available, Apple has not yet indicated compatibility with these models.

Table A-1. Memory configurations

Model	RAM soldered on board (Mb)	Basic Apple config's (Mb)	Number of SIMM Slots	Possible SIMM sizes	Physical RAM configurations (Mb)	Req'd RAM speed (ns)
Mac Plus	0	1	4	256K, 1Mb	1, 2, 2.5, 4	150
Mac SE	0	1	4	256K, 1Mb	1, 2, 2.5, 4	150
Classic	1	1, 2	2*	256K, 1Mb	2, 2.5, 3, 4	150
Portable	1	2, 4	0	Expansion card†	1, 2, 3, 4, 5, 6, 7, 8, 9	100
Mac LC	2	2, 4	2	1Mb, 2Mb, 4Mb	2, 4, 6, 10	100
Mac II	0	1	8	256K, 1Mb	1, 2, 4, 5, 8	120
SE/30	0	2, 4	8	256K, 1Mb, 4Mb	1, 2, 4, 5, 8, 16, 17, 20, 32	120
Mac IIx	0	1	8	256K, 1Mb	1, 2, 4, 5, 8	120
Mac IIcx	0	1	8	256K, 1Mb, 4Mb	1, 2, 4, 5, 8, 16, 17, 20, 32	120
Mac IIsi	1	3, 5	4	256K, 512K, 1Mb, 2Mb, 4Mb	1, 2, 3, 5, 9, 17	100
Mac IIci	0	5	8	256K, 1Mb, 4Mb	1, 2, 4, 5, 8, 16, 17, 20, 32	80
Mac IIfx	0	4	8	1Mb, 4Mb	4, 8, 16, 20, 32	80

Notes: *Requires a memory expansion card available from Apple.
†Third-party expansion cards available up to 8Mb.

Hard disk drives

Most third-party suppliers provide their own utility software, which is used to initialize the drive and establish basic performance characteristics. System 7 requires certain updates to this software so it can function properly. Be sure you can obtain a System 7 compatible version of the software, as indicated below in Table A-2. Later versions might be available when you read this.

*Table A-2. Hard disk driver utilities**

Drive vendor	Utility software	Req'd for S/7	Req'd for VM
Alliance Periferal Systems	Alliance Power Tools	1.1⇧	2.0
Apple Computer	Apple HD SC Setup	7.0	7.0
Club Mac	SCSI Director	1.65⇧	1.65⇧
CMS Enhancements	CMS SCSI Utilities	6.0⇧	6.1
DJK Development	SCSI Director Prof.	1.6⇧	1.6⇧
Ehman	HDD Formatter	3.0⇧	3.4
GCC Technologies	Drive Manager	7.0	7.0
HDI/Wholesale 54	Disk Manager Mac	2.24	2.24
Jasmine Technologies	DriveWare	1.77⇧	1.77⇧
La Cie	Silverlining	5.3	5.3
Liberty	FormatterOne	3.27	3.4
Mass Microsystems	PadLock	2.7⇧	2.7⇧
MicroNet Technology	MicroNet SCSI Utility	5.0⇧	5.0⇧
Microtech International	Microtech Utilities	3.0⇧	3.4
Mirror Technologies	MediaManager	1.36⇧	
Optima	DiskMount	2.4	2.4
Peripheral Land	Formatter	3.1	3.1
Rodime Systems	Rodime Driver Utility Cobra Driver Utility	2.1⇧ 1.1.0⇧	2.1⇧ 1.1.0⇧
Software Architects	Formatter One	3.0⇧	3.4
Storage Dimensions	MacinStor Installer	3.01⇧	3.01⇧
SuperMac	Manager	3.26⇧	4.2
Third Wave	Disk Manager Mac	2.24	2.24

*Source: MacWEEK 4/30/91 and 5/7/91.

Macintosh models

Table A-3 lists all Macintosh models as of June 1991. Some models are no longer offered by Apple, but might be available as used machines. Apple is also expected to introduce additional models during 1991, including a series of Notebook computers as well as new high-end models based on the Motorola 68040 CPU.

Table A-3. Macintosh models comparing features and prices

Model	CPU chip	Clock speed (MHz)	RAM	Floppy drive	Hard drive (Mb)	Built-in video	Apple list price	Approx used price
Mac 128K	68000	8	128K	400K	—	B&W	*na*	$250
Mac 512K	68000	8	512K	400K	—	B&W	*na*	$300
Mac 512Ke	68000	8	512K	800K	—	B&W	*na*	$400
Mac Plus	68000	8	1Mb	800K	—	B&W	*na*	$600
Mac SE	68000	8	1Mb	800K 1.4Mb	20 20	B&W	*na* *na*	$1,050 $1,200
Classic	68000	8	2Mb	1.4Mb	40	B&W	$1,499	$1,100
Portable	68000	16	2Mb	1.4Mb	40	B&W	$4,199	$2,350
Mac LC	68020	16	2Mb	1.4Mb	40 80	Color	$2,499† $2,999†	$1,550
Mac II	68020	16	1Mb	800K	—	—	*na*	$2,050
SE/30	68030	16	2Mb	1.4Mb	40	B&W	$3,369*	$2,150
Mac IIx	68030	16	1Mb	1.4Mb	—	—	*na*	$2,750
Mac IIcx	68030	16	1Mb	1.4Mb	— 40	— —	*na* *na*	$2,450
Mac IIsi	68030	20	3Mb	1.4Mb	40 80	Color	$3,769† $4,569†	$2,700
Mac IIci	68030	25	5Mb	1.4Mb	— 80	Color	$5,269† $5,969†	$3,200
Mac IIfx	68030	40	4Mb	1.4Mb	— 80	— —	$7,369‡ $8,069‡	$4,450

Notes: *Keyboard required for a complete system.
 †Keyboard and monitor required for a complete system.
 ‡Keyboard, video card, and monitor required for a complete system.

Accelerators

Apple and a number of third-party vendors offer upgrades or add-in boards that enhance the performance of a stock Macintosh. Table A-4 lists some selected products to consider.

Table A-4. Macintosh peformance upgrades

Manufact.	Product	For Mac models	CPU chip	Clock speed (MHz)	Static RAM cache	List price
Apple Computer	Mac Plus Upgrade	128K 512K 512Ke	68000	8	—	$1,098† $898† $599
	Mac SE/30 Upgrade	SE	68030	16	—	$999
	PMMU Chip	II			—	$499
	Mac IIci Upgrade	IIcx	68030	25	—	$1,499
	Mac IIci Cache Card	IIci			32K	$399
	Mac IIfx Upgrade	II, IIx	68030	40	—	$2,599
DayStar Digital	PowerCard 030	II IIx IIcx	68030	25 40 50	32K 32K 32K	$1,699 $2,199 $2,999
	Fast Cache IIci PowerCache IIci	IIci		25 40 50	64K	$379 $1,299 $2,299
Dove	MaraThon Racer	Plus, SE II, IIx SE/30	68030	16 32	32K 128K	$899 $1,599
Total Systems	Mercury 030 32-bit RAM module	128K 512K, Plus SE	68030	16		$785 $585 $436
	Gemini Classic	Classic	68030	20	—	$1,505
	Gemini Ultra	512Ke Plus SE	68030	20 25 33 40		$1,315 $1,745 $2,195 $2,295

Notes: †Includes floppy drive upgrade (400K->800K)

Products and developers

The following is a list of products that are mentioned in this book. Most of the information was extracted from the Compatibility Checker, including the latest versions that were reported by the developer to Apple as System 7 compatible. Information on products not found in the Compatibility Checker is from the developer or other sources.

Table B-1. Product and vendor listing

Product	Vers.	Developer	Phone No.
4th Dimension	2.1.1	Acius	408 252-4444
Aask		CE Software	515 224-1995
Accountant, Inc.	2.1	Softsync/BLOC	305 445-0903
Adobe Type Manager	2.01	Adobe Systems Inc.	415 961-0911
AntiToxin	1.5	Mainstay	818 991-6540
Apple CD ROM	1.0	Apple Computer Inc.	Apple dealer
Apple File Exchange	7.0	Apple Computer Inc.	Apple dealer
AppleLink	6.0.2	Apple Computer Inc.	408 974-3309
ATF Type Designer I™	1.4	Kingsley/ATF Type Corp.	602 325-5884
AutoSave II	2.0	Magic Software	800 342-6243
Backmatic	2.0	Magic Software	800 342-6243
Bitstream TrueType Fonts		Bitstream Inc.	617 497-6222
Canvas	3.0	Deneba Software Inc.	305 594-6965
CEToolbox	1.6	CE Software	515 224-1995
Claris CAD	2.0v3	Claris Corp.	408 727-8227
ClickChange	1.05	Dubl-Click Software Inc.	818-700-9525
ClearAccess	1.4	Fairfield Software	515 472-7077
DAM	7.0	Apple Computer Inc.	408 974-3309
DataClub™	2.0	International Business Software	408 522-8000
DataPrism/DataPivot	1.7	Brio Technology, Inc.	415 961-4110
DDE		Microsoft Corp.	800 426-9400
Disinfectant	2.5.1	Northwestern University	User groups
DiskTop	4.01	CE Software	515 224-1995
Extensions Manager	1.6	Apple Computer Inc.	Apple dealer
FastPath Manager II	5.3	Shiva Corp.	617 252-6400

Table B-1. Continued

Product	Vers.	Developer	Phone No.
FileMaker Pro	1.0v2	Claris Corp.	408 727-8227
Finder 7 Menus!		Adam Stein	201 549-0590
Finder Hack	1.0	Donald Brown/CE Software	515 224-1995
Fluent Laser Fonts		Casady & Greene	408 484-9228
Font/DA Mover	4.1	Apple Computer Inc.	Apple dealer
FontMonger™	1.0.1	Ares Software Corp.	415 578-9090
FontStudio	2.0	Letraset USA	201 845-6100
GateKeeper	1.5	Cayman Systems	617 494-1999
Gatorbox	1.0	Cayman Systems	617 494-1999
GeoQuery	2.0	GeoQuery Corp	708 357-0535
GOfer	2.0	Microlytics, Inc.	800-828-6293
GQL	2.2	Andyne Computing Ltd.	613 548-4355
Hand-Off II	2.2.0	Connectix Corporation	415 324-0727
Helium	1.0	Robert L. Mathews	User groups
HyperCard	2.1	Claris Corp.	408 727-8227
Informed Designer/Manager	1.1.1	Shana Corporation	403 463-3330
Inforum Conferencing	1.0	MacVONK•USA	215 660-0606
INITPicker		Microseeds Publishing Inc.	813 882-8635
Instant Update	1.0	ON Technology	617 876-0900
Just Click	1.01	TACTIC Software	User groups
Kingsley/ATF Classic Type		Kingsley/ATF Type Corp.	602 325-5884
Layout (for System 6)	1.9	Michael O'Conner	User groups
Linotype TrueType		Linotype-Hell Company	516-434-3079
MacDraw II	1.1v2	Claris Corp.	408 727-8227
MacPaint	2.0	Claris Corp.	408 727-8227
MacProject™ II	2.5v1	Claris Corp.	408 727-8227
MacWrite II	1.1v2	Claris Corp.	408 727-8227
MasterJuggler	1.16	ALSoft	713 353-4090
MAXIMA	2.0.0	Connectix Corporation	415 324-0727
Meeting Maker	1.0	ON Technology	617 876-0900
Metamorphosis™ Pro	2.02	Altsys Corp.	214 680-2060
MODE32	1.2	Connectix Corporation	415 324-0727
Monotype Imprints-TrueType		Monotype Typography Inc.	312 855-1440

Product	Vers.	Developer	Phone No.
Microsoft Excel	3.0	Microsoft Corp.	800 426-9400
Microsoft Mail	3.00a	Microsoft Corp.	800 426-9400
Microsoft Word	4.00D	Microsoft Corp.	800 426-9400
Microsoft Works	2.00b	Microsoft Corp.	800 426-9400
MyTimeManager	3.5	MacShack Enterprises	617 876-6343
Norton Utilities	1.1	Symantec/Peter Norton Group	800 441-7234
Now Utilities	3.0	Now Software Inc.	800 237-3611
On Location™	1.0.2	ON Technology	617 876-0900
PhoneNET		Farallon Computing Inc.	415 596-9100
PowerCard 030	4.0.2	DayStar Digital Inc.	800 962-2077
POWERicons™	1.1	Magic Software	800 342-6243
PowerPoint	2.01E	Microsoft Corporation	800 426-9400
Preview	1.5	Computer Applications	919 846-9811
Pyro!	4.0.1	Fifth Generation Systems	800 766-7283
QuicKeys	2.1	CE Software	515 224-1995
QuickMail	2.5	CE Software	515 224-1995
RagTime	3.1	RagTime USA	800 875-9632
Ray Dream Designer		Ray Dream Inc	415 960-0765
ReadingMaze	1.0	Great Wave Software	408 438-1990
ResEdit	2.1.1	APDA	800 282-2732
Resolve™	1.0	Claris Corp.	408 727-8227
Retrospect®	1.3	Dantz Development Corp.	415 849-0293
Rival	1.1.8	Microlytics, Inc.	800-828-6293
SAM	3.0	Symantec/Peter Norton Group	800 441-7234
Sound Manager	1.70c	Ricardo Ettore	User groups
STATUS*Mac	2.0	Pharos Technologies, Inc.	513 884-9273
Suitcase II	1.2.11	Fifth Generation Systems	800 766-7283
SUM II	2.0.2	Symantec/Peter Norton Group	800 441-7234
SunDesk	1.1	nOne Corp	User groups
System 7	7.0	Apple Computer Inc.	Apple dealer
		Prerecorded System 7 Q&A	408 257-7700
		Phone support @ $2 per minute	900 535-2775
Timbuktu/Remote™	2.0.1	Farallon Computing Inc.	415 596-9100

Table B-1. Continued

Product	Vers.	Developer	Phone No.
TOPS/Macintosh		Sitka Corp.	415 769-8711
TrueType INIT	1.0	Apple Computer Inc.	Apple dealer
Type Reunion	1.0.2	Adobe Systems Inc.	415 961-0911
UserLand INIT	1.0	UserLand Software Inc.	415 325-5700
User group clearinghouse		For name of nearest user group	800 538-9696
Virex	3.5	Microcom Software	919 490-1277
VIRTUAL	3.0.0	Connectix	415 324-0727
Wingz	1.1a	Informix	800 331-1763
Word Finder	2.6	Microlytics, Inc.	800 828-6293

Glossary

32-bit clean   A characteristic associated with certain programs that follow Apple's guidelines and do not alter the usage of address bits 25 through 32. One of several criteria by which applications are gauged System 7 friendly.

A

A/ROSE   Apple real-time operating system executive. A system extension used by certain NuBus coprocessor cards that requires true preemptive multitasking.

AMS 7   Acronym for Apple Macintosh System 7.

access privileges   The ability to see folders or files and make changes to a shared item on a file server. Privileges are granted by the owner, who determines what others can do with the shared item.

active application   The program currently operating in the foreground, as indicated by its icon in the application menu and an active window that appears in front of all others.

address   A method for locating information in computer memory. Early Macintosh system software used a 24-bit address. System 7 implements a wider 32-bit address that enables the use of more memory.

alias   A small file that substitutes for an original disk, folder, application, or document. Opening an alias locates the original, even if renamed or moved, and opens it. An alias filename is displayed in *italics*.

Apple event   A method for passing messages between applications. Apple and third parties are defining special protocols for specific types of events.

Apple Menu Items   One of S/7's designated folders inside the System Folder. Any item stored in this folder will automatically appear under the menu.

AppleShare   File server software that allows a computer to share its hard-disk drive with others on a network. Users can store and retrieve files, as well as share folders and applications.

AppleTalk   A protocol developed by Apple that enables devices to communicate over a network. AppleTalk works over LocalTalk, EtherTalk, and TokenTalk connections.

application program   Any software program that is launched from the Finder. In common usage, however, applications usually refer to full-function packages, such as a word processor or spreadsheet program. In contrast, certain specialized software is often designated a "utility program," such as Apple's Disk First Aid, which repairs damaged files.

Application menu   In System 7, or in older systems when MultiFinder is running, the application menu appears as a small application icon at the upper right corner of the screen. In either case, the icon will indicate the active application. System 7 includes a pull-down menu that allows the user to select, hide, or show open programs.

Apple menu   The left-most menu located under the symbol. Typically available from the Finder or from any application.

audio output jack   An output jack on the back of Macintosh computers that allows external speakers to be connected.

B

backup   To make an additional copy of a file or disk on another disk or tape. The backup copy then acts as a safety net if anything happens to your original, and allows you to revert to an earlier version.

background printing   A Chooser option that allows programs to print to a storage buffer instead of directly to a printer. This feature allows the Mac to be used for other tasks while printing takes place in the background.

Balloon Help   A help description used by pointing with the mouse in System 7. Balloon Help can be activated in System 7 friendly applications by clicking on the Balloon Help icon, which appears to the left of the Application menu.

bit   The smallest unit of measure understood by a computer. Usually represents the condition of an electronic element as either on or off.

bitmap   A grid of dots that make up a recognizable object when seen from the correct perspective.

bitmapped font   A family of characters (font) where each character is represented by a bitmap. *See also* outline font.

blessed folder   A folder containing both the System and Finder files that the Macintosh looks for during startup. The blessed System Folder will have a small Mac icon on it. *See also* System Folder.

bomb message   An icon similar to the one on the left will appear on the screen with a message like "Sorry, a system error occurred." When this occurs, attempt to save any work and then restart the Mac. This might involve physically turning the computer off before it will restart.

boot   To start up the computer. The boot procedure consists of just enough software stored in ROM to instruct the Macintosh to load the System and Finder from a disk drive.

Brightness CDEV   Controls brightness or contrast level on a Mac Portable. Not used on other Mac models.

byte   Unit of information containing eight bits, typically representing a single character (such as a letter, numeral, or punctuation mark).

C

CD-ROM   *See* compact disk

CDEV   *See* control panel device.

CPU   *See* central processing unit.

CRT   Cathode ray tube, usually called a TV screen or a computer monitor depending on the use.

cache   Special memory for fast access by the CPU. Some Macs support a cache card with very high-speed RAM chips that enable the Mac to perform faster.

calculate folder size   A feature of the Views CDEV that instructs the Finder to add up the sizes of all of the files contained in a folder and display it in a list view.

central processing unit (CPU)   The "brains" of a computer; the primary chip on the motherboard. Macs use one of the Motorola 68000 series chips (68000, 68020, 68030, or 68040).

Chooser   A desk accessory to select devices, such as a printer or a network file server. Also used to turn AppleTalk on and off.

Clear   A command that removes selected text, graphics, or sound. Cleared items can generally be rescued by the Undo command.

Clipboard   A place in memory where copied or cut text, graphics, or sound is stored so that they can be retrieved using the Paste command.

Color CDEV   Controls the background color used to highlight a text selection. Also controls the color and style of window frames.

command   An instruction to the computer to do something. Commands are typically given by clicking on menus or buttons with the mouse or by pressing command keys on the keyboard.

command key   ⌘ key on the Apple keyboard. Generally used in combination with other key(s) to perform an action, often equivalent to selecting a choice from a pull-down menu.

compact disk (CD-ROM)   An optical storage media for large quantities of data. Computer's CD-ROMs work the same way as compact disks for stereos. They are removable like floppy disks and can store 300Mb to 600Mb of information, comparable to a very large hard disk. Unlike hard disks, however, CD-ROMs cannot be modified; information can only be read from them.

control panel device (CDEV)   Programs in the Control Panels folder that set various system parameters. Typical CDEVs control items like the number of screen colors, mouse speed, and the information displayed by the Finder.

Control Panels folder   A special folder included in the System Folder that contains all of the active control panel devices (CDEVs).

⌘–C **Copy**   A command that makes a duplicate of the selected text, graphics, or sound and stores it in the clipboard file. *See* clipboard.

CPU   *See* central processing unit.

current startup disk   A disk volume containing the System Folder that is currently in use by the Mac. System 7 typically requires a hard disk to store all of the system files. Earlier versions of system software were small enough to fit on a floppy disk. *See also* Startup Disk CDEV.

⌘–H **Cut**   A command that makes a duplicate of the selected text, graphics, or sound, stores it on the clipboard, and then clears the original. *See* clipboard.

D

DA   *See* desk accessory.

DAL   *See* data access language.

DAM   *See* data access manager.

DTP   *See* desktop publishing.

Data Access Language (DAL)   A standard language protocol used by the Data Access Manager to connect Macs to mainframes and minicomputers.

Data Access Manager (DAM)   Provides a standard interface for applications to access data from nonMac computers such as corporate mainframes, minicomputers, and file servers.

database   A structured collection of information.

desk accessory (DA)   Small programs that perform useful functions to augment normal applications. Pre-System 7, DAs were accessible only from the Apple menu and were installed with the Font/DA Mover utility. With System 7, DAs can be located and accessed from any folder.

desktop   The Macintosh screen background. Menus, applications, and documents often block most of the user's view of the desktop.

desk top publishing (DTP)   The ability to produce high-quality documents with a desktop sized computer, such as the Macintosh.

device driver   A system program that tells the computer how to operate external devices like printers and communication devices.

dialog box   A special type of Macintosh window that displays messages and typically requires a user response. A dialog box might ask for items like the name of a file to load, what text to look for, or how many copies to print.

disk cache   A place in memory that is set aside to hold frequently accessed disk information. The purpose of the disk cache is to speed up the computer because memory access is faster than disk access.

disk capacity   Refers to the amount of information that can be stored on a magnetic disk. Hard disks typically store from 20Mb to 100Mb or more. Floppy disks hold 400K, 800K, or 1.4Mb.

disk drive   Device that holds and reads information from a disk. There are two varieties—hard-disk drives and floppy-disk drives.

document   A file that is created by an application. A document might contain information in the form of graphics, text, sound, or application settings.

download (v)   To send data from one computer to another computer, typically from a mainframe or minicomputer to a personal computer like the Mac.

drop folder   A shared folder in which files can be placed by authorized users, but no one can view the contents except the owner.

dpi   A unit of measure representing the number of dots per inch. Typical Macintosh screen resolution is 72 dpi; laser printers generally print at 300 dpi or higher, providing smooth images and characters.

driver   *See* device driver.

E

Easy Access   A CDEV that assists users who have trouble either using the keyboard or the mouse.

edition   A file containing text or graphics that has been published so that its information can remain current in any subscribing documents. Publisher -> edition -> subscriber is analogous to copy -> clipboard -> paste. *See also* publisher and subscriber.

editions manager   A System 7 feature that manages the Publish and Subscribe process.

Ethernet   A popular network connection that offers higher-speed transmission rates (10 Mbps) than LocalTalk (230 kbps).

event driven   A programming style where the computer waits for the user to do something (an event), and then responds accordingly.

expansion card   A type of printed circuit board that can be plugged into some Macintosh computers to extend its capabilities. For example, a card that allows a Mac to be connected to an Ethernet network.

expansion slot   A receptacle into which expansion cards can be plugged.

extension   *See* system extension.

Extensions folder   A folder within the System Folder that contains all of the active system extensions.

Extensions Manager   Control panel device allowing a user to temporarily deactivate selected INITs and CDEVs.

F

file server   A central computer that holds software and data for other computers connected on a LAN. Peripheral devices can also be attached to the file server for use by other nodes on the network.

File Sharing Monitor CDEV   A control panel for monitoring file-sharing activity. It indicates who is sharing information on your Mac, as well as the level of activity.

⌘-F   Find command   A System 7 Finder command that locates files by name, size, kind, label, date, version, or lock status.

Finder   System software that provides the Mac's familiar desktop features including icons, folders, and the menu items visible immediately following startup.

floppy disk   A removable magnetic diskette encased in plastic. Macintosh diskettes are 3.5" and can store 400K, 800K, or 1.4Mb of information.

folder   A container for applications, documents, and other files. The purpose of folders is to help organize your desktop. For example, system software is typically stored in the System Folder.

font   The electronic equivalent of a typeface. A font is a collection of shapes that represent letters, numbers, and symbols. Fonts can be stored either in bit-mapped form or as an outline, described by a mathematical formula. Common Macintosh fonts include Chicago, Geneva, Helvetica, and Times.

Font/DA Mover   A utility program that was necessary in previous Macintosh system versions to install fonts and DAs in the system file. No longer required with System 7.

fragmentation   The breaking up of files into multiple parts for storage when a single space large enough for the whole file is not available. This tends to occur over time as files are erased and written to a disk, and results in slower disk performance. Certain utility programs can correct this problem.

G

gateway   A system of hardware and software to connect computer networks that use different communication protocols.

General Controls CDEV   Controls desktop pattern, blinking rates of insertion point cursor, and menu selections. Also permits resetting the Mac's built-in clock and calendar functions.

gray-scale monitor   A monitor that is capable of displaying shades of gray such as a photograph, rather than merely black and white.

H

hard disk   A nonremovable magnetic disk. Hard disks can be installed inside a Mac or externally connected to the Mac's SCSI port. Hard disks are faster than floppy disks and can store from 20MB to over 1000 MB of data.

hardware   The physical computer. All of the chips, printed circuit boards, power supplies, etc. that make up a computer.

hierarchical filing system (HFS)   A filing system in which folders are recognized as part of filenames. This allows multiple files with the same name to exist on the same disk, just not in the same folder. HFS has been the primary filing system used by the Finder since version 4.1.

Help menu   *See* Balloon Help.

HyperCard   A program included with all Macintosh computers that uses a stack of cards as a metaphor to represent stored information. Cards can contain text, sound, data, pictures, and buttons that are used to navigate between cards in a stack.

I

icon   A graphic representation of an item, such as a disk, folder, or document.

INIT   Short for initialization program. *See also* system extension.

Installer   A special program that installs or updates software. System 7 includes two Installer programs—one installs system software and the other updates printer drivers.

integrated circuit (IC)   A complete electronic circuit consisting of capacitors, resistors, diodes, transistors, and a circuit board all on one piece of semiconducting material. Also called a *chip*.

interapplications communications (IAC)   An architecture that enables programs to call on each other to perform specialized tasks. For example, a drawing package might call on a word processing package to perform a spelling check on text blocks.

interface   How a program appears and communicates with a user.

J, K

Kbps   Kilobits per second. A unit of measure equivalent to 1,000 bits per second, which is used to describe the transmission speed of information on a network. *See also* Mbps.

Keyboard CDEV   Controls keyboard sensitivity (repeat rate) as well as allowing selection of alternate keyboards. U.S. keyboard is standard, but foreign-language versions are available from Apple.

Key Caps   A desk accessory that displays the various characters available in each installed font.

keyboard equivalent   Keys that can be pressed at the same time as the command (⌘) key to activate a menu command. Example ⌘-X for **Cut.**

keyboard navigation   A System 7 Finder feature that allows a user to select files by using the keyboard.

kilobyte (K)   A unit of measure equal to 1024 bytes, which is 2^{10} bytes. *See also* byte.

L

LAN   Acronym for local area network.

label   A system 7 feature that allows a user to assign a short text phrase and a color (on color Macintoshes) to a file or folder.

Labels CDEV   Controls colors and text assigned to each of the seven categories that can be selected from the Finder Label menu.

Label menu   Finder menu that assigns a user-defined text label to any icon. On a color equipped Mac, the icon will appear in the associated color. *See also* Labels CDEV.

laser printer   A printer that uses a computer-controlled laser to create a page image. Laser printers typically produce a high-quality printed image at resolutions of 300 dpi or greater.

launch (v)   To start an application program. Applications can be launched from the Finder by double-clicking the program icon or a document that was created by the application.

list views   A Finder feature that displays a list of filenames in a window rather than a collection of icons. Lists can be sorted by filename, size, kind, last modification date, version, or comments. The Views control panel determines which sorting criteria is available for a list view.

local area network (LAN)   A group of computers at one site that have been connected together using hardware and software to share data.

LocalTalk   A network connection that is built into every Macintosh. Similar to Ethernet, but operates at much slower speeds (230 kbps versus 10 Mbps).

lock   A method to prevent a file or disk from being modified or deleted. Disks can be locked by opening the write-protect tab on the upper right-hand corner of the disk. Individual files can be locked in the Get Info window.

M

Mb   *See* megabyte.

Mbps   One million bits per second. A unit of measure used to describe the transmission speed of information on a network.

macro   A series of keystrokes, mouse actions, and commands that can be recorded by a user and played back on demand. This feature is found in some programs and is particularly useful for repetitive tasks.

main logic board   *See* motherboard.

main memory   *See* random-access memory.

Map CDEV   A control panel program that can be used to set the Mac's location and determine the current time in different parts of the world.

marquee selection   A standard Macintosh technique to select multiple items by clicking and dragging a box around them.

math coprocessor   A microprocessor specifically designed to do calculations very quickly. The math coprocessor acts as a calculator for use by the CPU.

megabyte (Mb)   A unit of measure precisely equal to 1,024 kilobytes or 1,048,576 bytes, which is 2^{20} bytes. *See also* byte.

Memory CDEV   Controls disk cache size, virtual memory, and 32-bit addressing.

menu   A list of command options available from the menu bar at the top of the screen. Options can be selected by clicking on the menu with the mouse, dragging it to the desired command, and releasing the mouse button.

menu bar   The strip across the top of the Mac screen that contains a series of pull-down menu choices.

menu title   The name of the menu that appears on the menu bar.

microphone jack   A stereo mini audio input jack on the back of some Macintosh computers for plugging in external microphones.

MODE32 A software product from Connectix Corporation that enables 32-bit addressing on certain Macs (II, IIx, IIcx, and SE/30) that would not otherwise be able to use this feature.

modem An abbreviation for modulator/demodulator. A device that allows computers to communicate over standard telephone lines.

modem port A connector on the back panel of Macintosh computers for attaching a modem.

Monitors CDEV Controls color or gray-scale depth on Macs equipped with appropriate monitors. Also allows a user to select alternate monitors and customize certain features when they are available.

motherboard The main printed circuit board that holds a computer's primary electronics, as well as sockets (slots) to connect other components.

mouse A pointing device that operates by moving a rolling ball over a flat surface.

MS-DOS An acronym for Microsoft disk-operating system, which is commonly used on IBM and IBM clone personal computers.

Mouse CDEV A control panel device for setting the mouse reaction speed and the double-click speed.

MultiFinder A feature that allowed previous versions of the Finder to have more than one program open. System 7 is always in a MultiFinder mode.

multitasking The ability to load more than one program into RAM at a time. This feature allows one application to process data, calculate, or print in the background while the user works with another application in the foreground. System 7 and MultiFinder provide a form of multitasking.

N

nested folder A folder within a folder. With System 7, the System Folder contains several special-purpose nested folders, such as the Extensions folder and the Control Panels folder.

network A collection of computers, printers, and other devices that are connected together by hardware and software. A network can be a convenient way to share resources including disk space, printers, and data.

network administrator A "super user" responsible for maintaining the network, which might include physically connecting computers, assigning passwords, configuring software, and backing up shared storage devices.

Network CDEV Controls selection of built-in AppleTalk or alternate network connections, such as EtherTalk or TokenTalk.

node   Any individual device connected to a network.

Note Pad DA   A desk accessory for recording brief amounts of text.

Note Pad File   A file created and maintained by the Note Pad DA.

NuBus   An address/data bus installed in some Macintosh computers. NuBus provides a common method for connecting expansion cards to the Mac's motherboard.

O

open (v)   To launch a document or application. *See also* launch.

open architecture   A computer design that allows for easy expansion via expansion slots.

outline fonts   Typefaces that are stored as a series of mathematical equations. Outline fonts can produce acceptable output at almost any size. Contrast with bitmapped fonts.

operating system   The base software that controls communication between devices, other software, and the user.

outline views   A System 7 Finder feature that displays the contents of nested folders in a list view.

P

PMMU chip   A chip that handles paged memory management for Macs that use the 68020 CPU chip. This chip is required for virtual memory on the Mac II. Equivalent functionality is built into the 68030 CPU, so Macs such as the SE/30, IIcx, IIci, and IIfx do not required a PMMU chip.

PPC   *See* program-to-program communications.

paged memory management   A memory management scheme that allows portions of memory called *pages* to be swapped between RAM and a hard disk.

parallel port   A type of port used on nonMacintosh computers to transmit a whole byte at a time. Contrast with serial port.

parental hierarchy   The list of folders in which a folder is located.

password   A secret code that can be used to prevent access to documents, applications, and devices.

⌘–P   **Paste**   A command that places a copy of the contents of the clipboard into the current document. *See* Cut, Copy, and Clipboard.

peripheral device   An external computer-controlled device. Popular peripherals include printers, external disk drives, and modems.

physical memory   RAM that actually exists within the computer. Contrast with virtual memory.

pixel   Short for picture element. The smallest dot that a CRT can draw.

pointer   An arrow, cross, I-beam, or other symbol that indicates the cursor position on the screen as the mouse is moved.

point   Unit of measure for character size. There are approximately 72 points per inch. For example, this is 8 point and this is 12 point.

pop-up menu   A menu that displays a list of options when the menu title is clicked on.

port   A plug recepticle on the back of a computer for connecting peripheral devices.

PostScript   A popular page description language from Adobe Systems, Inc. that allows a laser printer to produce smooth graphics and fonts . Some laser printers include built-in PostScript software.

preference files   Documents that hold program settings when an application is deactivated. *See also* Preferences folder.

Preferences folder   A folder nested within the System Folder that contains preference files for system software, applications, and utilities.

Print Spooling   *See* background printing.

printer port   A plug recepticle on the back of the Mac for connecting printers or LocalTalk networks.

program-to-program communications (PPC)   the mechanism on which Apple events and other IAC events ride.

program   A collection of instructions that tell a computer how to preform specific tasks. Computer programs are also known as software and applications.

protocol   A common language spoken by devices on a network. Examples include AppleTalk and TCP/IP.

publisher   A document containing a user-selected portion that has been published to an edition file, so that the information will be automatically updated in subscribing documents. *See also* edition and subscriber.

pull-down menu   A menu, usually at the top of the screen, that displays a list of options when the menu title is clicked on with the mouse pointer.

Puzzle   A colorful push puzzle to keep users amused while waiting for printouts.

Q

QuickTime A new set of Macintosh standards regarding time-based information, such as animated image sequences or video.

R

RAM *See* random-access memory.

RAM disk A simulated floppy disk created in memory. RAM disks are much faster than even hard disks. However, RAM disks typically lose all data when the computer is turned off.

random-access memory (RAM) Special chips that provide storage that can be accessed in an arbitrary order. RAM can be updated and read an unlimited number of times. The contents of RAM are lost when the computer is turned off. Contrast with ROM.

read-only memory (ROM) Information storage that is preprogrammed when the computer is manufactured. Information in ROM is not lost when the computer is shut off. Information in ROM cannot be changed. Contrast with RAM.

ROM *See* read-only memory.

ResEdit An Apple utility for maintaining resources. WARNING: ResEdit should be used with caution because it can easily damage an application.

resolution The size of the smallest dot that can be drawn by either a printer or a monitor. *See also* dpi and pixel.

resource Objects that can be referenced by code. Applications can have bitmap, icon, menu, sound, and text resources.

RGB Monitor A CRT that receives separate signals for red, green, and blue.

S

S/7 Abbreviation for System 7.

SCSI *See* small computer system interface

SCSI cable terminator A device that monitors the integrity of signals in a SCSI chain. SCSI cable terminators are built into Apple hard disks.

SCSI chain A collection of SCSI devices connected by SCSI cables to the SCSI port. SCSI chains must have SCSI terminators on both ends.

SCSI port A connector on the back of the Mac for connection to a SCSI chain.

screen-blanking programs Also known as screen savers. This class of programs will dim the screen or draw patterns to keep a constant image from becoming burned into the screen.

serial ports   Ports that receive data serially. A serial signal is one that sends one bit at a time. Contrast with parallel. *See also* printer and modem ports.

Scrapbook DA   A desk accessory in which text, pictures, and sounds can be stored or retrieved for use in application programs.

Scrapbook File   A file automatically created and maintained by the Scrapbook DA. Text, pictures, and sounds can be stored in this file.

Script   A set of instructions that can be used to link different applications or computers together.

server   *See* file server.

shared disk   A disk on a LAN that is accessible by the other nodes on the network. *See also* file server.

Sharing Setup CDEV   A control panel device for setting file-sharing parameters.

SIMM   Single in-line memory module. A small circuit board containing ROM or RAM chips that attach to a socket on the Mac's motherboard.

small computer system interface (SCSI)   A standard covering mechanical, electrical, and functional properties for connecting peripheral devices.

software   The set of instructions that make up a computer program.

sound   A type of Macintosh resource that generates an audible signal for the Mac's built-in speaker or for an external device through the speaker port.

Sound CDEV   Selects which sound contained in the System file will be used in place of the normal "beep."

Startup Disk CDEV   Allows a user to select which hard drive will be used during the startup process. Useful for switching between system versions when two or more hard drives are available.

Startup Items folder   A System 7 feature that automatically opens any files in the startup items folder at the end of the startup procedure.

stationery   A special file designation for templates or documents containing a standard format, such as a memo or letterhead.

subscriber   A document including one or more segments that have been created by another document and published to an edition file. Changes made in the originating document automatically update the edition file, and subsequently the subscribing document. *See* edition and publisher.

suitcase   Under prior system versions, desk accessories and fonts were stored in suitcase files. System 7 allows you to open such files directly and move the contents to the appropriate location in the System Folder.

System 7.0   Macintosh system software and the topic of this book.

system extension   Software that adds capabilities to the basic system. Examples include printer drivers and network connections.

System file   Contains information used by the entire system. System 7 makes it easy to add fonts, sounds, and other resources to the System file.

System Folder   The folder where the startup software expects to find the Finder and the System files. *See also* blessed folder.

system software   Software that manages general functions like controlling the mouse or scanning the keyboard for user input. *See also* operating system.

T

third-party   Hardware or software developed by companies other than Apple.

title bar   The top part of a window that shows the title of the window. An active window will have horizontal lines across the title bar, as illustrated in the example below:

▐▒☐▒ **Window Ex** ▒▒▒▒▌

Trash   An icon that can be used to delete files. It can also be used to eject floppy disks and dismount hard disk and CD-ROMs, provided they are not the startup volume or being shared on a network.

TrueType font   A type of outline font that was developed as an alternative to Postscript fonts. System 7 includes built-in software that supports TrueType fonts. A TrueType INIT is also available for System 6.

Type 1 Font   Post Script outline fonts with hints that help produce sharper character images especially at smaller sizes.

Type 3 Font   PostScript outline fonts without hints.

U

Users & Groups CDEV   A network control panel device used to set parameters associated with file-sharing privileges for individual or groups of users.

utility programs   Software designed to perform special functions that are not related to one specific application. Software to copy disks or convert file formats are examples of utility programs.

V

version   A number indicating a particular software release. For example, the initial release of System 7 is version 7.0.

video card   An expansion card that can be plugged into some Macs that manages the video signals sent to an external monitor.

Views CDEV   Controls the font and size used in Finder windows. Also permits selection of icon size and arrangement in list view windows, as well as which fields are displayed.

virtual memory   A method of using hard disk space to temporarily augment RAM. *See also* Memory CDEV and PMMU.

volume   Typically associated with a storage device such as a hard-disk drive. A hard drive can contain a single volume or multiple volumes.

W

WAN   Acronym for wide area network.

wide area network (WAN)   Similar to a LAN, but geographically broader in scope. WANs can connect computers in different buildings, cities, or countries. They usually have much slower transmission speeds than LANs.

window   A portion of the screen that communicates with a user, as shown below. Programs typically create windows to give and receive information.

```
┌─────────────────────────┐
│ ▮□▭▓ Window Ex ▬▬▬ │
├─────────────────────────┤
│        Hello World!     │
│                      ▣  │
└─────────────────────────┘
```

word processing   A class of programs designed for producing moderately complex documents containing text and graphics.

X, Y, Z

zone   A segment of a local area network that is connected through a router. Zones are useful in isolating groups of nodes so that their transmissions have minimal impact on other parts of the LAN.

zoombox   The box in the upper right-hand corner of the title bar that automatically resizes a window to its maximum size. A second click on the zoombox will return the window to its original size.

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Apple Software Disclaimer

MACINTOSH SYSTEM 7: THE COMPLETE SOURCEBOOK