chapter 13

Windows 98

That must be why we're not shipping Windows 98 yet!

—Bill Gates, after Windows 98 crashed during a preview presentation

When introduced in June of 1998, Windows 98 was the first version of Windows that Microsoft targeted specifically at the consumer market. But Microsoft sort of miscalculated—Windows 98 was indeed accepted by the consumer market, but it was also adopted by corporate users.

In this chapter, you'll get an overview of the strengths of this OS that appealed to both the consumer and corporate markets. Although its considerable strengths led to wide adoption, Windows 98 became a source of frustration for many users because it was notoriously unstable and prone to suddenly locking up. We'll discuss the reasons for this situation, and you'll consider the other limitations of Windows 98. Of course we'll also tell you about the hardware it needs and how to create a startup disk to initiate Windows 98 Setup. You will actually install it and customize the desktop, and in other step-by-steps you will create users and manage files and printers on your lab computer. Finally, you'll explore the tools available for troubleshooting common Windows 98 problems and learn how to solve some of the more common problems you may encounter.

In this chapter, you will learn how to:

- **Measure the features, strengths, and weaknesses of Windows 98**
- **Install and configure Windows 98**
- **Customize and manage Windows 98**
- **Manage users, files, and printers**
- **Troubleshoot common Windows 98 problems**

In 1999, just one year after the release of Windows 98, Microsoft brought out an improved, incremental update to Windows 98, called Windows 98 Second Edition, or Windows 98 SE. We used the Second Edition for most screenshots and all step-by-steps in this chapter.

Windows 98 Overview

Although Windows 98 was basically just an upgrade to Windows 95 and targeted at the consumer market, it still made its way into the corporate world. To give you some perspective on these markets, we'll explore the features designed to appeal to home users and **small office/home office (SOHO)** users, and because you'll undoubtedly run into Windows 98 at work, we'll also consider why this OS played so well in the corporate market.

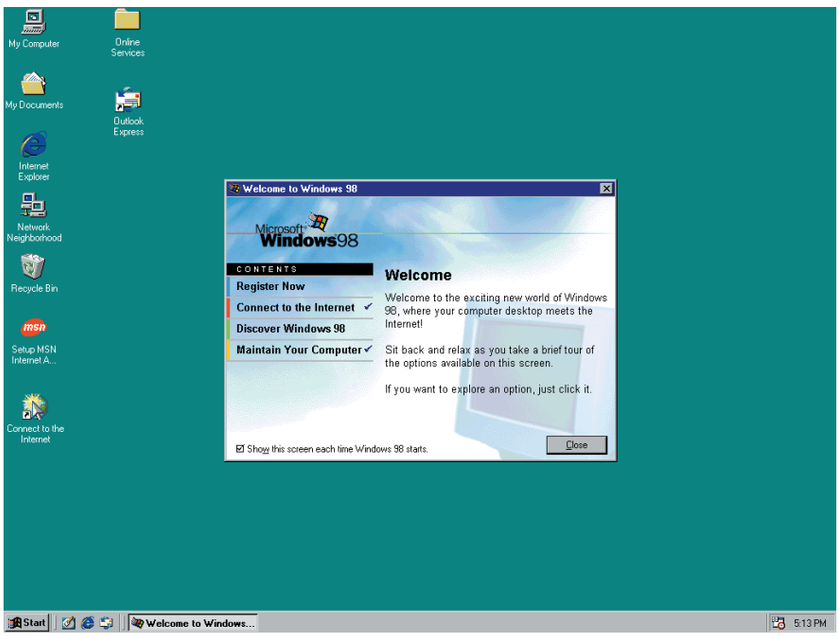
Windows 98 Features and Strengths

If you bought a new PC for home use between the summer of 1998 and the introduction of Windows 2000 in February of 2000, it probably came with Windows 98 preinstalled because you were a member of the target market for this consumer-oriented OS. However, the fact that Windows 98 also found a place on desktops in organizations worldwide surprised many people. After all, Microsoft already offered a desktop operating system, Windows NT 4.0 Workstation, for the business market. Let's explore the features and strengths of Windows 98 that appealed to such a wide range of users, and why Windows 98 was often chosen over Windows NT 4.0 Workstation.

Desktop

The Windows 98 desktop resembles the Windows 95 desktop, with several significant functional modifications.

Internet Explorer Integration Internet Explorer is intertwined with the Windows 98 OS, meaning that web browsing is integrated into the OS, and that you can connect to the Web from Windows Explorer, other applications, and desktop shortcuts without first consciously starting Internet Explorer.



- Windows 98 desktop

Inside Information

MS-DOS Command Prompt

Like Windows 3.x, and Windows 95 after it, Windows 98 has MS-DOS as a required component. This is also true of the upgrade to Windows 98, the Millennium Edition (Windows Me), introduced in 2000. These were the last versions of Windows to have such deep ties to MS-DOS. Of the two, only Windows 98 gives you the option of starting up to a true MS-DOS command prompt with full access to the file system. As a computer professional, you may find this feature useful because it allows you to fix problems such as corrupted system files that you can't fix while the OS is running. However, troubleshooting features that have been added to Windows, such as Safe Mode in Windows 9x, have given us similar abilities with a friendly GUI.

This web integration is most apparent visually when you turn on the Active Desktop, as shown in Figure 13-1. The graphic at the upper right of the screen is a hyperlink to `www.microsoft.com`. A **hyperlink** is an element of a **hypertext markup language (HTML)** document. HTML is the language of the World Wide Web. The pages you view on the Web with your browser are written in this language, which your browser interprets in order to display the pages on the screen. A hyperlink element is a link to a different location or document. That different location can be elsewhere in that same document, or in another document, or it can be a uniform resource locator (URL) that points to a web page, FTP site, or other resource on the Internet.

Try This!

Add a URL to Your Desktop

You can add a URL to your desktop, even if you have not turned on Active Desktop. To complete this task, you will need a computer with Windows 98, an Internet connection, and a web browser. Try this:

1. Right-click an empty part of the desktop and choose New | Shortcut.
2. On the first page of the Create Shortcut wizard, type the following in the Command Line box: **http://www.google.com**.
3. Click Next and type the following in the Name box: **Google**.
4. Click Finish and confirm that there is a new desktop shortcut named Google.
5. Test the shortcut by opening it. Your web browser should open to the Google home page.

Another indication of the integration of Internet Explorer is the channel bar. In Windows 98 (First Edition), a channel bar appears on the right side of the desktop. We found this to be as annoying as the pop-up windows that appear when you're browsing the Internet, but there was more to this than met the eye. Each of the services listed maintains an **Active Channel web site**, which, by definition, delivers updated information to a subscriber's computer on a regular schedule. You have to initiate the relationship to the sites listed on the default channel bar. This is not a very popular feature.

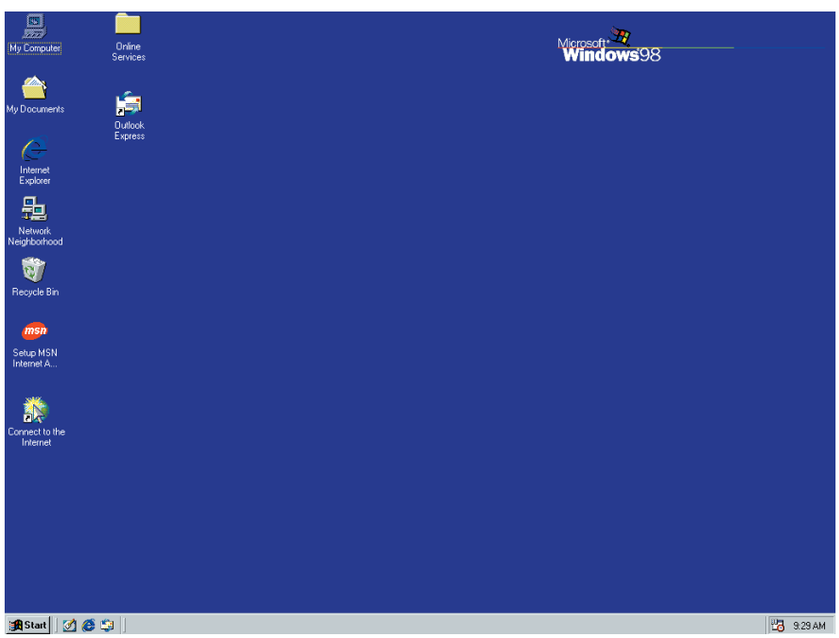
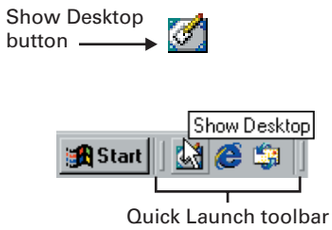


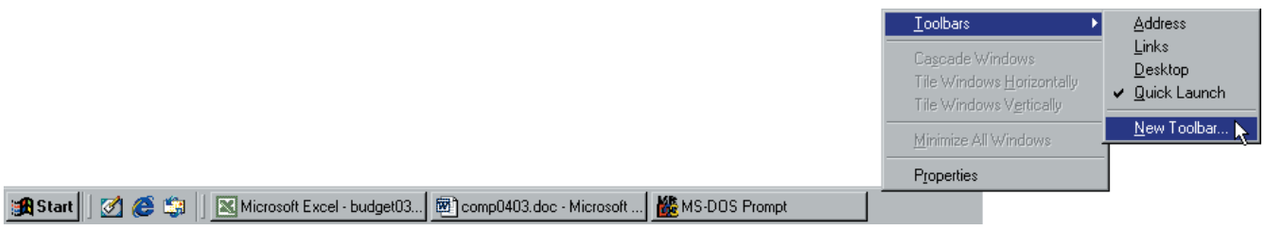
Figure 13-1. Windows 98 Active Desktop

Windows 98 (First Edition) channel bar



New GUI Navigational Features If you ever worked with Windows 95, did you feel frustrated when you wanted to quickly access an icon on the desktop while one or more windows hid the desktop? You probably first tried the ALT-TAB key combination, but it switched between windows, not between an open window and the desktop. If several windows were open, you likely needed to close or minimize each one to see the desktop. Windows 98 provides a solution with the **Show Desktop button**, included by default on the Quick Launch toolbar. When you click this button, all open windows are minimized so that you can see the desktop.

Navigation from the Start menu has also been improved over Windows 95. The submenus in Windows 98 stay visible long enough for you to make a selection, even if you pause a bit first. You can also customize and add other toolbars to the taskbar. Simply right-click on the taskbar and select the Toolbars menu.



- Windows 98 taskbar

File Systems

Any operating system that uses disk storage must have a method for retrieving information from disks. In the case of writeable disks, it must also be able to write and organize the data on disk. Such a method is called a file system, and Windows 98 supports several standard file systems. For CD-ROMs the OS uses Compact Disc File System (CDFS), and it uses the universal disk format (UDF) for digital versatile disks (DVDs). For floppy disks Windows 98 uses the FAT12 file system.

You don't really have to make any decisions about the file systems mentioned so far; the OS uses the appropriate one by default. However, when it comes to hard disk drives, you have two realistic choices—FAT16 or FAT32. The FAT12 file system is only used for incredibly small hard drive partitions (under about 16MB), and FAT16 is used for hard disk partitions up to 2GB in size. However, beginning with Windows 95 and continuing through all subsequent OSs to date, Microsoft added a

Cross Check

Quick Launch Toolbar

The Quick Launch toolbar is now available in several versions of Windows. Review the information on the taskbar and the Quick Launch toolbar in Chapter 6, and then answer the following questions:

1. Which versions of Windows offer the Quick Launch toolbar?

   _____

2. If the Quick Launch toolbar is available in a version of Windows, how can you enable it?

   _____

3. You have a program you want to add to the Quick Launch toolbar. How can you add a button for this program to the Quick Launch toolbar?

   _____

special driver to the OS called virtual file allocation table (VFAT). VFAT makes disk access faster and also supports the use of long file names on FAT volumes, including a new type of FAT volume, FAT32. Next, we'll compare the FAT16 and FAT32 file systems and then explore the use of long file names.

FAT16 FAT16 was a nice file system for small hard drives. It became something of a liability even as early as 1990 because of its inefficient allocation of disk space and its inability to keep up with the ever-growing hard disk sizes. It also was susceptible to a single point of failure, primarily because it had only one physical location in which it could place the root directory of a volume. FAT16 has a 2GB partition volume size limit in Windows 9*x*.

FAT32 The FAT32 file system addresses the problems with FAT16. It uses space more efficiently because for drives up to 8GB, it uses 4KB clusters, instead of FAT16's 32KB clusters on 2GB drives. A cluster is the minimum space a file system will allocate to a file. The FAT32 file system supports larger drive partition sizes than the 2GB FAT16 limit. But because FAT32 is much more efficient for large hard drives, Windows 98 will default to the FAT32 file system for partitions larger than 512MB. FAT32 theoretically supports up to 2TB, but in fact operating system, hardware, and BIOS limits can restrict this size to anywhere from 7.8GB to 32GB. Lastly, the root directory location is no longer a single point of failure, because the root directory is not restricted to the first physical track of the disk, and the OS can also reliably back up the FAT table and use the backup in case the first copy fails.

Converting from FAT16 to FAT32 If you bought a computer with Windows 98 preinstalled and a hard disk larger than 512 MB, FAT32 was usually the file system the manufacturer used, but if your Windows 98 is installed on a FAT16 partition, you can use a Windows 98 utility, Drive Converter, to convert from FAT16 to FAT32. (Drive Converter can be found at Start | Programs | Accessories | System Tools | Drive Converter.) You can also create new FAT16 or FAT32 partitions on free space on a hard disk. Table 13.1 compares the FAT16 and FAT32 file systems as implemented in Windows 98.

Support for Long File Names

You can save files that break the 8.3 naming convention rules with **long file names (LFNs)** up to 255 characters, including spaces. This is a feature supported by the VFAT driver on all implementations of FAT in Windows 98. Adding LFN support to the OS and file systems was forward looking, because people were tired of trying to create meaningful file names under the old 8.3 rules. However, they still had to worry about backward compatibility with applications that understood only 8.3 file names, so Microsoft saved both

Inside Information

What Do 12, 16, and 32 Mean?

In FAT12, FAT16, and FAT32, the 12, 16, and 32 indicate the size of the FAT. Because FAT12 has the smallest FAT table, it is used on disks with the least amount of space to allocate. Each allocation entry in the FAT12 table uses just 12 bits. Similarly, FAT16 uses 16-bit entries, while FAT32 uses 32-bit entries. This also means that the FAT16 file system can divide the data space on a disk into many, many more allocation units than FAT12, and FAT32 uses many more than FAT16.

When FAT16 is described as inefficient, we are referring to how much space is wasted on a large disk. The minimum space allocated to a file is a cluster, which is 32KB on a 2GB FAT16 partition. This means that even a 20-byte file owns 32KB of disk real estate. If that file grows to 33KB, it requires an additional cluster to accommodate the 1KB over the cluster size, and the file then owns 64KB of disk space. Multiply the waste in this one file by thousands!

Table 13.1 FAT16 to FAT32 Comparison

Features	FAT16	FAT32
Maximum Partition Size	2GB	32GB (theoretically 2 terabytes)
Cluster Size	32KB on 2GB partition	4KB on 2GB partition
OS Compatibility	All Microsoft OSs, OS/2, UNIX, and Linux	Windows 95 OSR2, Windows 98, Windows Me, Windows 2000, Windows XP

Inside Information

Where Will You Find FAT32?

The FAT32 file system was actually introduced in Windows 95 OSR2 (OEM Service Release 2) in the fall of 1996. This version is also known as Windows 95B, and as with all Microsoft OEM OSs, it was available only with a new PC. Therefore, when FAT32 was included in the retail version of Windows 98, it was the true introduction of FAT32 to the general public. It is important to remember that FAT32 is available in both releases of Windows 98, because you may run into Windows 98 on the job for a few more years. But FAT32 is not just a Windows 9x file system. It continues to be supported in Windows Me, Windows 2000, and Windows XP, so you will encounter this file system long after Windows 98 is no longer around.

LFNs and 8.3 file names for each file with an LFN. This was not a simple trick, and you'll explore how this was done and work with long file names in the section "Managing Users, Files, and Printers" later in this chapter.

Hardware Support

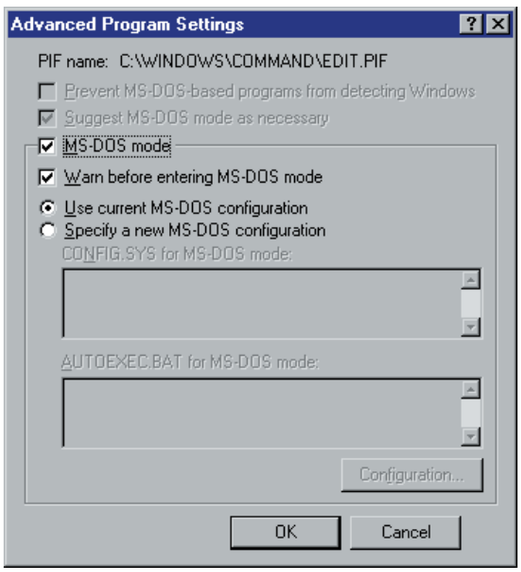
Like Windows 95, Windows 98 has plug-and-play support, with added support and drivers for DVD drives, universal serial bus (USB) devices, and IEEE 1394 (similar to Apple's FireWire) devices. It also includes power management features that allow hardware components, such as the disk, monitor, and even PC card modems, to be powered down when not in use—a great feature for laptop users trying to conserve battery power! All of these hardware support features combine to be the most compelling reason why businesses chose Windows 98 for their laptop computers over Windows NT 4.0. Windows 98's enhanced multimedia support, intended to appeal to the home user, also found fans among corporate users. In addition, like Windows 95, Windows 98 allowed users to continue to use older devices with their DOS device drivers, saving them the expense of buying newer devices.

Performance

Each successive edition of Windows has shown performance improvements. Windows 98 continued this tradition with faster bootup, shutdown, and program loading. The **VFAT file system driver** improves performance on both FAT16 and FAT32 volumes. Other performance enhancements, including improved multitasking, exist "under the hood." Experienced Windows 95 users can appreciate the performance difference without having to understand the improvements.

Reliability

Windows 98 did not show a huge improvement in reliability, but there was some due to the evolutionary process of improvements in the underlying program code. Therefore, it was less vulnerable than Windows 95 to problems that caused the system to hang. If you used the FAT32 file system, you also benefited from its improved reliability over FAT16, as described earlier.



- Advanced settings for MS-DOS mode

Software Compatibility with Legacy Applications

In the area of software compatibility, Windows 98 is generally much more tolerant of older application programs than is Windows NT or the newer OSs. This is by design. Many DOS applications do not need special handling, but some run unacceptably slower on a Windows 95 virtual machine than on a true DOS computer. For those, Windows 98 includes the ability to use **MS-DOS mode** whenever the program is started. In MS-DOS mode Windows 98 removes much of its own program code from memory and loads a real-mode copy of MS-DOS while a DOS program is running. It may even reboot into MS-DOS mode to load special drivers or other programs required by the DOS application. It boots back into Windows 98 when the DOS application is closed. This requires the use of advanced configuration options in the shortcut used to call up the DOS program.

Limitations of Windows 98

Like any OS, Windows 98 has limitations and troublesome areas. In this section, we'll identify limitations in the following areas: file system, legacy hardware support, and stability.

File System Limitations

Windows 98 has file system limitations in the areas of security and recoverability and file compression.

Security and Recoverability Although the FAT32 file system is an improvement over FAT16, it still lacks the file-level security of the NT file system (NTFS). Additionally, NTFS was designed to recover data in the event of a system failure, whereas even FAT32 provides only limited recovery of the root directory and FAT table.

File Compression If your system is low on disk space, Windows 98 has a disk compression function—but we don't recommend that anyone use it. Disk compression in Windows 98 is integrated into the OS, but not into the file system. Windows 98 compresses an entire drive volume (C:, D:, and so on) by compressing all of the files on the drive and storing them in a single file. Then it makes that single file look like your drive C: or D: or other drive, while it hides the underlying "real" drive from the casual user. This smoke and mirrors is clever, but it leaves you with a single point of failure: the file that is storing your compressed files. We have experienced firsthand how easy it is to damage these compressed drives. Don't use this function!

Legacy Hardware Support Limitations

How can legacy hardware support be both a feature and a limitation of Windows 98? If you have an old device that only has Windows 3.1 or MS-DOS device drivers, you can save money by keeping that device and using the old device drivers—something Windows NT, Windows 2000, and Windows XP will not allow. The problem with doing this in Windows 98 is that it will cause Windows to run in **MS-DOS compatibility mode**, which is slower and more prone to failure.

Stability Limitations

Windows 98, like Windows 95 before it, uses a combination of 16-bit and 32-bit code. Yes, they are considered 32-bit OSs, but in reality they are hybrids, and they have instability problems because of this. We have witnessed this in our own computers and in the computers of many clients and students, who experienced frequent crashes of their systems. For this reason alone, when selecting a Windows desktop today for a new computer, you would not even consider Windows 98.

The reason for the instability is tied to the processor modes. The 16-bit code runs in real mode, while the 32-bit code runs in protected mode. The more 16-bit code you have running, the more switching the system has to do between these two modes. If you run only Windows 98 32-bit drivers and also avoid running MS-DOS applications or 16-bit Windows programs, your computer will perform best and be more stable.

Inside Information

Why Have Both Types of Names?

Why create 8.3 names for files and folders with LFNs? Obviously, if you can create a file or folder with an LFN, you are using software that understands LFNs. However, the theory is that you might also want to access the same file using a program that does not understand LFNs. Therefore, Windows creates an 8.3 file name in addition to the LFN so that older programs can also access the file.

This discussion includes all versions of NTFS. The version in Windows NT 4.0 was version 4, and the version beginning in Windows 2000 was version 5. We now call these NTFS4 and NTFS5, respectively.

To learn how to check for MS-DOS compatibility mode, see "Poor Performance" in the "Troubleshooting Common Windows 98 Problems" section later in this chapter.

Why Would I Use Windows 98 Today?

Why would you choose Windows 98 today? The short answer is that you shouldn't need Windows 98 today, because there are newer and better versions of Windows. It also may simply not be available. The Microsoft web site lists Windows 98 in the Previous Products category, not in the Products category. Microsoft's Windows Life-Cycle Policy, currently at `www.microsoft.com/windows/lifecycle/default.mspx`, shows that direct OEM and retail license availability ended June 30, 2002. You will still find online support information for Windows 98 at the Microsoft web site, but even that service can be discontinued with 12 months notice. Add to all that the newer replacements for Windows 98 (Windows 2000, Windows Me, and Windows XP), and your conclusion must be that Windows 98 is no longer a viable choice if you are shopping for a new desktop OS. However, we urge you to learn about it because it is still in use in homes, schools, and even some businesses.

Newer Windows Does Not Work with Hardware

You may run into situations when newer OSs simply will not work with the existing hardware. Consider our friends Dennis and Jeanette. In the fall of 2001, Dennis surprised Jeanette with a brand-new Windows XP Home upgrade, which he promptly installed on their two-year-old Windows 98 computer. A few days later, he called us because his computer hadn't been the same since the upgrade. It was extremely slow, and some of their programs no longer worked. We discovered that Microsoft had scripts that could be used to make some of their programs usable, but that was a moot point once we realized that their computer model was not supported by Windows XP, and that the manufacturer did not intend to create drivers to add support. We uninstalled Windows XP Home, Dennis returned the OS for credit, and they were back to their familiar Windows 98 desktop.

Inside Information

Why the Minimums Are Not Practical!

As you can see, the requirements for Windows 98 are pathetically minimal, especially in light of the fact that the minimum computer system you can buy today—for as low as $300—far exceeds the minimum requirements for Windows 98. Even back in 1998, a system meeting only these minimum requirements would not have been acceptable for real-life use. There would be no room on the hard drive to install software, and 16MB of RAM would have caused your software to run very slowly. Many applications would not even install with so little RAM.

Newer Windows May Lack Features of Windows 98

People also had similar experiences when Windows Me came out in the fall of 2000. While the enhanced multimedia capabilities of Windows Me enticed some users to upgrade from Windows 98, many discovered that they had lost the ability to boot to DOS, run certain DOS applications, and load DOS drivers and resident programs. They returned to their Windows 98 installations.

Hardware and Windows 98

When you prepare to install an operating system, you have three concerns regarding the computer hardware:

- What are the minimum requirements for running the OS? What "horsepower" is required in the processor, how much RAM and hard disk space is needed, and what video capabilities and what input devices are required?
- What is the ideal configuration for the job you want this computer to do? Do you need a more powerful processor? More RAM or disk space? Fancy video?
- What other hardware is compatible with this OS?

Let's take a closer look at these concerns.

Minimum Hardware Requirements

Windows 98 can be installed on a computer that complies with the Intel/Microsoft set of standards. The published minimum requirements for Windows 98 include a 486DX/66 or higher processor, 16MB of RAM, 120 to 295MB of free hard disk space depending on the options you install, a CD-ROM or DVD-ROM drive (or access to the Windows 98 source files over a network), a VGA or higher-resolution video adapter, and a Microsoft mouse (or compatible pointing device).

Ideal Hardware Configuration

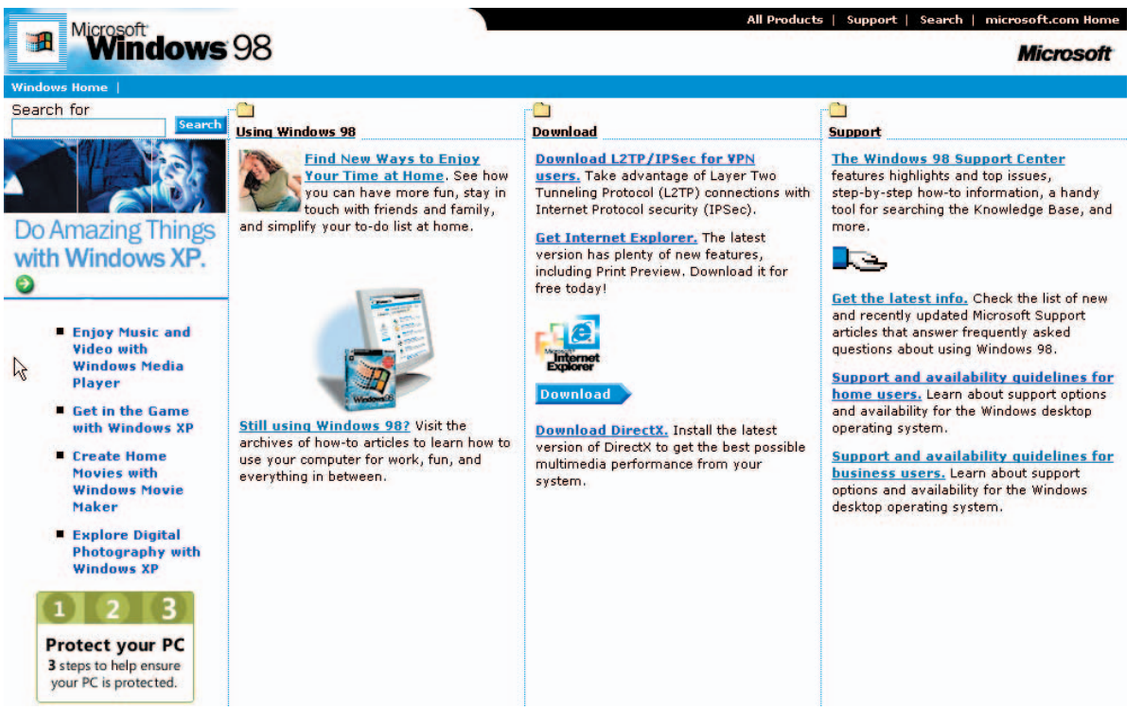
The minimum hardware configuration just lets you install the OS, look at it, and play around with it. If you need to install a bunch of office applications and expect to work without annoying delays, you need more processing power, memory, and disk space. Here is our recommendation for an ideal Windows 98 computer running standard office applications:

It's a good idea to check out the compatibility of the hardware and software before attempting to use them with Windows 98.

- Intel Pentium II processor
- 64 to 128MB RAM
- 4GB available hard disk space
- CD-ROM drive
- SVGA or higher-resolution video adapter
- Microsoft mouse

Compatible Products

Microsoft no longer maintains a hardware compatibility list for Windows 98. When installing Windows 98, or adding new hardware to a Windows 98 computer, check out the discs packaged with the hardware to find Windows 98



drivers for the hardware. If no Windows 98 driver comes with the hardware, check the manufacturer's web site, where you may find one to download.

Windows 98 Web Site

At this writing, Microsoft maintains a Windows 98 web page at `www.microsoft.com/windows98`. This page offers links to how-to articles, downloads, archives, and more.

Installing and Configuring Windows 98

Now that you understand the strengths and limitations of Windows 98, the hardware requirements, and the ideal configuration, it is time to install it and learn more about working with it, because that's really the only way you'll begin to understand it. You're not just going to walk up to a computer and immediately begin installing a new OS. Well, maybe you will once or twice, but then you'll discover that life is too short to begin such a complicated procedure without some planning, decision making, and preparation.

Preparing for Windows 98 Installation

You'll save time in the long run if you prepare the hardware, determine the method of installation, and decide on and gather the materials (disks, drivers, applications, and so on) you'll need to complete the installation.

Prepare the Hardware

To install Windows 98, you must be sure that the computer is a complete system, with at least the hardware minimums you have earlier decided to use, and that all the hardware is compatible with Windows 98. You also need to ensure that all necessary connections are in place and that the computer is plugged into a power outlet. You can prepare your hard disk ahead of time if you have the know-how, or you can allow Windows 98 to do so during installation.

Determine the Method and Type of Installation

If you are installing Windows 98 on a computer with a previous OS, you will also have to decide whether you want to perform a clean installation or an upgrade or create a dual-boot configuration. In other words, you have to decide what goals you want to achieve. In addition, you can choose manual installation, automated installation, or imaging as your Windows 98 installation method; in other words, you also have to decide what to do to achieve your goals.

Clean Installation When installing a new OS on a computer with a previous OS, we prefer to perform a clean installation, which is one that begins with a completely empty hard disk. We even prefer starting from the very beginning and partitioning and reformatting the hard drive. The advantage to a clean installation is that you don't carry problems from the

old OS over to the new one, but the disadvantage of a clean installation is that you have to reinstall all of your applications and reconfigure the desktop to your own preferences. This process is problematic if you have no means of backing up the data on the hard drive. If your computer is on a network, you can back up (or copy) the data files to a network server before repartitioning the hard drive. Then, after the clean installation, you can restore the data files to the computer.

Upgrade Installation If your computer has a previous version of Windows installed, you can perform an **upgrade installation**, which means that you install the OS into the same directory as the previous OS. This has the advantage of keeping all of your personal preferences and application settings intact, but it may carry over problems from the old installation.

Dual-Boot Configuration A dual-boot configuration lets you choose during startup between two OSs. We do not recommend that you create a dual-boot computer unless you have, at minimum, intermediate-level knowledge of PCs in general and OSs in particular. However, such a configuration is possible to create, and over the years, we have done so frequently when we needed to work in more than one OS to gain experience or to be able to simultaneously support users of more than one OS. Therefore, we will be brief on this subject.

If the previous OS is MS-DOS or Windows 3.*x*, you can create a dual-boot configuration during installation. To do this, you leave the old OS intact and install Windows 98 in a separate directory. Windows 98 Setup will automatically preserve the files needed to boot the old OS. In the case of MS-DOS or Windows 3.*x*, Windows 98 renames the system files during setup. You can then choose between the two OSs during startup. This type of dual-boot configuration will work only if drive C: uses FAT16. It is also possible to create a dual-boot configuration of Windows 98 and newer OSs, but we won't go there in this chapter!

When creating a dual-boot configuration, it is best to install the oldest OS first.

Manual Installation A manual installation requires your attention throughout the entire process to provide information and to respond to messages. You will perform a **manual installation** in the Step-by-Step 13.01 exercise. This is the method you would choose for a unique installation or if the number of computers is too few to warrant the time, effort, and expense that an automated installation requires.

After deciding to perform a manual installation, you have other choices to make:

- Will the source files (those in the Win98 directory on the Windows 98 CD) be found on the local computer or on the network? If the computer does not have a CD-ROM drive but it is connected to a network, then you'll have to boot up the computer with an operating system that has the network components installed so you can connect to a server where the source files are stored. That OS could be DOS or another version of Windows.
- If the computer does have a CD-ROM drive, will it work for the installation? That is, will the Windows 98 Setup program recognize it?
- If a CD-ROM drive is present and is recognized by Windows 98 Setup (which you may know only by trying), you will need the Windows 98 boot disk as well as the CD.

Automated Installation You perform an **automated installation** of Windows 98 by using scripts that someone (often a team of people) has prepared ahead of time. An automated installation can run either unattended or with very little input from a user. This method is used by organizations with large numbers of desktop computers that need identical applications and desktop configurations. This method requires training and planning.

Imaged Installation Many organizations that need large numbers of identically configured desktop computers install from images. An image is an exact duplicate of the entire hard drive contents, including the OS and all installed software. You perform this kind of installation by using imaging software, such as Symantec's Ghost (`www.ghost.com`), to copy the image of the hard drive onto a CD or a network server. From there, the image can be copied to many computers on the network.

Decide on the Components and Applications to Install

You must plan ahead of time for the optional components that will be installed. These include several categories of options: Accessibility, Accessories, Communications, Desktop Themes, Internet Tools, Multilanguage Support, Microsoft Outlook and/or Outlook Express, Multimedia, Online Services, System Tools, and WebTV for Windows.

To learn about the components available with a Microsoft OS, check out the web site for that OS. For instance, the home page of the Windows 98 web site is at `www.microsoft.com/windows98`.

Most people don't buy a computer just to look at the OS. They buy it to accomplish some task, whether at home or at work. Therefore, more important than the components available with the OS are the applications you plan to install after the OS is installed. Therefore, if you install an OS, you should also be prepared to install the desired applications on the computer so that the person using the computer has the software tools he or she needs.

Gather the Materials Needed for Installation

The materials you need depend on the choices you made while preparing for the installation. If you are installing on a new computer without an OS, or if you simply want to perform a clean installation, you will need the Windows 98 boot disk that comes with Windows 98. With this disk, you can boot to MS-DOS with CD-ROM support and select Windows 98 Setup from a menu, as described in the following step-by-step exercise. If you do not have this diskette, you can create a similar one from a program on the Windows 98 CD. You can also create this diskette during and after installation, but that doesn't help if you need one before installation, unless you have one from a previous installation. One difference between this diskette and the Windows 98 boot disk that comes with Windows 98 is that the startup menu on the boot disk has a choice that will automatically start the Setup program from the CD-ROM drive. Because this disk does not have an option to start setup, if you use it for setup, you will have to manually start setup by entering this command at the DOS prompt: ***d:*\win98\setup** (where *d* is the drive letter of your CD-ROM drive). Step-by-Step 13.01 has instructions for doing this.

Don't let the use of two names confuse you. Windows 98 boot disks and Windows 98 startup disks are basically the same: diskettes that will boot to MS-DOS 7, the version underlying Windows 95 and Windows 98. We use these two names because that is how the disks are labeled by Microsoft.

If you are upgrading from an earlier version of Windows, you will not need to start the computer from a diskette, because you will start the Setup program from the old OS. This is also true if you are creating a dual-boot computer, as long as the existing OS can access the CD-ROM drive or the

network location where the source files are located. In addition, you need a blank diskette (if you choose to create a startup disk during installation).

You should also gather together the driver disks for the components in or attached to your computer. These include driver disks for the network adapter (especially if the adapter is newer than 1998 or so), video adapter, mouse (if non-Microsoft or non-standard), and printer. Some of these you may install during the installation process, but in general we recommend that you let Windows use generic video and mouse drivers during installation and then, after a successful installation, install the correct drivers. We also recommend that you wait to install network adapter drivers until after the installation.

Finally, you will need the installation files for the applications you plan to install after the OS is successfully installed.

Try This!

Creating a Windows 98 Startup Disk

It is easy to create a startup disk using a computer running MS-DOS or Windows 3.*x* or higher. You'll need the Windows 98 CD and a blank, high-density 3.5-inch diskette. Try this:

1. Place the Windows 98 CD in the drive, and at a command prompt, type the following, replacing *d* with the drive letter of your CD-ROM drive. Press ENTER at the end of each line.

   ```
   d:
   cd \tools\mtsutil\fat32ebd
   fat32ebd
   ```

2. When prompted, insert a floppy disk and press Y to continue.
3. Leave the diskette in the drive and test it by restarting Windows. From the Startup menu, choose Start Computer With CD-ROM Support and press ENTER.
4. Remove the diskette and label it "Windows 98 Startup Disk."

Gather the Information Needed for Installation

The final item needed before you can install Windows 98 is information. This includes a name for your computer, a workgroup name, a password, and network configuration information.

Computer and Workgroup Names Each Windows computer on a Microsoft network must have a name. Use a unique name that contains 15 or fewer alphanumeric characters. A name is unique if no other computer, workgroup, or domain has the same name on your network. A Windows 98 computer must also belong to a workgroup on the network. This name must also contain 15 or fewer alphanumeric characters, and must be unique on the network, although many computers may belong to this same workgroup.

A Windows 98 boot disk created using the FAT32EBD program from the Windows 98 CD can be used to create, format, and read FAT32 partitions and volumes.

Password If you've ever installed an OS from the Windows NT family, you may remember having to supply a password for the local Administrator during installation. You don't need to do that for Windows 98, because unlike those more security-conscious OSs, Windows 98 does not have a local security accounts database, and therefore does not have a local Administrator account. However, you do have to be prepared to provide a user name and password during the first logon after installation. This may be a user name and password that you only use to log onto this computer (a Windows logon), or it may be a user name and password that you use to log onto the network (a logon using the Client for Microsoft Networks). In either case, the user name and password you provide are saved in a password list file, which is given an 8.3 file name. The file name portion is the first 8 characters

of the user name, and the extension is PWL. The password should be no more than 14 characters long.

The type of logon (Windows or Network) depends on the questions you answered and how Windows 98 was configured during installation. If the logon dialog box is titled Welcome To Windows, the user name and password you must supply is used to log onto Windows locally. At this point, if you cancel that first logon dialog box, you will not be required to log on in the future, but you will not have network access.

After Windows 98 is installed, you can modify the settings that control the primary logon using the Network Properties dialog box, which you can access by right-clicking Network Places and selecting Properties.

If the logon dialog box is titled Enter Network Password, but only has the User name and Password boxes, your primary logon is to the Client for Microsoft Networks, which will give you network access in a peer-to-peer network (workgroup).

If your logon dialog box is titled Enter Network Password, but has three entry boxes, the first two as before, but with a third box labeled "Domain," you must provide a domain user name and password. In this case your primary logon is to the Client for Microsoft Networks, with a logon to the domain.

CD Key Many software installation programs require that you enter a particular string of characters before the software will install. In the case of Windows 98, this key is called a CD key code, and you will find it on the envelope of your Windows 98 CD.

Whenever you buy software, read the documentation to see if a key code is required. If one is needed, but it is not printed directly on the distribution CD, locate it (on the CD envelope or in the documentation) and use a permanent marker to write the code directly on the label side of the CD.

Network Configuration Information If your computer is on a LAN, it probably needs the TCP/IP protocol, which is the one installed by default when the Windows 98 Setup program detects a network. If the school lab computers are on a network, ask your instructor for the network configuration you will need to successfully connect your computer to the network. For TCP/IP this information may be simplified if the network has a special server, called a DHCP server, which gives out IP addresses and other IP configuration settings automatically to each computer. If there is no DHCP server on your network, you will be required to manually enter a static IP address and configuration information. You will need to obtain this information from your instructor before you begin.

Step-by-Step 13.01

Installing Windows 98

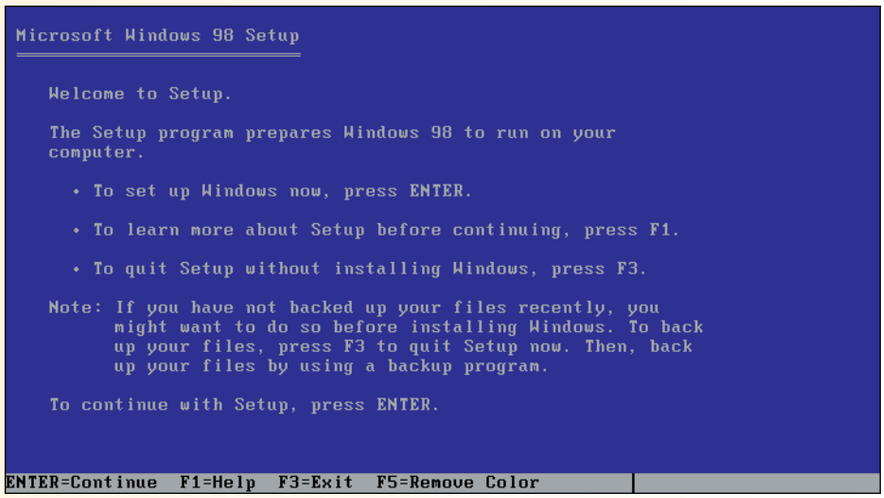
In this step-by-step exercise, you will perform a clean installation of Windows 98, creating a new partition and formatting it during the installation process. To complete this exercise, you'll need the following:

- A Microsoft/Intel standard personal computer (desktop or laptop) with a CD-ROM drive
- A connection to a LAN
- An unpartitioned hard disk (disk 0, the first hard disk)
- The Windows 98 CD
- The Windows 98 Setup boot disk or a DOS or Windows 98 startup disk with CD-ROM drivers
- One 3.5-inch diskette to use to create a new Windows 98 startup disk
- The CD key code from the envelope of your Windows 98 CD
- A name for your computer
- The name of the workgroup to be used in the class lab
- A password

- An IP address and other TCP/IP settings for your computer, or confirmation from your instructor that you should configure Windows 98 to get an IP address automatically

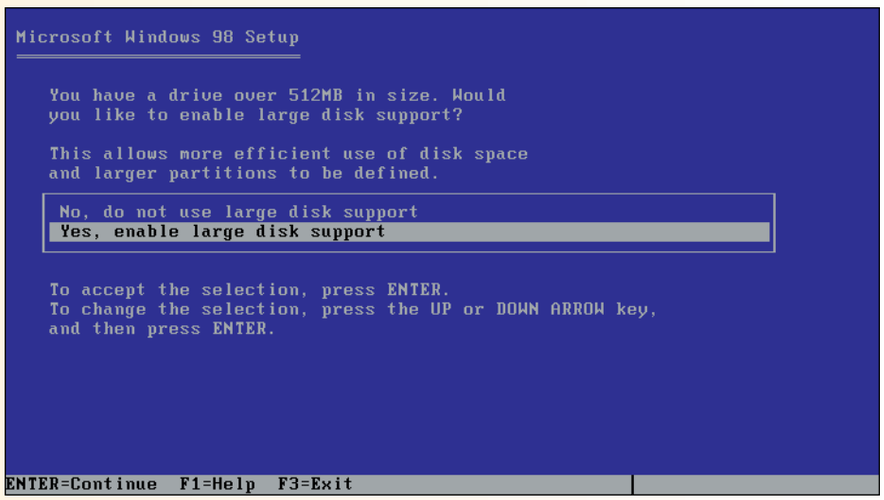
Step 1

Insert the Windows 98 CD and the Windows 98 boot disk or startup disk, or DOS boot disk, and restart the computer. When the computer restarts, the Microsoft Windows 98 Startup menu appears. Use the UP ARROW and DOWN ARROW keys to move the cursor among the three choices; select Start Windows 98 Setup from CD-ROM. Copyright messages for various drivers appear onscreen while DOS loads; then the screen turns blue and displays the Welcome to Setup message. Press ENTER to begin Windows 98 Setup.



Step 2

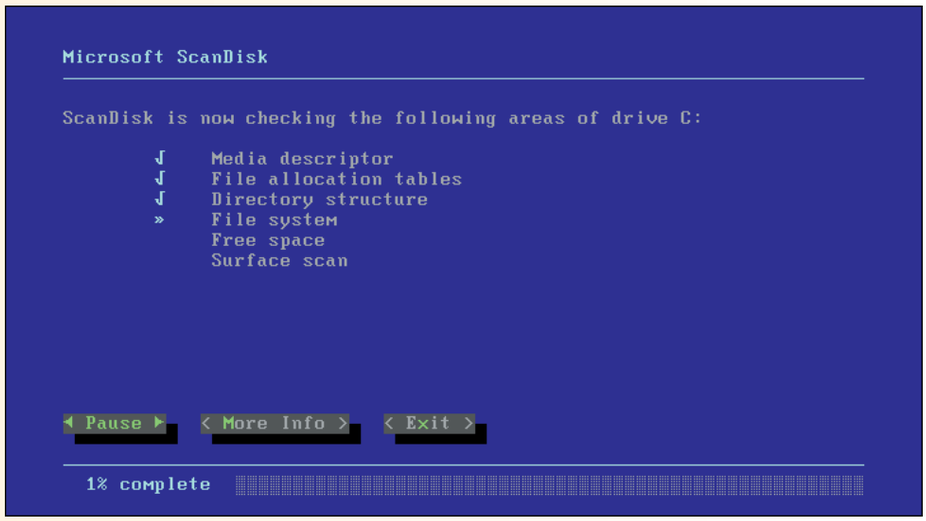
When the screen with choices for preparing your hard disk appears, select the choice to configure the unallocated disk space and then press ENTER. Another screen will appear if you have a drive over 512MB. If you see this screen, select Yes to enable large-disk support, and press ENTER to have Setup continue and partition your disk.



Step 3

Follow the instructions on the next screen; then press ENTER. Your computer will reboot, and you'll see a message that Setup is formatting your newly partitioned drive C:. After a

minute or two, a message states that Setup is preparing to install Windows. Setup then initializes and checks your system. When prompted, press ENTER to continue. ScanDisk will then run various tests on the disk.



Step 4

Setup prepares to start in GUI mode, and "Windows 98 Setup" appears over blue and black wallpaper. This will be the background for Setup until the next reboot. The first message box on this background shows the progress while files are copied. Click Continue, and Setup will prepare the Windows 98 Setup wizard.

Step 5

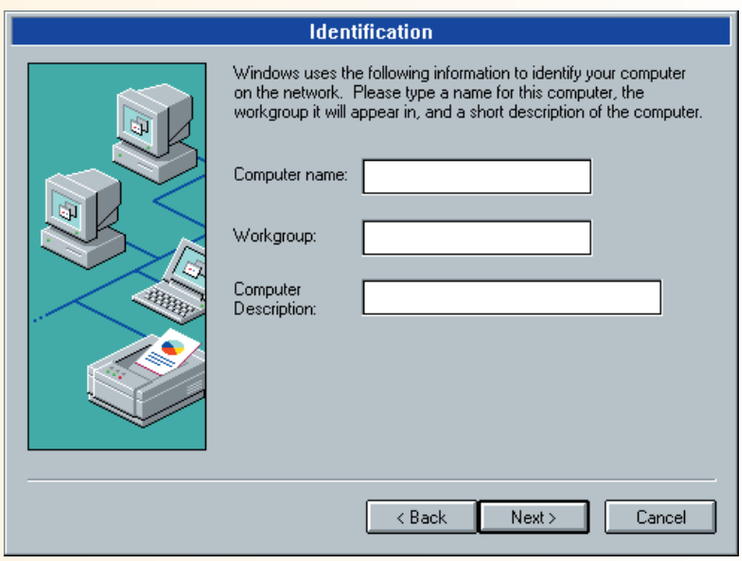
The license agreement appears next. Select I Accept The Agreement and click Next. The Select Directory dialog box appears in the Setup wizard. Leave the default (C:\WINDOWS) and click Next. The Preparing Directory message appears next with a single progress bar while Setup checks for installed components; then a second progress bar appears while Setup checks for available disk space. On the Setup Options page, select Typical and click Next.

Step 6

Enter your name and the name of your school or company on the User Information page. The Company field is optional. Next, the Windows Components page is your opportunity to customize the set of components Setup will install. Since you can also install any of these options after Windows 98 is installed, select Install The Most Common Components and then click Next.

Step 7

In the Identification dialog box, provide the computer name and workgroup name you prepared at the beginning of this exercise. The Computer Description field is optional. When you have completed this page, click Next.



Step 8

In the Location dialog box, select your country or region from the list and click Next. On the Startup Disk screen, click Next. A progress bar will appear, and if you have not yet inserted the disk into the floppy drive, a message box will appear requesting the disk and

giving directions for labeling it. Follow the instructions, click OK, and when prompted remove the startup disk; then click OK again and click Next.

Step 9

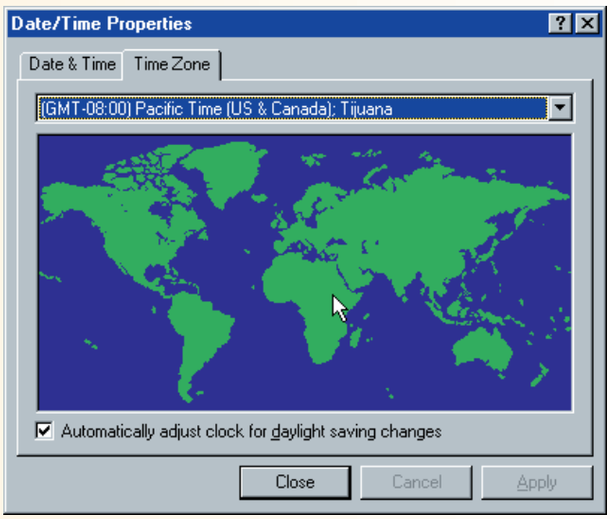
Click Next on the Start Copying Files screen. When the files have been copied, Setup will continue the installation, and you will see the Welcome to Microsoft Windows 98 message. In spite of the welcome, you're not quite there yet. It will take another 30 minutes, depending on the speed of your computer, and at least one more reboot before Windows 98 is completely installed. When all of the files are copied, Setup will automatically restart your computer.

Step 10

After the reboot, you'll see the Windows 98 splash screen with a message that the system is preparing to start Windows 98 for the first time. The Windows 98 Setup screen will appear again, and you'll see message boxes as it detects and sets up your hardware, both plug and play and non–plug and play. When this process is complete, Setup will restart your computer (again!).

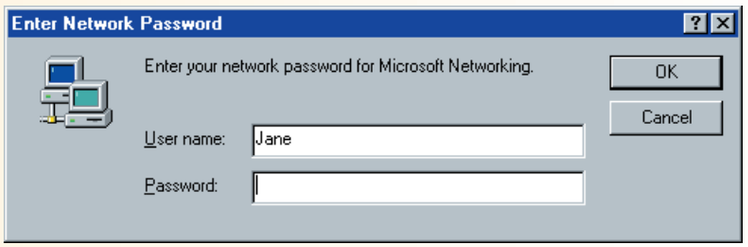
Step 11

After the reboot, the Setting Up Hardware message may appear yet again as Setup continues to detect, configure, and initialize hardware. When this process is done, the Date/Time Properties dialog box will appear. Use the drop-down list box to select your time zone, and then adjust the date and time as necessary; then click Close.



Step 12

A list of final tasks to be completed appears. When Setup has completed the tasks in the list, a Restart Computer screen will appear. Do nothing, and the computer will restart in 15 seconds, or click Restart Now to restart the system sooner. After the first reboot, you will see the Welcome To Windows (if only logging onto computer) or Enter Network Password (if logging onto network) dialog box, with the name you entered earlier on the User Information page.



Step 13

Enter a password in the Set Windows Password dialog box. Enter the same password again in the Confirm New Password text box. If your second entry matches the first, Windows 98 will save the password in a file stored locally with your name as the file name (for example, JANE.PWL). To have access to a Microsoft network from Windows 98, you must use this user name and password or a domain user name password.

Step 14

Windows 98 will take a few minutes to start. You'll see various messages while it builds the driver information database, completes the final, final installation tasks, and installs your personalized settings. If the Windows desktop appears, you have succeeded!

Performing Post-Installation Tasks

Now that you have installed Windows 98, you will want to verify that all devices are working, configure the desktop to your preferences, connect to the network (if necessary), and install the latest service packs.

Device Manager

The Device Manager tool allows you to configure and troubleshoot problems with devices. You can view and change device properties, update device drivers, configure device settings, and uninstall devices. Desktop support people have come to rely on this tool to verify a successful Windows installation by confirming that all of their hardware was recognized and is working properly.

Step-by-Step 13.02

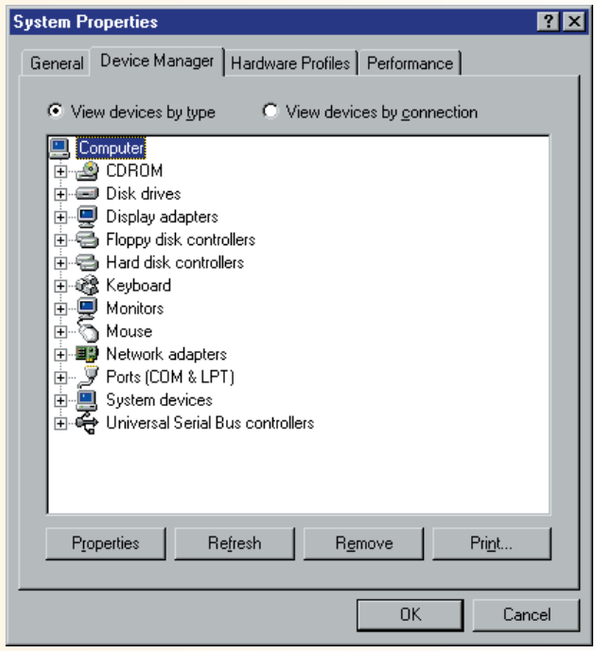
Working with Device Manager

In this step-by-step exercise, we will use Device Manager to verify that your devices are recognized by Windows 98 and functioning normally.

To complete this step-by-step exercise, you will need a computer on which you have successfully installed Windows 98 as described in Step-by-Step 13.01.

Step 1

Right-click My Computer and select Properties. In the Properties dialog box, select the Device Manager tab. You have two options for viewing: View Devices By Type and View Devices By Connection. You will normally use the first view, because it is simpler and more understandable. If Windows 98 recognized all of your hardware, you should see a list of device types under the Computer node.

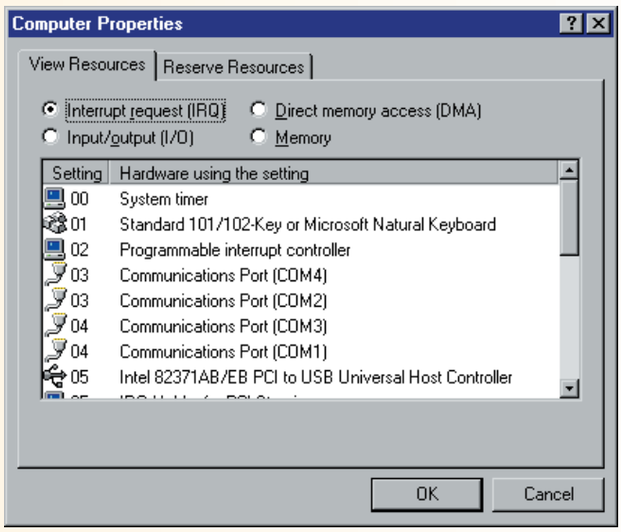


Step 2

If the OS detects a device and does not know what it is, does not have a device driver for it, or detects a problem with the device, that device type will be expanded and the device in question will have a yellow question mark next to it. If you see this on a device for which you do have a device driver from the manufacturer, you should install the device driver, following the manufacturer's instructions.

Step 3

If you are troubleshooting a problem with a non–plug-and-play device, you need to know the resources that are in use so you can determine whether there is a resource that your device can use. In this case, you can use Device Manager to view resource use. Do this now: select Computer in the device list, click the Properties button, and look at all four types of resources.



Configuring Network Access

Another common task after installing an OS is verification of connection to a LAN. If the computer was connected during installation, the network drivers should have been installed, but this is one part of the installation that can easily go awry with Windows 98. It is not uncommon to wait until after the installation of base components to install a network card driver or to configure the network protocol.

If the network card driver was successfully installed during setup, you still may not be connected to the network if you are not using the correct network protocol. That usually involves a choice among the protocols supported by Windows 98: NetBEUI, TCP/IP, and NWLink (Novell's IPX/SPX in Microsoft clothing). If your network is using NetBEUI, you just install the protocol and you are done—no configuration needed. If your network is using NWLink or IPX/SPX, you install the Microsoft NWLink protocol and then, in most cases, you are finished.

However, the majority of networks today use TCP/IP, so we will assume that is the protocol you need. That is also the most complicated protocol to work with, but we will do only the absolute basics here. In the following step-by-step exercise, you will verify network connectivity, assuming a TCP/IP network. If you discover a problem with network configuration, you will have to correct that problem. In the class lab, your instructor can guide you through these corrective measures. In the step-by-step exercise, you will open the dialog boxes you would have to use to correct network configuration problems.

Step-by-Step 13.03

Verifying and Configuring Network Access

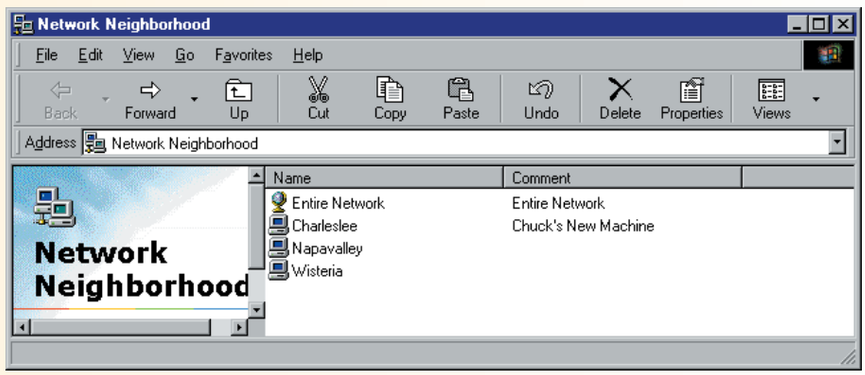
In this step-by-step exercise, you will verify network access of your new Windows 98 installation. You will also explore a few of the most common scenarios you may encounter.

To complete this step-by-step exercise, you will need the following:

- A computer on which you have successfully installed Windows 98 as described in Step-by-Step 13.01
- Connection to a LAN that has other computers using TCP/IP
- One or more computers on the LAN with shared folders visible to all LAN users
- The Windows 98 CD or an alternate location where the Windows 98 source files are stored

Step 1

Use Network Neighborhood as a very casual test of network connectivity. Double-click the Network Neighborhood icon now. You should see a globe icon labeled "Entire Network" and a list of all computers that are in the same workgroup as your computer. In our example, all the computers in the workgroup named Workgroup are listed. But wait; the Windows 98 computer we are using, Cholla, doesn't show up in this list. Why? We'll look at the reason for this next.



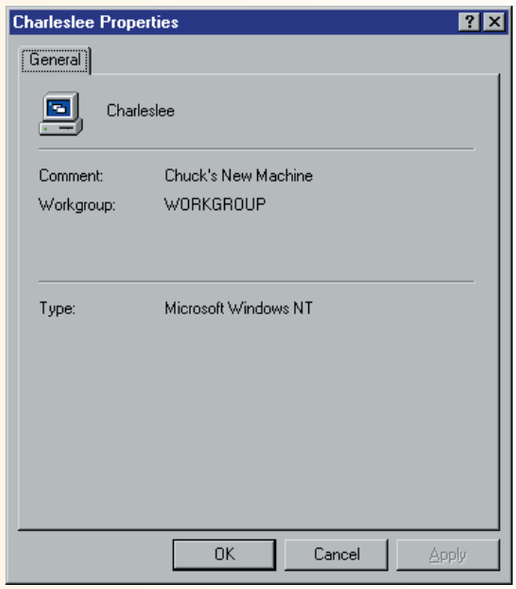
Step 2

The only computers that are seen in Network Neighborhood are servers. A service called File and Print Sharing will make a Windows 98 computer act like a server. In our example, the other computers have this service turned on, but Cholla does not. Do not turn on the File and Print Sharing service unless you intend to create folder shares on your computer for others on your network to access. The computer named Charleslee has an optional descriptive comment, "Chuck's New Machine."

Step 3

Right-click a computer in Network Neighborhood and select Properties. You can see the same identifying information shown in Network Neighborhood, plus the workgroup to

which the computer belongs and the OS it is running. However, this last item is not entirely accurate because all Windows NT, Windows 2000, and Windows XP computers are identified here as being Microsoft Windows NT. In our example, the computer Charleslee is actually running Windows XP.

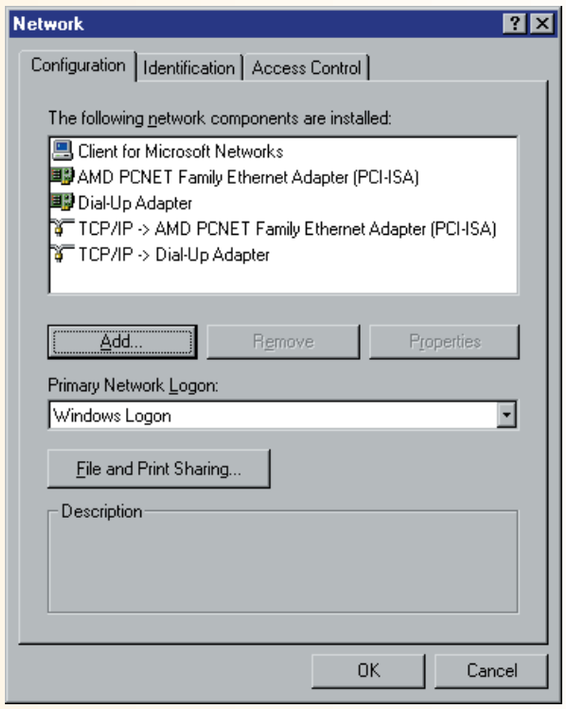


Step 4

Sometimes you are not permitted to view the Properties dialog box of a computer in Network Neighborhood. Don't be surprised if this happens, especially if you are trying to see the properties of a server to which you do not have permissions. If it does happen, just close the box and move on.

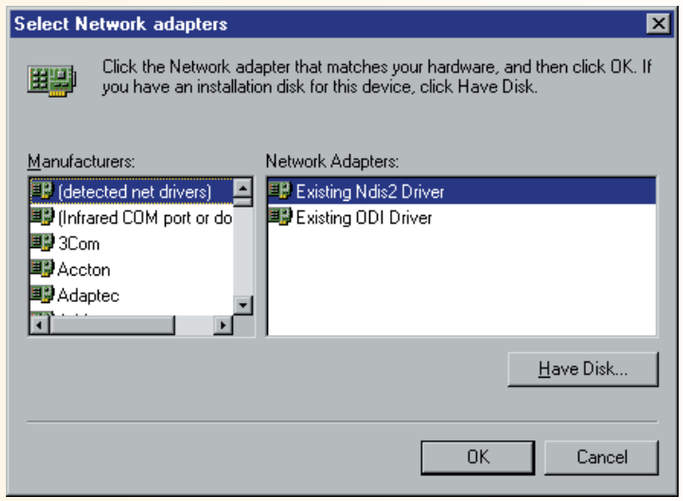
Step 5

Now check out your network configuration. Close Network Neighborhood; then right-click the Network Neighborhood desktop icon and select Properties. The list of network components should include Client for Microsoft Networks, a network adapter (usually an Ethernet adapter), and TCP/IP for the network adapter. If a modem was detected, you will also see Dial-Up Adapter and a network protocol for the dial-up adapter. Furthermore, the Primary Network Logon field controls which logon dialog box is used (Welcome To Windows or Enter Network Password).



Step 6

If the network adapter or the protocol is missing, you can add them by clicking the Add button in the Network Properties dialog box, selecting the component type in the Select Network Component Type box, and clicking Add. If the resulting Select Network Adapters dialog box does not contain your network adapter and you have the driver disk that came with the adapter, insert it, click the Have Disk button, and provide the path to the driver files (for example, D:\drivers).

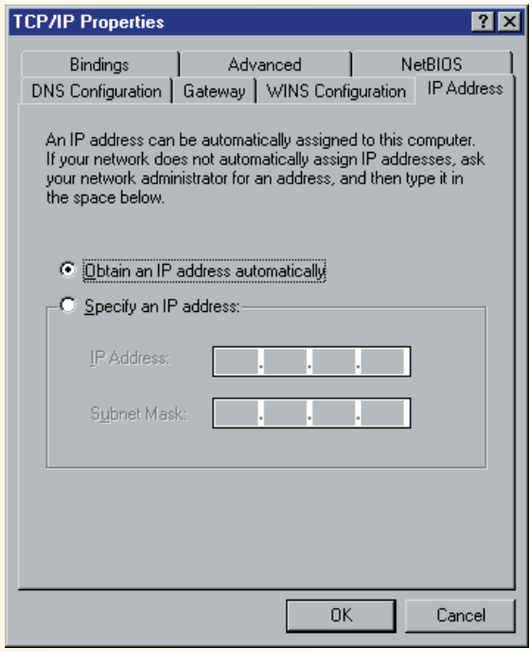


Step 7

When you're finished with the adapter installation (if, indeed, you had to install an adapter at this point), return to the Network Properties dialog box.

Step 8

Select TCP/IP *adapter* (where *adapter* is the name of your network adapter) and click Properties. In most organizations, the desktop computers obtain an IP address automatically from a special server on the network. If this is how you were instructed to configure your computer, it should look like the example shown here.

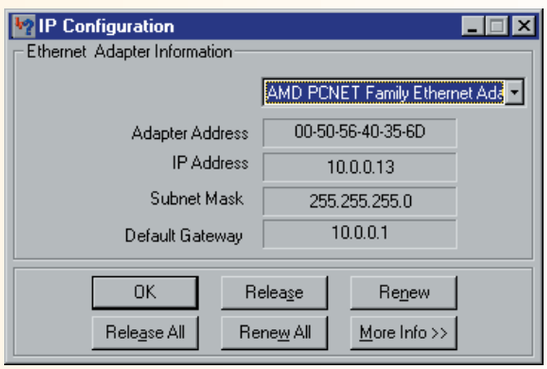


Step 9

If your instructor gave you a bunch of numbers to enter for your IP address and other settings, you should see those numbers in this dialog box. If you were not able to see other computers on your network, verify that these settings match those you were given and make any necessary corrections.

Step 10

If your computer is configured to obtain an address automatically, but you cannot see any computers on the network (assuming that there are computers to see), you can verify that your computer did obtain an address by using a program that looks at your TCP/IP configuration. To do this, choose Start | Run and type **winipcfg** in the Run box. This will open a small GUI program.



Step 11

If the adapter shown in the box is not your LAN adapter, use the spin arrow to select the adapter. If the IP address and subnet mask show zeros (0.0.0.0), or if the IP address begins with 169.254 (for example, 169.254.182.66) and has a subnet mask of 255.255.0.0, then your computer did not get a response from the server that should have given it an IP address, and, if this is the case, you should notify your instructor.

Step 12

If you and your instructor are satisfied that your computer is working as expected on the network, you can close the IP Configuration dialog box and any others that were opened for this step-by-step exercise. If you have made any changes to your network configuration, you will have to restart Windows to make the changes take effect.

Adding Updates and Service Packs

A Windows operating system is a very complex life-form—well, maybe it's not a life-form, but people talk to Windows all the time! As with anything so complex, flaws are discovered and solutions found for these flaws. Sometimes the solutions are needed to correct incompatibility with drivers for a class of hardware. Sometimes there are problems with Windows' interaction with an application program. Or maybe hackers have discovered a new way to defeat Windows security. These and many other scenarios cause the Microsoft programmers to seek solutions to the problems.

Applications are also updated. Therefore, after installing an application, check out the appropriate web site to see if updates need to be applied. There is a link to Microsoft Office Product Updates at the Microsoft Windows Update site.

The software solutions to these problems are called, collectively, updates. Those that solve security problems or problems that can potentially cause major failures are now called **critical updates**. These are made available as programs called patches that solve a single or more than one closely related problem. A group of patches may be bundled together into one large (several megabyte) installation package and called a service pack.

These updates are available at the Microsoft web site, but if you do not have an Internet connection, you can order updates on a CD for a nominal fee. If you do not have an Internet connection, your instructor may provide the updates needed for the next step-by-step exercise on a CD or on a server on the network.

Step-by-Step 13.04

Installing Updates and Service Packs

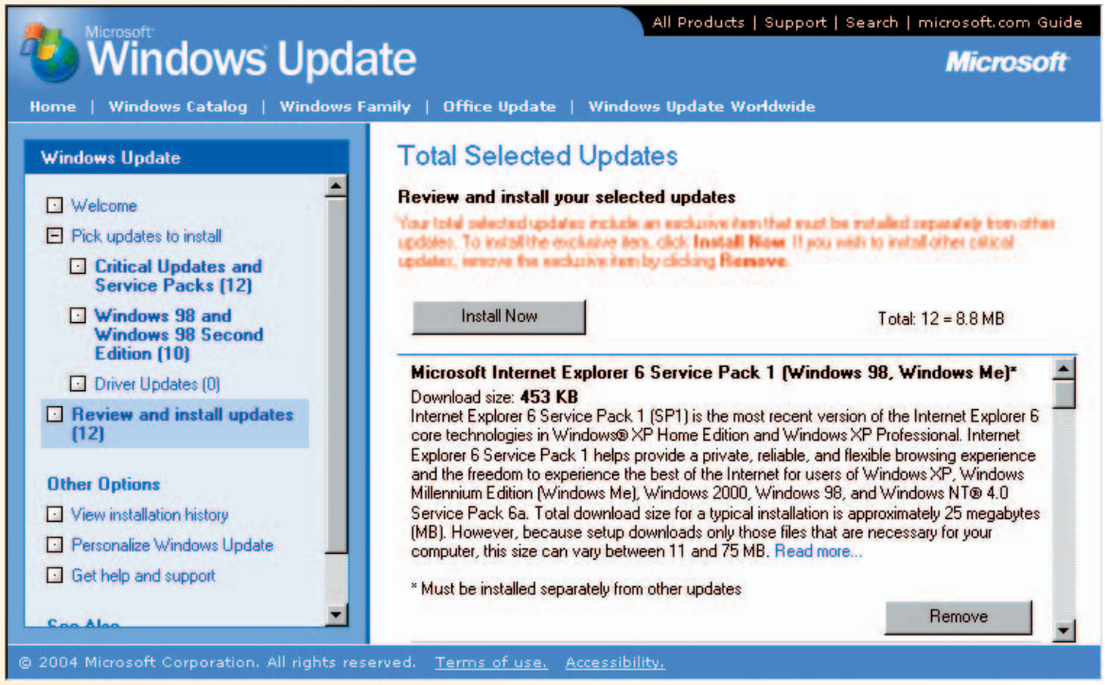
In this step-by-step exercise, you will connect to the Microsoft web site and download and install the latest service pack for Windows 98. Alternatively, if you do not have Internet access or if your Internet access is slow, your instructor may provide the service pack on a CD or on a network server. Service packs and other update files are usually huge—often in the tens of millions of bytes!

To complete this step-by-step exercise, you will need the following:

- A computer on which you have successfully installed Windows 98 as described in Step-by-Step 13.01
- An Internet connection or the service pack on a CD or on a LAN server

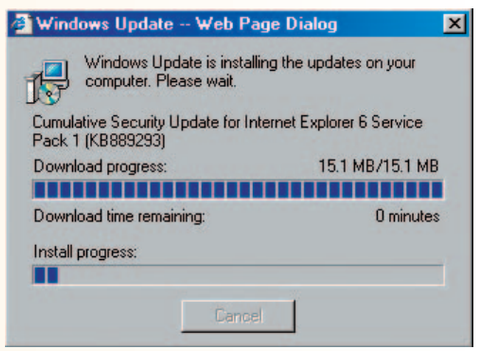
Step 1

Choose Start | Windows Update. When you first connect, the version of the locally installed Windows Update software will be checked. Follow the onscreen instructions to upgrade it, if necessary. Then, at the Welcome To Windows Update page, select Scan For Updates. On the Pick Updates To Install page, click Review And Install Updates. If an Internet Explorer warning appears, select Yes to continue.



Step 2

On the Total Selected Updates page, follow the instructions to install the updates, beginning with any exclusive updates, which will be installed separately. For instance, an upgrade of Internet Explorer is an exclusive update and requires a restart of Windows. Then you will need to run Windows Update again to continue selecting and installing other updates. Note that some of the updates require acceptance of the terms of a license agreement.



Step 3

After the exclusive update or updates are installed, Windows Update will allow multiple updates to be selected and installed. Follow the progress in a Web Page Dialog box as Windows Update first downloads and then installs the updates. Respond to the instructions on the screen. After restarting, there may be a short delay while system settings are updated, and then you may resume working in Windows.

Customizing and Managing Windows 98

After you have verified the success of your OS installation, ensured that the computer is communicating on the network (if necessary), and installed necessary updates, it's time to add the finishing touches that will make the computer the tool you or someone else can use. And there must certainly be applications that need to be installed. In this section, you will install an application using the installation program created for that application. Then you will use the Add/Remove Programs Control Panel applet to add and remove Windows components.

Application Installation Methods

When you install an application in Windows 98, you have two general choices for the method of installation. You can simply run the installation program for the application directly, or you can run the installation program from the Add/Remove Programs Control Panel applet. Add/Remove Programs is a Control Panel applet that allows you to install and uninstall applications, add and remove Windows components, and create a startup disk.

Installing Applications from Add/Remove Programs

The Windows 98 Add/Remove Programs Control Panel applet has a page that you can use for installing an application. Our recommendation is that you use this only if you are installing a DOS application or a 16-bit Windows application (written for Windows 3.*x*). In those cases, running the DOS or 16-bit Windows application from the Install/Uninstall page of the Add/Remove Programs dialog box will ensure that Windows 98 is aware of the installation and can make changes to its configuration information that these older installation programs would not know to do. In that case, you first find out the name and location of the installation program; then you would select the Install button from the Install/Uninstall page, and follow the instructions to enter the path and name of the command needed to run the installation program.

Installing Applications Directly

A program written to run in 32-bit Windows will come with its own installation program. This program will know the "rules" for passing on its configuration requirements to Windows, and you may run this program by starting it without the help and supervision of Add/Remove Programs. In the following step-by-step, you will do just that when you install an application using the installation program from the application.

Step-by-Step 13.05

Installing an Application in Windows 98

If you have a standard Office application, such as Microsoft Word, you may substitute that, but you will have to consult the documentation for the exact procedure for installation. In the following steps, we use an application you should have available to you: the Windows 98 Resource Kit Tools Sampler, which can be found on the Windows 98 CD. After installing this application, you will verify that it is installed and that you can open the application.

To complete this step-by-step exercise, you will need the following:

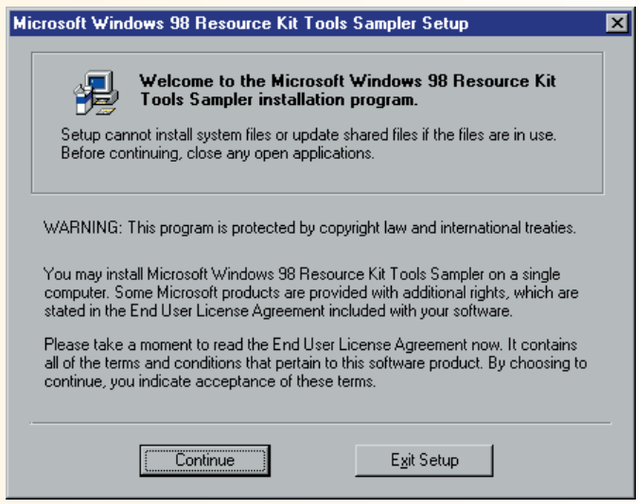
- A computer on which you have successfully installed Windows 98 as described in Step-by-Step 13.01
- The Windows 98 CD or a copy of the \tools\ reskit folder from the CD

Step 1

Insert your Windows 98 CD in the drive. If the Windows 98 CD-ROM window opens, select Browse this CD; otherwise, open Windows Explorer and expand the CD-ROM drive. In either case, expand \tools\reskit. In the reskit folder, double-click (or click, depending on your settings) the Setup.exe program. (If you cannot see the file extensions, the Setup program is the file with the computer icon.)

Step 2

When the software license agreement appears, read it and click Accept. Read the next message and take a minute to close all other open applications. Then click Continue.

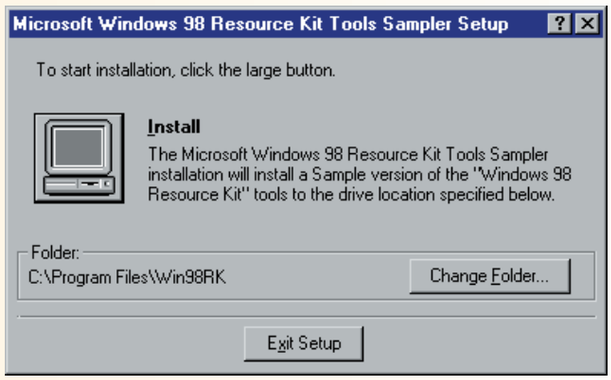


Step 3

Enter your name and organization information on the next screen and click OK. A confirmation screen will appear. Verify that your name and organization are correct and then click OK. The next screen displays the destination folder where the tools will be installed. If you want to change this location, use the Change Folder button. Otherwise, click OK.

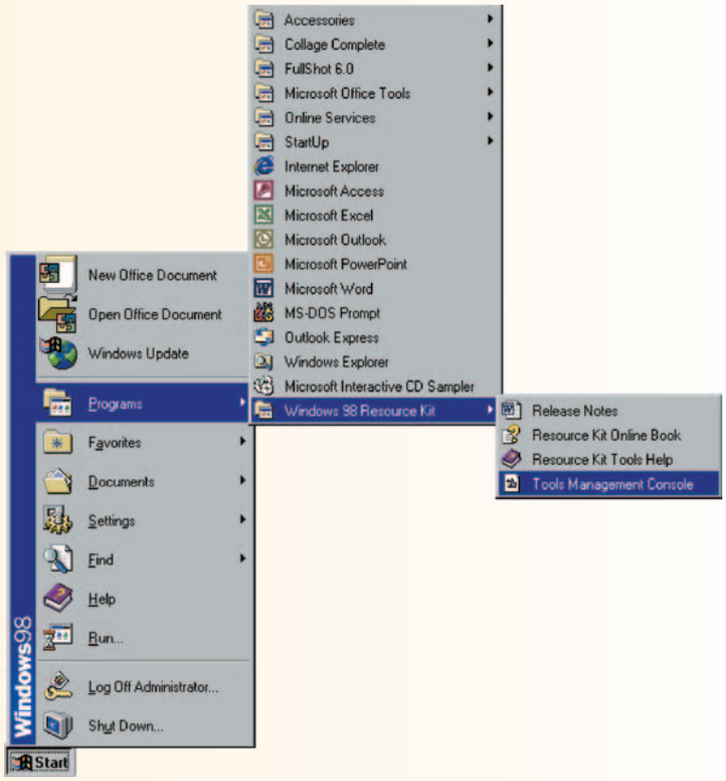
Step 4

The next screen prompts you to start the installation (finally!). Click the large button to the left of the word *Install*. Then click OK in the small dialog box announcing that the installation was successful.



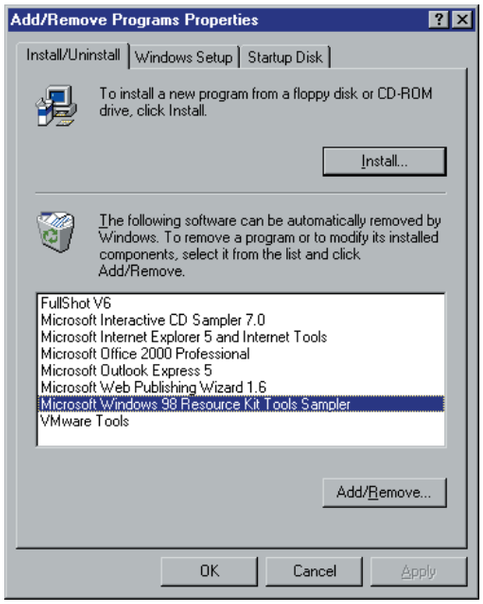
Step 5

Confirm that the Windows 98 Resource Kit Tools Sampler has been installed. Choose Start | Programs | Windows 98 Resource Kit. Then select each of the shortcuts on the Windows 98 Resource Kit menu to verify that the Resource Kit Tools Sampler was installed correctly.



Uninstalling Applications

After the installation, you will see programs listed in the Add/Remove Programs dialog box. They also usually come with their own uninstall program, and create a menu shortcut to uninstall when they are installed. For those applications that do not have an uninstall program, you should use the Add/Remove Programs dialog box when you wish to remove them. You simply select the applications from the list, and click the Add/Remove button.



Adding/Removing Windows Components with Add/Remove Programs

Certain programs that come with Windows 98 are considered to be optional components. During installation you can choose which components to install, and after installation you can use the Windows Setup tab of the Add/Remove Programs applet to add or remove components.

Step-by-Step 13.06

Using Add/Remove Programs

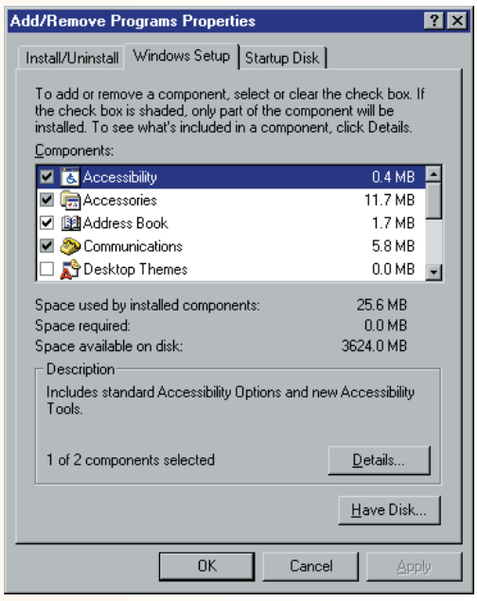
In this step-by-step exercise, you will use the Control Panel applet Add/Remove Programs to see the listing of optional Windows components. Then you will install and uninstall Windows components.

To complete this step-by-step exercise, you will need the following:

- A computer on which you have successfully installed Windows 98 as described in Step-by-Step 13.01
- The Windows 98 CD

Step 1

Choose Start | Settings | Control Panel | Add/Remove Programs. Select the Windows Setup tab. After the list of installed components appears, do not click the check boxes, because clearing or checking a box will uninstall or install an entire component category. A category with a check in a gray box has some components installed, a category with a check in a white box has all components installed, and a category with a cleared check box has no components installed.



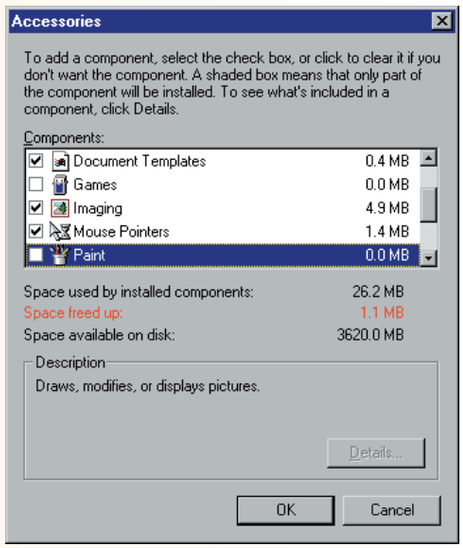
Step 2

Click the *name* of each of the component categories and notice that when you click a category with multiple components,

the Details button (bottom right) becomes enabled, and the Description box shows the number of components.

Step 3

Now install the mouse pointers and uninstall the Paint program. Click the Accessories Components category name and then click the Details button. Click to place a check in the box by Mouse Pointers. Click to remove the check in the box by Paint (this will cause Paint to be removed). Then click OK. If you removed the Windows 98 CD, you will be asked to reinsert it. When the installation is complete, close Add/Remove Programs, but leave Control Panel open.



Step 4

Verify that mouse pointers were installed by opening the Mouse icon in Control Panel. Click the Pointers tab and click the arrow button in the Scheme list box. The default schemes include only Animated Hourglasses and Windows Standard. You now have more schemes.

Step 5

Verify that the Paint shortcut is no longer on the Start | Programs | Accessories menu. Once you have verified that this change worked, if you would like to add the Paint program back, simply return to Add/Remove Programs, and place a check in the box by Paint.

Managing Users, Files, and Printers

What if two or more people need to share a Windows 98 computer, and they want to keep their files and preferences separate? Are there special issues to be aware of when working with files on a Windows 98 computer? How do you add a printer to Windows 98? In this section, you will learn the answers to these questions, which involve managing users in Windows 98 through user profiles, working with long file names, and installing printers.

In the following step-by-step exercise, you will use the F5 key to refresh an open window after making a change that adds or removes one or more objects in an open window. Until you refresh the screen, the object may not appear at all or may appear out of the normal order. Remember to refresh (also an option on the View menu) whenever a window or folder does not look up-to-date.

Adding a New User

Sometimes a computer is used by more than one person at different times. Perhaps it's a home computer shared by several family members, or maybe it's a computer in an office used by two people working different hours. If you create a new user in Windows 98, you can take advantage of something called **user profiles**. A user profile is a set of folders and desktop settings that are unique for each user.

If your Windows 98 computer is not a member of a Windows domain and is a stand-alone or workgroup computer, then users are managed locally. That's true for Laura and Rebecca, employees of a small import/export company. They share the same Windows 98 computer and desk. This

isn't a big problem, because Laura works days and Rebecca works nights. However, they have different work habits and different ideas of how a computer desktop should be organized, so they need separate user profiles. When Windows 98 was installed, Laura was the only user of the computer and hers was the only profile. Now Rebecca needs a profile added.

Although unlike Windows NT, Windows 2000, and Windows XP, Windows 98 does not truly have a security accounts database, it does allow you to create individual profiles for multiple users of a computer. If you set up this function, as described in the following step-by-step exercise, you can configure the computer for use by more than one user (not simultaneously, of course), and each user will have his or her own personal profile, which includes desktop settings and folders.

All local users will be able to access any file or folder on the local hard drive because Windows 98 and the FAT file systems do not support file- and folder-level security. To avoid conflict, each user should open his or her My Documents folder from the shortcut on the desktop.

Step-by-Step 13.07

Adding a User and Customizing the Desktop

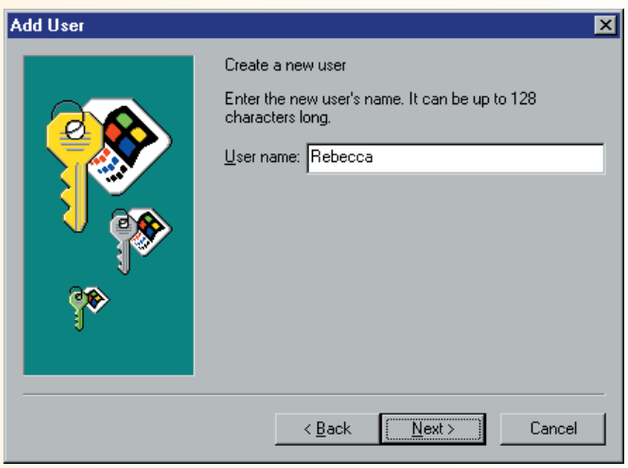
In the following steps, you will add a user profile for a second user on your lab computer to practice the steps necessary to configure the Laura/Rebecca computer. Then you will log on as the new user and customize the desktop for the new user, including installing Desktop Themes from the Windows 98 CD.

To complete this step-by-step exercise, you will need the following:

- A computer on which you have successfully installed Windows 98 as described in Step-by-Step 13.01
- The Windows 98 CD

Step 1

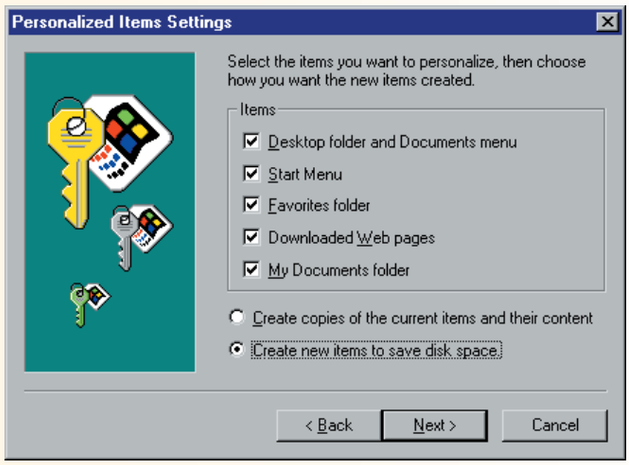
Choose Start | Settings | Control Panel | Users. If the Enable Multi-User Settings box appears, click Next to open the User Settings box. In the User Settings box, click New User. After the Add User wizard starts, click Next. On the next page, enter **Rebecca** in the User Name box and then click Next.



Step 2

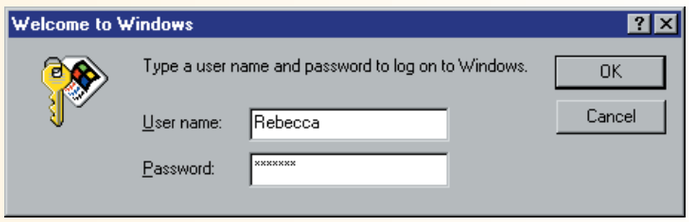
Enter a password in each of the Enter New Password boxes (be sure to remember the password!). Then click Next. On the Personalized Items Settings screen, place a check in all five check boxes, click the radio button by Create New Items To Save Disk Space, and

click Next. Click Finish on the Ready To Finish screen. Click Close to close the User Settings box.



Step 3

Log off by choosing Start | Log Off. Click Yes in the Log Off Windows dialog box. The Welcome To Windows or Logon Information dialog box will appear with fields for a user name and password. Enter the user name and password of the new user profile you created and then log on.

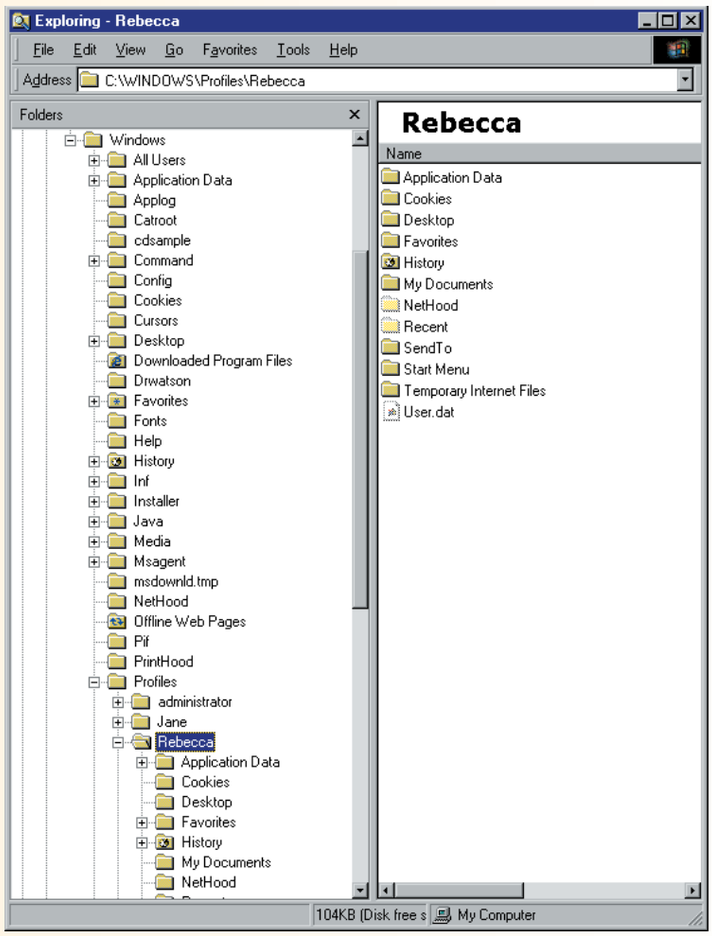


Step 4

While logged on as the new user, use the Desktop applet to modify the desktop so that it looks radically different from the default desktop with which you started as a new user. Then log off and log back on with your old user name. Notice that the desktop settings are preserved for each user. You each also have separate folders for your own use, but you will still be able to access each other's documents—a potential problem when users share a Windows 98 computer!

Step 5

Each user has a set of profile folders. Use Windows Explorer to look at the profiles stored on your computer. If you installed Windows 98 in C:\Windows, the profile folders are stored in C:\Windows\Profiles. Each user profile is contained in a set of folders bearing the user's name. When you are finished, close Windows Explorer but stay logged on as the new user.



Step 6

Your new user would like Desktop Themes, which come with Windows 98 but are not installed during a Typical installation. To install Desktop Themes, open Control Panel | Add/Remove Programs and select Windows Setup. In the Components list, click the check box by Desktop Themes and then click OK. Insert the Windows 98 CD and click OK. It may take a few minutes for the files to be copied, and then the Add/Remove Programs box will close automatically.

Step 7

You should now have a new Control Panel applet for Desktop Themes. If this does not appear in Control Panel, press F5 to refresh, and it will appear. Double-click the Desktop Themes icon. In the Desktop Themes applet, open the Theme drop-down box and notice that the themes require a minimum of 256 colors and some require high color. Check out your computer's color density on the Settings tab of the Display applet, and then select a theme with the correct color density and click OK.

Working with Long File Names in Windows 98

Earlier in this chapter, you learned that Windows 98 includes LFN support for file names up to 255 characters long. Now you will look at how LFNs are stored in a FAT directory and how Windows 98 creates an 8.3 alias for a file with an LFN.

Storing the LFN in a FAT Directory

Each file or folder on a drive must have a directory entry. On a FAT volume, each directory entry is only 32 bytes long—but the file name isn't the only information that has to fit into a directory entry. The size, date, time, file attributes, and beginning cluster information are also stored in those 32 bytes.

Here is how the programmers managed this trick: If you save a file with a standard 8.3 file name, the OS writes the file name and other information as a standard directory entry, just as MS-DOS or Windows 3.*x* would. But if you save a file with a long file name, where is the OS going to store it in a directory entry that is only 32 bytes long? The answer is that the OS uses multiple directory entries: a primary one to store the standard directory information, and additional (secondary) directory entries to store the long file name. Each file has only one **primary directory entry** in which Windows 98 stores an 8.3 version (alias) of the long file name, but the file may have as many **secondary directory entries** as necessary to store the entire LFN, because each secondary directory entry can store only 13 characters of the LFN, in spite of having 32 bytes to work with. Figure 13-2 shows a directory listing of the root of C: in which you can see two 8.3 aliases: MYDOCU~1 and PROGRA~1. The first is the **8.3 alias** of the long file name My Documents, and the second is the 8.3 alias of the long file name Program Files. Both of these happen to be folders, but the same naming rules and methods apply to them as to files.

Windows 98 is not case sensitive when creating file names—you can enter a file name in upper-, lower-, or mixed case, but the OS will convert all alphabetic characters to uppercase in the 8.3 alias while using the exact case you entered in the stored LFN.

Windows 95 and Windows 98 both use this method for creating the 8.3 alias. Windows NT, Windows 2000, and Windows XP use a similar method.

```
 Volume in drive C has no label
 Volume Serial Number is 1A59-1E06
 Directory of C:\

WINDOWS         <DIR>          04-24-02 11:35p
MYDOCU~1        <DIR>          04-27-02 11:37a
PROGRA~1        <DIR>          04-24-02 11:35p
RECYCLED        <DIR>          06-11-02  7:43a
CAPTURES        <DIR>          06-03-02  7:42p
DATA            <DIR>          07-13-02  5:23p
BOOTLOG  TXT        51,478     04-27-02 11:38a
COMMAND  COM        93,890     04-23-99 10:22p
SUHDLOG  DAT         5,166     04-25-02  7:43a
DETLOG   TXT        71,227     04-25-02  8:02a
MSDOS    ---            22     04-24-02 11:31p
SETUPLOG TXT       118,215     04-26-02  9:31a
NETLOG   TXT         9,971     04-26-02  9:31a
MSDOS    SYS         1,676     04-25-02  8:08a
ASD      LOG           182     04-29-02  9:53p
BOOTLOG  PRV        42,877     04-26-02  9:33a
CONFIG   SYS             0     04-26-02  9:32a
AUTOEXEC BAT             0     04-26-02  9:32a
SCANDISK LOG         6,460     08-03-02  5:17p
Press any key to continue . . .
_
```

• **Figure 13-2.** 8.3 file name for My Documents

Creating the 8.3 Alias

Windows 98 converts long file names to 8.3 file names by first removing all illegal characters (per the 8.3 naming convention discussed in Chapter 2). Then it uses the first six remaining characters and adds a tilde (~) and then a number. If this is the first file in the same directory with these first seven characters, the number will be 1. If a matching file ending with 1 already exists, then it will use 2, and so on, until it reaches 99. After that, it uses the first four legal characters, adds a tilde, and than a number, beginning with 100. View both the LFN and the 8.3 alias with Windows Explorer when you open the Properties dialog box for the file, as shown in Figure 13-3.

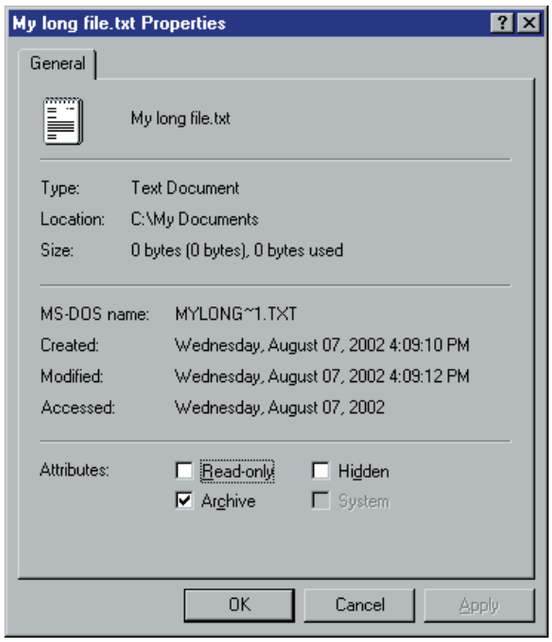


Figure 13-3. File Properties dialog box

Installing Printer Drivers

Installing a new printer in Windows 98 is fairly simple. If it is a plug-and-play printer, it may be recognized automatically, and if Windows 98 has the correct driver files, it will be installed automatically, if the driver files are available. You may be prompted for the Windows 98 CD even if your computer does have the driver for a device but needs to add support files to go with the manufacturer's driver files you provided.

Always read the manufacturer's installation instructions before connecting a new printer or installing device drivers. They may require you to run the manufacturer's installation program rather than use the Printer applet. In the following step-by-step, you will install the drivers for a printer. You do not need to have a printer physically connected to complete it; you can just pretend that you have a printer connected!

You often need the Windows 98 CD to add components and drivers to Windows 98. Therefore, if you have sufficient disk space, you should copy the contents of the Win98 folder from the Windows 98 CD to a folder on your hard drive.

Try This!

Find a Windows 98 8.3 Alias

If you have a computer running Windows 98, you can create files with LFNs and view the resulting 8.3 alias. Try this:

1. Using Windows Explorer, expand the My Documents folder.
2. Right-click in the contents pane and choose New | Text Document. Name the text document **My long file.txt**.
3. Right-click My long file.txt and select Properties.
4. At the top of the General tab, you can see the long file name, My long file.txt. Further down, you should see the 8.3 alias identified as the MS-DOS name, MYLONG~1.TXT.

Step-by-Step 13.08

Installing a Printer Driver

In this step-by-step exercise, you install a printer driver in Windows 98.

To complete this step-by-step exercise, you will need the following:

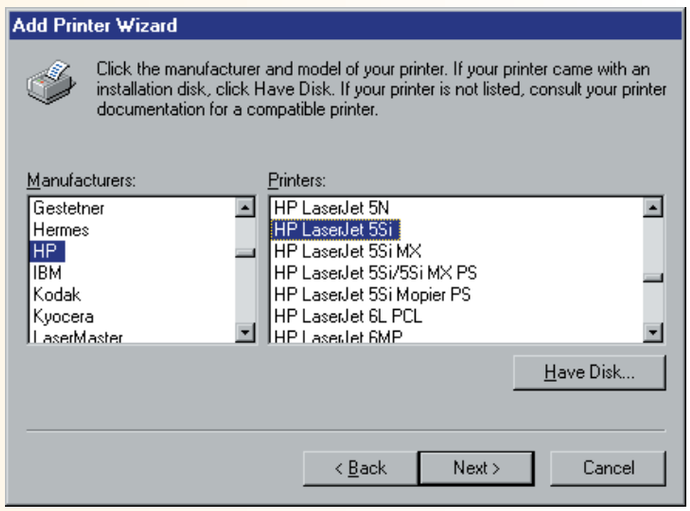
- A computer on which you have successfully installed Windows 98 as described in Step-by-Step 13.01
- The Windows 98 CD

Step 1

Choose Start | Setting | Printers and click the Add Printer icon, which starts the Add Printer wizard. Click Next to begin the installation. In the dialog box that asks "How is this printer attached to your computer?" select Local Printer and click Next.

Step 2

There may be a delay while Windows loads the driver information database; then the manufacturer and model page appears. Select HP in the Manufacturers list and HP LaserJet 5Si in the Printers list; then click Next.



Step 3

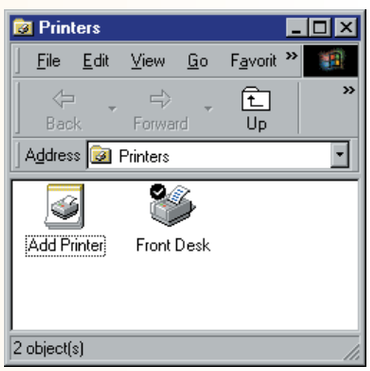
Select Lpt1 as the port to which the printer is connected and click Next. On the Printer Name page, you can give the printer a name that makes sense to the people using the printer: for instance, "Front Desk" or "Back Office." Replace the printer model name with a more user-friendly name and click Next.

Step 4

In the last dialog box, you can choose to print a test page. This is something you will want to do if you are installing a driver for an actual printer attached to your computer. If you do not have the printer that goes with the driver you just installed, click Finish. If the Windows 98 CD is not in the drive, you will be prompted to insert it; insert the CD and click OK.

Step 5

If you chose to print a printer test page in the preceding step, it will print after the files are copied and the driver is installed. In this case, a dialog box will appear with the name of the printer and ask whether the page printed correctly. Click Yes (if it actually did print correctly) to close this box.



Step 6

Open the Printers folder to verify that an icon for the new printer appears in the Printers folder.

Troubleshooting Common Windows 98 Problems

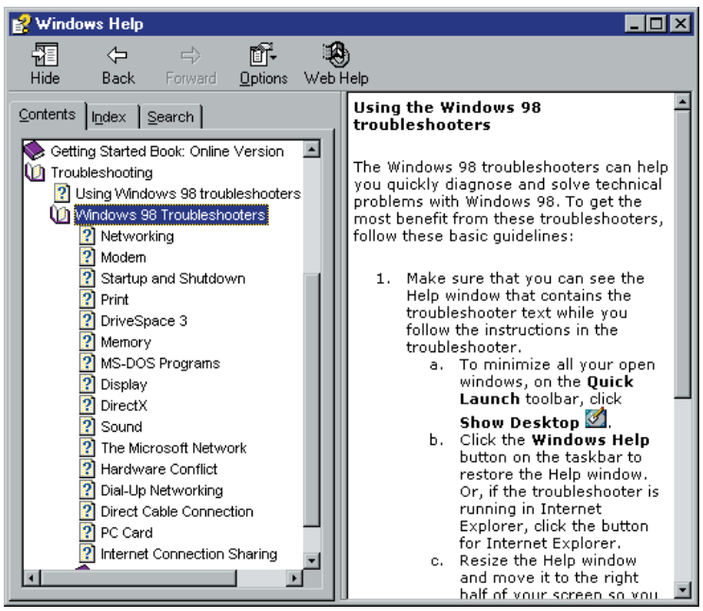
Troubleshooting is sometimes more art than science. In fact, even if you are new to working with computers, you can solve many problems by carefully observing and recording what you see. Sometimes the problems and solution are obvious—like when you notice that the power cord isn't plugged in. Other times, they aren't so obvious—like when an error message appears on your screen. In this section, we will take a simple approach to troubleshooting the most common Windows 98 problems. First we will list resources you can check when you are looking for a solution; then we will go through some common problems and approaches to solving them.

Resources for Troubleshooting

The resources for troubleshooting Windows 98 problems include components that come with Windows 98, such as Windows Help, Device Manager, and the Registry Editor. Other tools come with the Windows 98 Resource Kit, which can be purchased as a separate product.

Windows Help

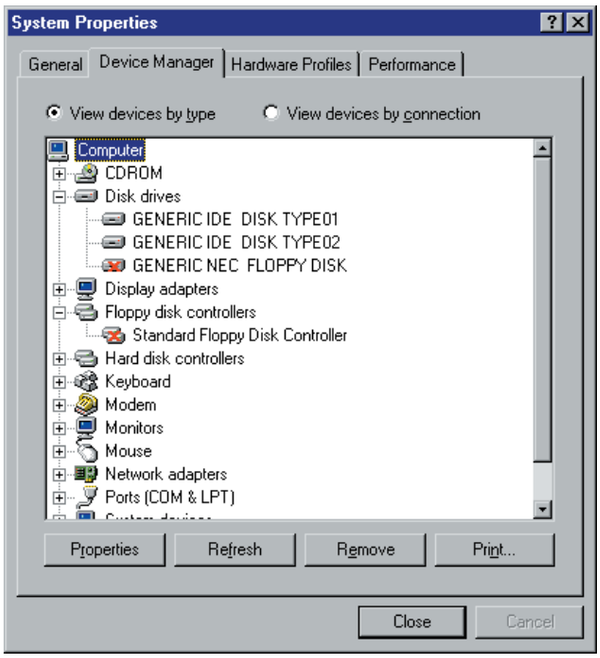
Windows 98 has a pretty good help program that includes help topics to get you started using the desktop, connecting to the Internet, using Windows components, configuring hardware and software, and more. It also has troubleshooters that will walk you through many categories of troubleshooting tasks. You can browse for a topic related to your problem on the Contents or Index tab of the help program, or use the Search tab to search the contents. Select Troubleshooting on the Contents tab to see an entire list of the Windows 98 troubleshooters listed by topics. Open the one related to your problem, and it may either open a troubleshooter or give you a list of troubleshooter titles if there is more than one related to the topic. Once you find a title that seems to match your problem, click Display and follow the instructions in the troubleshooter.



- Windows 98 Help troubleshooters

Device Manager

Device Manager is an important troubleshooting and problem-solving tool. You used it in Step-by-Step 13.02 to verify that there were no hardware detection or configuration problems immediately after installing Windows 98. If your computer or some of its components are not plug and play, you may need to resolve resource conflicts using Device Manager. On a plug-and-play computer with all plug-and-play devices, you should never have to bother with resources, because the plug-and-play BIOS and Windows 98 Configuration Manager work to resolve potential conflicts.



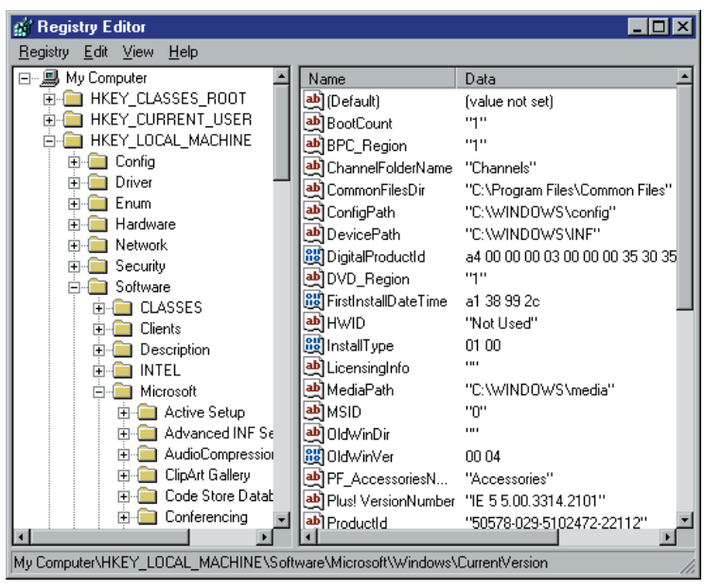
• **Figure 13-4.** Disabled devices

Device Manager also allows you to remove device drivers for physical devices you are removing from a computer. Or you can update device drivers through Device Manager. You also may want to disable a device that will remain present when you are troubleshooting a problem. In Figure 13-4, the floppy disk controller and the floppy disk drive are both disabled. If the problem persists when the device is disabled, then the device is not causing the problem, unless just having the device connected to the computer, with or without a device driver, causes problems.

The Registry Editor

The registry is a central place where Windows 98 configuration settings are stored. When you are troubleshooting, you will run into situations in which it is suggested that you edit the Windows registry. These suggestions include settings for drivers, applications, user preferences, and the OS in general. When you run Windows 98 Setup, a Control Panel applet, or the Setup program for an application or driver, the program saves its configuration settings in the registry, unless they are older programs, which save their settings in the Windows 3.*x* configuration files (the ones with an INI extension). The registry is actually stored in files on disk, but you can view and edit the registry as a hierarchical structure using registry editing tools, such as REGEDIT, which come with Windows 98. The best way to make configuration changes to Windows 98 after it is installed is through the Control Panel applets.

Editing the registry is a very advanced task that should be done only as a last resort. An incorrect value can make your system unusable.



• Registry Editor

Windows 98 Fails During Startup

Failure during startup indicates a problem with a component required by the OS during startup. A driver file may be missing or corrupt, or you may have the wrong driver. Or perhaps a registry setting intended to configure a device is incorrect. Or a registry file may be corrupt. Failure to start can also be caused by a virus.

Then again, you shouldn't rule out a hardware failure or a conflict between hardware devices. We certainly can't cover all of the possibilities in this chapter, but what we can do is look at a handy feature of Windows 98 that allows you to troubleshoot and pinpoint many of the causes of startup failure in Windows 98. This feature is called **Safe Mode**.

Try This!

Disable and Enable Devices in Device Manager

Use Windows 98 Help to guide you through disabling and enabling a device in Windows 98. Try this:

1. Open the Windows Help program and click the Index tab.
2. Type the keywords **Device Manager**.
3. Click the Device Manager topic Disabling Devices and then click the Display button.
4. Following the instructions for disabling a device, disable your floppy disk controller. This will also disable your floppy disk drive.
5. View the disabled devices in Device Manager.
6. Place a diskette in the floppy drive and attempt to view it in Windows Explorer.
7. Enable the floppy disk controller and verify that both the controller and the floppy disk drive are enabled by attempting to read the floppy disk again.

Using Safe Mode to Correct Problems

In Safe Mode, Windows 98 starts without using all of the drivers and components that would normally be loaded. It loads only very basic, nonvendor-specific drivers for the mouse, VGA adapter, keyboard, hard drives, and OS services. If Windows 98 detects a serious problem at startup, it may start in Safe Mode automatically. You can also initiate Safe Mode by pressing F8 or the CTRL key while Windows 98 is starting. Then select Safe Mode from the Startup menu.

Once Windows 98 is in Safe Mode, you can work to locate and correct the source of the problem using the Control Panel objects, usually Network or System.

Here's just one scenario in which you might use Safe Mode. Perhaps you just installed a new internal modem, installed the manufacturer's device driver, and restarted your system. At restart, the system fails and is unusable. Restarting the computer in Safe Mode allows you to disable the device and remove the bad driver or replace it with one that works. You still might have to remove the physical device itself, but give Safe Mode a try first.

Timing is important. You must wait to press a key until after the BIOS POST test of your keyboard to avoid getting an error message.

Step-by-Step 13.09

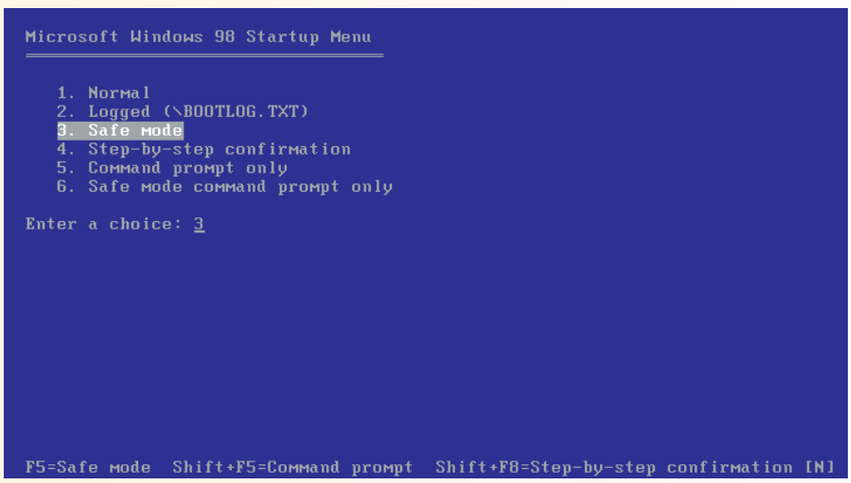
Starting in Safe Mode

It's a good idea to practice starting in Safe Mode and looking at the tools you would use for troubleshooting in Safe Mode.

To complete this step-by-step exercise, you will need a computer on which you have successfully installed Windows 98 as described in Step-by-Step 13.01.

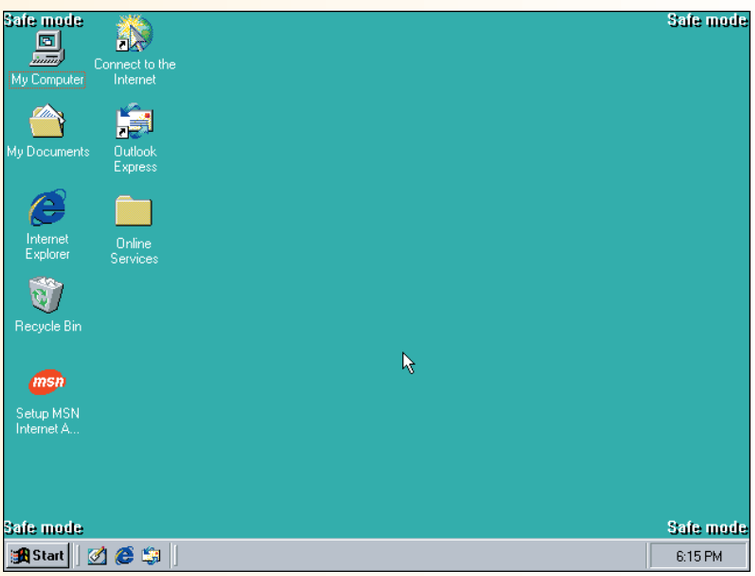
Step 1

Choose Start | Shutdown | Restart. After Windows shuts down, watch for the black text screen with BIOS startup information. Then press the F8 or CTRL key. When the Windows 98 Startup menu appears, move the cursor to select Safe Mode and then press ENTER.



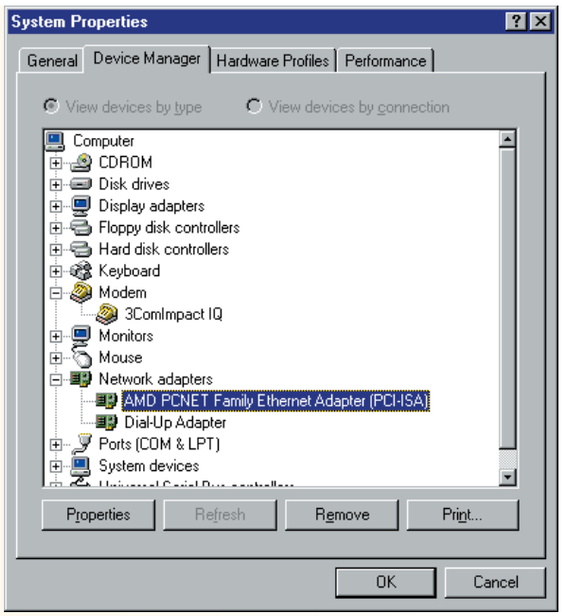
Step 2

Once you have selected Safe Mode from the menu, a dialog box appears that explains Safe Mode. Click OK to close this box and access the desktop, which displays "Safe Mode" at the four corners as a reminder (as if the poor screen resolution wouldn't remind you). Now you can go into Control Panel and work to solve your problem.



Step 3

Right-click My Computer and select Properties. In the System Properties dialog box, select Device Manager. Notice the radio buttons to change the view are disabled (dimmed). However, you can still browse through all of the devices and look at their properties.

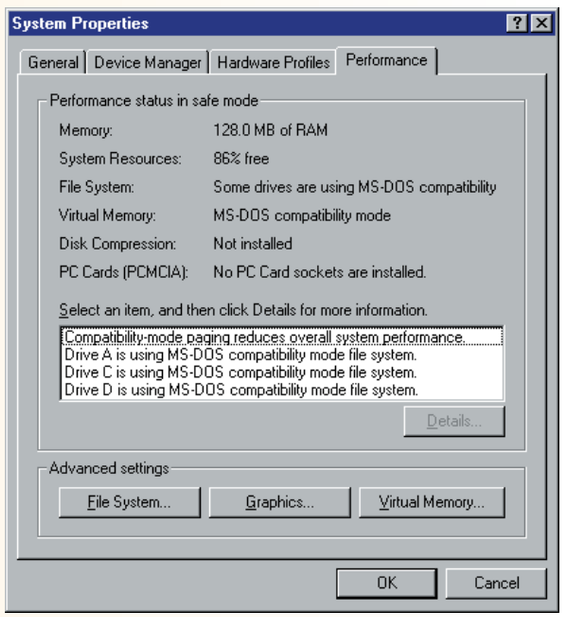


Step 4

Expand a device type node (Modem or Network Adapters, for instance) and open the properties of a device. Look at each page of the Properties dialog box, and notice the settings that you can change. If you are not sure which device is causing a problem, you can experiment by disabling suspect device drivers one at a time. Disable one and restart. If Windows 98 restarts normally, then you have found the problem device driver and should contact the manufacturer for a replacement for the driver. You can also view the driver details, update a driver, and manually modify resources (a very advanced task).

Step 5

Cancel the Properties dialog box for the device, and return to the System Properties dialog box. Select the Performance tab and notice that Safe Mode is running in MS-DOS compatibility mode. When you are done, cancel out of the System Properties dialog box.



Step 6

Once you make a change that you hope will solve the problem, restart in normal mode. If Windows 98 starts successfully in normal mode, you are done. If not, you may need to experiment with settings. You should also research your problem at the Microsoft Technet site.

Step 7

If you know that a specific file is corrupted, you can use My Computer to delete and replace the corrupted file. Or if you are unsuccessful in solving the problem so that your computer will start normally, use Safe Mode to copy your data files from the ailing computer to a safe place.

A Program Stalls in Windows 98

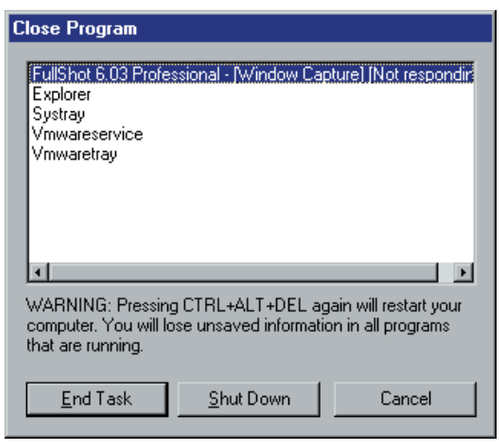
You are happily working at your computer when the "busy" icon attaches itself to your cursor and just remains there. Nothing you do makes a difference. There is no response from mouse movements or keystrokes. Maybe you can't even switch to another program previously opened on your desktop. What should you do?

The first thing you should do is walk away for at least a couple minutes. There is a chance (very slim) that a program has caused the computer to temporarily become very busy, and it may finish soon and let you continue. It's worth trying this first, especially if you've made changes to your data since the last time you saved it. When you come back, if the program is still stalled ("hung up" is another term we use), then you will have to press CTRL-ALT-DELETE. This will open the Close Program dialog box, in which you will see a list of your open programs, as shown in Figure 13-5. Select the program that is currently not responding and then click End Task. You will often see another dialog box, as shown in Figure 13-6. If so, select End Task. If Windows is now responsive, you closed the offending program. If not, one by one select each program (except Windows Explorer) and select End Task. After closing each program, check to see if Windows responds. When it does, you know that you have removed the program that caused the problem. In any case, once you can get back into Windows, you should consider it unstable until the next restart. Therefore, save any unsaved data, close all remaining programs, and restart Windows.

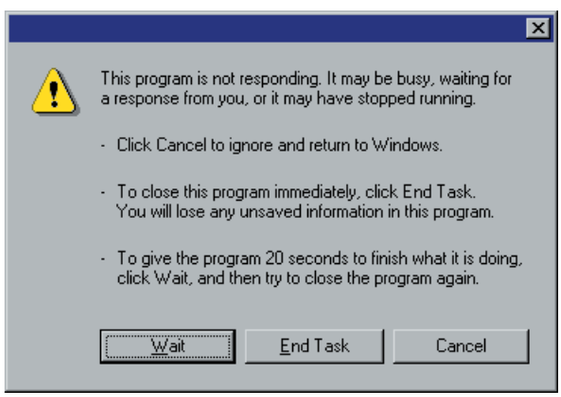
Your program may not be listed as not responding in the Close Program dialog box. If that is the case, select Cancel. If your system is still not responsive, press CTRL-ALT-DELETE again to open the Close Program dialog box. We have often found that the second time it is opened, it will list a program as not responding.

Explorer Performed an Illegal Operation

Once again, you are happily working at your computer when you are rudely interrupted. This time you receive an error message like the one in Figure 13-7 stating that Explorer performed an illegal operation. That doesn't seem like a friendly thing for a Windows program to do, and in this case, it may not be the fault of Explorer. It may actually be another program that is at fault. Click Close to close the message box, and usually all the objects on your desktop disappear temporarily. You may even see the same message

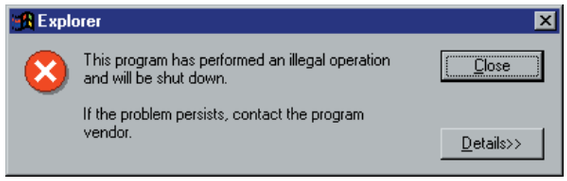


• **Figure 13-5.** Close Program dialog box



• **Figure 13-6.** Program Not Responding message

again, in which case, close it again. If possible, you should save all data, close all applications, and shut down your computer from the Start menu. If this is not possible, meaning that your computer is unresponsive, press CTRL-ALT-DELETE to bring up the Close Program dialog box. This may reveal which program is not responding. Proceed as in the previous section, "A Program Stalls in Windows 98."



• Figure 13-7. Explorer Illegal Operation message

Fatal Exception Error: The Windows 98 Blue Screen of Death

And yet again, you are interrupted. This time your application and the Windows desktop disappear entirely, to be replaced by a rude Fatal Exception error message, as shown in Figure 13-8. This is the Windows 98 version of the Blue Screen of Death. Make a note of the information on the top two lines. This information may help you to prevent this from happening again.

Research and Solve the Problem

As the instructions in the Fatal Exception message state, press any key to terminate the offending application. This does not always work, but if it does and you are returned to the desktop, save any data files that are open, close all open applications, and restart Windows 98. After the system successfully starts again, use the information you copied down from the blue screen to research the cause of the problem. In our example, this is the important piece of information: A fatal exception 0E has occurred at 0028:C02402C1 in VXD VMM(0E) 000012C1.

Not all possible fatal exception errors are documented with a solution, but it is worth trying to find the cause.

If You Can't Fix It, Avoid It!

The event that caused the fatal exception may never occur again, and you may be able to continue to work in the application you were previously

• Figure 13-8. Fatal Exception message—The Windows 98 Blue Screen of Death!

Inside Information

Microsoft Knowledge Base

The Microsoft ***Knowledge Base*** *is a database of articles on problems and solutions created by Microsoft Support Services. These articles formerly had identifier numbers preceded with a Q. The location of these articles on Microsoft's web site has changed and will surely change again by the time you read this. Search for an article by going to the Technet page (*`www.microsoft.com/technet`*) and entering an article number in the Search box. While we cannot guarantee that recommended articles will continue to be available at the Microsoft site, at this time Microsoft maintains a large number of articles on older OSs. As your career progresses, you'll find yourself using the Knowledge Base more and more, because it's the one place where the most detailed information about problems and solutions exists. It's in your interest to become an expert on the Knowledge Base!*

using at the time of the problem. Our general advice is that after a fatal exception error, if you cannot pinpoint the cause, then modify your work habits slightly to avoid fatal exception errors. You're thinking that you can't avoid what you don't understand, and that is mostly true. However, we have found that having many applications open or even only a few with very large data files can make the system prone to these errors. Therefore, try doing "simple computing" for a while. Keep more than one application open at a time only if you are truly working in both applications at the same time.

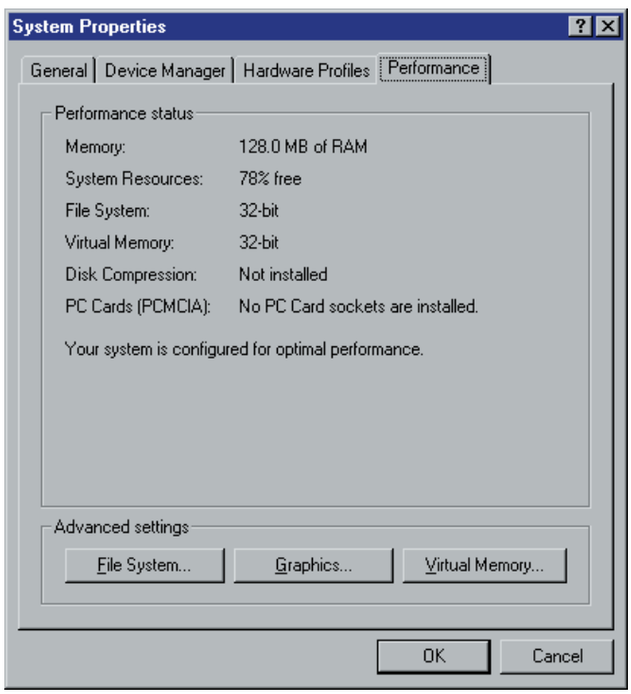
Windows 98 Shutdown Problems

To learn more about MS-DOS compatibility mode, check out Microsoft Knowledge Base Article Q130179, "Troubleshooting MS-DOS Compatibility Mode on Hard Disks." You can find other articles by connecting to the Technet site at `www.microsoft.com/technet` and searching on MS-DOS Compatibility Mode.

It happened to Chuck many, many times. He would choose Shut Down from the Windows 98 Start menu, and his applications would close, but the desktop would remain. He was running Windows 98 Second Edition. When he researched this problem at the Microsoft web site, he found that the most common causes of Windows 98 SE shutdown problems had to do with the Advanced Power Management system and the system BIOS on some computers. This was corrected in a patch. To learn more about this, see Microsoft Knowledge Base article 238096, "Problems Shutting Down Windows 98 Second Edition," at the Microsoft Windows Help and Support site at `http://support.microsoft.com`. Once connected to the site, enter either the article number or keyword into the Search For box, click Go, and select the article from the Search Results.

Poor Performance

If your Windows 98 system seems slow, here are several things you can check. If you are using an MS-DOS driver for an old hardware component, your computer will run in MS-DOS compatibility mode, because the OS will replace some of its 32-bit code with 16-bit code to support the MS-DOS driver. This happened frequently with CD-ROM drives that did not have Windows 98 drivers. The quick check to see if this is the problem is to look at the Performance tab of the System Properties dialog box and to make sure that File System and Virtual Memory both are using 32-bit OS components, as shown in Figure 13-9.



• **Figure 13-9.** The Performance tab

Chapter 13 Review

Chapter Summary

After reading this chapter and completing the Step-by-Step tutorials and Try This! exercises, you should understand the following facts about Windows 98:

Measure the Features, Strengths, and Weaknesses of Windows 98

- Windows 98, an upgrade from Windows 95, was the first Microsoft OS targeted at the consumer market and the last version of Windows to still have ties to the MS-DOS operating system.
- Windows 98 is available in two editions: the original 1998 release and Windows 98 Second Edition, released a year later.
- The Windows 98 desktop resembles the Windows 95 desktop, with modifications such as the integration of Internet Explorer, which is apparent if you turn on Active Desktop and add the channel bar.
- An Active Channel bar contains hyperlinks to services that maintain an Active Channel web site, which delivers updated information to the user's computer at scheduled intervals.
- The Microsoft Knowledge Base is a database of problem-resolution articles maintained by Microsoft.
- The Quick Launch toolbar is a small, optional toolbar on the taskbar that can contain icons for programs. Quick Launch toolbar icons launch programs with a single click.
- Windows 98 has improved GUI navigational features, such as the Show Desktop button on the Quick Launch toolbar (assuming that you enable the Quick Launch toolbar). Show Desktop minimizes all open windows.
- Windows 98 supports three file systems, FAT12, FAT16, and FAT32; it can store long file names in all three file systems.
- Windows 98 supports plug and play, DVD drives, universal serial bus (USB) devices, and IEEE 1394 (similar to Apple's FireWire) devices.
- Windows 98 has power management features that allow hardware components to be powered down when not in use.
- The broad hardware and power management support features appeal to laptop users.
- Windows 98 performs better than its predecessor, with faster bootup, shutdown, and program loading.
- To support old MS-DOS and Windows 3.*x* applications, Windows 98 has configuration options and a special mode called MS-DOS mode.
- The Windows 98 file systems do not provide security, have limited recoverability, and do not provide file compression at the file level. The OS has a file compression capability that is actually disk compression and creates a single point of failure.
- You can use MS-DOS drivers in Windows 98, but this will cause Windows 98 to run in MS-DOS compatibility mode, which degrades performance and is more prone to failure.
- The combination of 16-bit and 32-bit code in Windows 98 makes it less stable.
- Windows 98 is no longer a viable choice for a new OS, because it has been replaced by newer, improved desktop versions of Windows.
- The minimum hardware requirements are not realistic when you consider that they would not give you enough memory or disk space to install an office suite of software.
- An ideal hardware configuration, depending on your needs, would include an Intel Pentium II processor, 64 to 128MB of RAM, 4GB of available hard disk space, a CD-ROM drive, an SVGA or higher-resolution video adapter, and a Microsoft mouse.
- You can research compatible software and hardware products for Windows 98 at `www.microsoft.com/windows/compatible/default.asp`.

Install and Configure Windows 98

- When you prepare for Windows 98 installation, you determine whether the hardware and software you want to install are compatible with the OS.
- Before installing Windows 98, be sure that your computer hardware and peripherals are connected and ready to use. You must also choose the method and type of installation.

- A manual installation requires your full attention, whereas an automated installation does not require attention during installation but requires time and expertise to create the installation scripts.
- Organizations with a large number of desktop computers that require identical OS installations use images that include installed applications. These images can be created and distributed to the desktop using software such as Symantec's Ghost product.
- A clean installation begins with a completely empty hard disk, whereas an upgrade installation begins with a previously installed OS that can be upgraded to Windows 98.
- A dual-boot configuration allows you to select between two or more OSs during startup. To create a dual-boot configuration, install the oldest OS first. You cannot dual-boot between Windows 98 and older versions of Windows if drive C: uses FAT32.
- Select components and applications to install.
- Gather materials needed for installation, based on the decisions you made about the method and type of installation.
- A floppy disk labeled "Windows 98 Boot Disk" comes with Windows 98 and is used to boot up your computer to MS-DOS 7. A similar disk can be created using the FAT32EBD utility on the Windows 98 CD.
- After installation, you should use Device Manager to verify that all devices are working.
- After installation, you should configure the desktop to your preferences and connect to the network and the Internet, if required.
- After you have installed the OS, you should install the latest updates and service packs.

Customize and Manage Windows 98

- Install some applications using the installation program that came with the application.
- Use Add/Remove Programs to install or remove user applications without their own installation programs and to add or remove Windows components.

Manage Users, Files, and Printers

- When you add a new user in Windows 98, you are creating a user profile for that user.
- User profiles allow more than one user to use a computer while preserving each user's desktop preferences and personal folders.
- A user profile is a set of folders and desktop settings unique to each user.
- Press F5 to refresh an open window when it does not show newly added or removed objects.
- All local users of a Windows 98 computer can access any file and folder on the local hard drive.
- Windows 98 can create file names with up to 255 characters, at the same time storing an 8.3 alias for every long file name.
- You can install a new printer driver using the manufacturer's installation program, if provided, or the Add Printer wizard found in the Printers applet.
- You can copy the Windows 98 source files (the Win98 folder) onto your hard drive to make adding components and drivers easier.

Troubleshoot Common Windows 98 Problems

- Use the Windows 98 Help program to find the solution to problems in Windows 98.
- The Windows 98 Help troubleshooters will walk you through steps to resolve common problems.
- The first thing you should do when a program hangs up is give it a few minutes to recover.
- If a program continues to hang, press CTRL-ALT-DELETE, select the offending program in the Close Program dialog box, and click Close. If you still don't get a response in Windows 98, open the Close Program dialog box again and select another program, until you can get back to Windows. Once you are back to Windows 98, attempt to save any open data files; then restart the OS.
- If you receive an error message saying that Explorer performed an illegal operation, close the message box. This will most often cause the desktop to disappear temporarily, and the same message may reappear. If so, close it again. Then, if Windows will respond to keyboard and mouse commands, attempt to save data and close programs. If Windows does not respond, use the Close Program dialog box, as outlined in the previous paragraph.
- If Windows 98 is slow, check the Performance tab of System Properties to see if it is running in MS-DOS compatibility mode.

Key Terms

8.3 alias *(36)*
Active Channel web site *(3)*
automated installation *(12)*
critical update *(26)*
hyperlink *(3)*
hypertext markup language (HTML) *(3)*
Knowledge Base *(45)*
long file name (LFN) *(5)*
manual installation *(11)*
MS-DOS compatibility mode *(7)*
MS-DOS mode *(6)*
primary directory entry *(36)*
Safe Mode *(41)*
secondary directory entry *(36)*
Show Desktop button *(4)*
small office/home office (SOHO) *(2)*
upgrade installation *(11)*
user profile *(32)*
VFAT file system driver *(6)*

Key Term Quiz

Use the Key Terms list to complete the sentences that follow. Not all the terms will be used.

1. A/an _____ is an element of a hypertext markup language (HTML) document that points to another location.
2. The _____ lets you quickly close all open windows so you can get to the icons on the desktop.
3. A/an _____ can have up to 255 characters, including spaces.
4. The _____ improves performance on both FAT16 and FAT32 volumes.
5. _____ is used for DOS applications that will not run well in a Windows 98 virtual machine.
6. When you create a file with an LFN, Windows 98 also saves a/an _____.
7. _____ is the term Microsoft uses to refer to a security-related patch.
8. If you wish to keep all the configuration information from an old version of Windows, install Windows 98 as a/an _____.
9. _____ allows several people to use a single Windows 98 computer while keeping their unique settings and preferences.
10. _____ is the language of the World Wide Web.

Multiple-Choice Quiz

1. What are the two Windows 98 editions, including the unofficial name for one?
   a. Primo Edition
   b. Gold Code Edition
   c. Active Desktop
   d. Second Edition
   e. First Edition
2. What program is integrated into the Windows 98 desktop interface?
   a. Solitaire
   b. Microsoft Office
   c. Microsoft Exchange
   d. Internet Explorer
   e. Network Neighborhood
3. The Windows 98 desktop most closely resembles that of which other OS?
   a. Mac OS X
   b. Windows 95
   c. Windows 3.1
   d. Linux
   e. Windows XP
4. What is the name of Microsoft's collection of technical articles, each identifying a problem and providing a solution?
   a. .NET
   b. Knowledge Base
   c. Webopedia
   d. Q Base
   e. Microsoft Windows Update

5. How much space would be allocated to a 4KB file on a 2GB FAT16 partition?
   a. 4KB
   b. 80KB
   c. 32KB
   d. 16KB
   e. 512 bytes
6. Using MS-DOS drivers with Windows 98 will cause it to run in which of the following?
   a. Internet Explorer
   b. MS-DOS compatibility mode
   c. Device Manager
   d. MS-DOS mode
   e. Control Panel
7. When installing any operating system, which is most important to consider?
   a. Minimum hardware requirements
   b. Mean time between failures
   c. Prime meridian
   d. Ideal hardware configuration
   e. Speed of the network
8. What should you do if you can see other computers in Network Neighborhood, but not your own computer?
   a. Call the help desk.
   b. Nothing, unless you have file and print sharing turned on.
   c. Restart.
   d. Reinstall.
   e. Refinance.
9. Why should you avoid MS-DOS compatibility mode?
   a. It causes file corruption.
   b. It causes poor performance.
   c. You can't access the Control Panel applets.
   d. You can't shut down.
   e. None of the above.
10. A Windows 98 boot disk or startup disk actually boots up into which OS?
    a. Windows 3.1
    b. PC DOS 6.22
    c. MS-DOS 6.20
    d. MS-DOS 7
    e. Windows 95
11. Why is it important to know how long Microsoft will continue to sell a desktop OS?
    a. To know how long it will be available to purchase
    b. To know how long Microsoft will continue to support it
    c. To plan purchases for desktop computers
    d. All of the above
    e. None of the above
12. Which is the preferred type of installation if you can back up any data saved on the hard drive first?
    a. Dual-boot
    b. Upgrade
    c. Overnight
    d. Clean
    e. Downgrade
13. What type of Internet site is created by an organization to provide updated information, automatically downloaded on a schedule, to a subscriber's desktop?
    a. Search engine
    b. FTP
    c. Newsgroup
    d. Active Channel web site
    e. Mail server
14. What should you do if a program hangs up in Windows 98? Select all that apply.
    a. Call the help desk immediately.
    b. Turn off the computer.
    c. Press CTRL-ALT-ENTER.
    d. Press CTRL-ALT-DELETE.
    e. First take a short a break.
15. Where can you find the Windows 98 performance settings?
    a. Start | Settings | Control Panel | System
    b. Start | Programs | Accessories | System Tools
    c. Permon
    d. My Documents
    e. Start | Find | Computer

Essay Quiz

1. Write a few sentences describing why, in 1998, Windows 98 appealed to corporate users, even though Microsoft did not intend it for them.
2. Briefly describe the weaknesses of Windows 98. Select the one you believe is the most compelling reason not to use it. Support your statement.
3. Explain the importance of installing critical updates and service packs.
4. Describe the tasks that can be accomplished using the Add/Remove Programs applet.
5. Describe in general terms what happens when you save a file with an LFN in Windows 98 and discuss the issue of case sensitivity as it applies to file names.

Lab Projects

• Lab Project 13.1

You have been asked to install Windows 98 on four computers in a branch office. Each computer will have a slightly different set of Windows components installed and different user applications. The office presently has Windows 95 installed on its computers. The organization has had a lot of problems with Windows (it fails often), and the computers now have unauthorized applications the users have installed themselves. The organization does not want these unauthorized applications in Windows 98, because they believe they are causing some of the problems.

The organization is not installing a newer OS because it owns these four Windows 98 licenses through a purchase someone made a few years ago, and the organization feels that Windows 98 is adequate for the work required on these computers. The computers are in a workgroup, and the network employs a Windows NT Workstation computer that acts as a file and print server. All user data is saved on this server, and it is saved nightly on a tape backup system. The users have been told that any data saved locally will be destroyed during this installation.

Although each computer will be configured with different settings and applications, they will all have the same hardware configuration. A coworker researched and confirmed that all of the hardware is compatible with Windows 98 and left you with the list of manufacturers and model names of all components. The current hardware configuration on these machines is as follows:

- Intel Pentium II processor
- 96MB RAM
- 8GB available hard disk space
- CD-ROM drive
- A network card that is confirmed as compatible, but is newer than any of the network drivers that came with Windows 98
- An SVGA video adapter that is confirmed as compatible, but is newer than any of the video adapters that came with Windows 98
- Microsoft mouse

Describe how you will perform the following:

1. Preinstallation tasks
2. Installation, including the type and means of installation
3. Post-installation tasks that will leave each computer ready for the users

• Lab Project 13.2

You are preparing to visit the sales department in your company to install a new printer. The department assures you that, although the driver is not on the Windows 98 CD, a driver disk that came with the printer is available. Another person has unpacked the printer, connected it to the computer, and left all of the documentation and disks from the printer for you to use. Describe the procedure you will use when you arrive to install the printer. You may go beyond the scope of this course in your answer. Be creative!

• Lab Project 13.3

You have just been assigned to provide desktop support over the phone to a small office. You have a computer running Windows 98 on your desktop to help you support their use of Windows 98. You have not even had a chance to familiarize yourself with the people and the equipment in that office when you receive a call that one of the printers is not working. It is an infrared printer that is used with a laptop. You have told the user that you will call her back in five minutes. You did this to have time to figure out a plan of action, since you have never seen or touched an infrared printer. Now do the following:

1. Describe in a sentence or two a source you will use to find a solution to this problem and why you have picked that source.
2. Using the source described in Step 1, compose a list of questions you will ask the user when you call her back. Follow each question with a description of the action that should be taken.