



The A+ Certification and PC Repair Handbook

by Christopher A. Crayton, Joel Z. Rosenthal and Kevin J. Irwin

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This guide combines a complete test preparation for the new A+ examinations (220-301 and 220-302) with a hands on guide that reflects how the A+ exam questions apply to real-world PC repair problems.



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Many A+ certification guides prepare aspiring PC technicians to pass the exam, but don't put test objectives in a "practical use" context. Other PC repair guides cover A+ exam objectives in a real-world setting, but don't prepare students well enough to pass the test and get certified. *The A+ Certification and PC Repair Handbook* solves this problem by combining a complete test preparation for the new A+ examinations (220-301 and 220-302) with a hands-on guide that reflects how the A+ exam questions apply to real-world PC repair problems. The book teaches users how to install and troubleshoot hardware, and provides solutions to common operating system-related problems for machines running Microsoft Windows 9x, Me, 2000, and XP. Each chapter includes numerous diagrams and photographs, and explains PC repair techniques using easy-to-understand language and accessible terms. For each chapter explaining these PC repair tactics, another chapter is included on how to pass the corresponding portion of the A+ exam with objectives and sample exam questions based on the actual tests. Test-taking techniques are also covered, including the test's recent return to conventional linear testing, as opposed to the adaptive format of previous years.

KEY FEATURES

- Covers all of the Comp TIA 2003 A+ objectives for exams 220-301 and 220-3002
- Discusses the repair of personal computers running Windows 9x, Millennium, 2000, and XP with numerous photographs and diagrams showing how to perform various tasks
- Integrates sample A+ exam questions after the appropriate PC Repair chapters

About the Authors

Christopher A. Crayton is a Comp TIA-certified instructor. Keiser College recognized him as their "Teacher of the Year" in 2000; now he serves as network administrator for Protocol, and ECRM company. His past books include the best-selling *A+ Adaptive Exams* and *The Security+ Exams Guide* (Charles River Media).

Joel Z. Rosenthal is an A+ and Microsoft certified technician, writer, and editor. He currently works as a computer repair technician.

Kevin J. Irwin owns and operates a computer repair shop. He has been repairing and working with computers for over 20 years.

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Christopher A. Crayton
Joel Z. Rosenthal
Kevin J. Irwin

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CHARLES RIVER MEDIA, INC.
10 Downer Avenue
Hingham, Massachusetts 02043
781-740-0400
781-740-8816 (FAX)
info@charlesriver.com
www.charlesriver.com

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This book is dedicated to all of my former students who are now managing networks and fixing computers all over the world. It is also dedicated to all certification exam hopefuls who seek to change their lives by achieving certification success!

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Preface

Welcome and congratulations! You hold in your hands the most powerful, user-friendly combination PC repair/A+ certification tool available. It is crafted to teach you the basics of PC repair and maintenance as well as prepare you to take and pass the current Computing Technology Industry Association’s (CompTIA’s) A+ certification computerized exams.

This practical, no-nonsense book focuses on and teaches you specific topics that will prepare you well to fix computers and prepare for a career as a computer technician. It also targets topics that are most likely going to be addressed on the current A+ exams. The authors’ main objective is to prepare the reader by isolating and focusing on these specific topics without adding all of the “fluff” found in other books. It is not designed to fill your head with unnecessary information before you fix specific computer-related issues or enter a computerized testing site (this type of preparation is usually accompanied by confusion, lost time, and certification exam failure).

HOW TO USE THIS BOOK

This book is divided into two main parts.

Part I, *PC Repair and Maintenance*, is an easy-to-read “hands-on” approach to learning, repairing, and maintaining PCs. It is loaded with detailed figures and diagrams that make even the most complicated of tasks easy to understand. In **Part I**, you will learn important industry terminology. You will learn how to install and troubleshoot hardware. You will learn how to solve many of the most common operating system-related problems that occur when you are running Windows 95, 98, Me, 2000, or XP. You will also learn how to acquire computer replacement and expansion components inexpensively.

After every few chapters in **Part I**, you will notice cumulative A+ Certification Review Questions. These questions are in place to build upon your acquired knowledge of the subject matter discussed and ultimately prepare you for deeper discussion of those topics in Part II. The review questions are followed by answers and a cross-reference as to where the topics are located in Part II. It is very likely that you will have to do a little work to find the supporting theory behind the correct answers!

Part II, *The A+ Certification Exams*, is a powerful resource specifically designed to prepare you to ace the current CompTIA A+ certification exams. This section is further separated into two parts: Part II A, which covers A+ Core Hardware Service Technician Study (Exam 220-301), and Part II B, which covers A+ Operating Systems Technologies Study (Exam 220-302). All of the CompTIA A+ certification objectives are covered in detail in Part II of this book. You will be able to reinforce your acquired knowledge of these objectives by answering certification review questions at the end of every chapter.

It is important to note that you will see important subject matter in this book covered more than once. Remember that you learn the basics in **Part I** and build upon that knowledge in Part II. In other words, you will learn to walk before you run.

WHAT'S ON THE CD-ROM?

The CD-ROM included with this book features a plethora of video tutorials that will, among other things, show you how to properly open cases and towers, install memory, remove and replace expansion cards, install motherboards and CPUs, and properly maintain your computer.

The CD-ROM also includes A+ practice exams that will prepare you well for the CompTIA A+ Hardware Service Technician and Operating Systems Technologies examinations. There are four practice exams. The first two exams contain practice questions for the A+ Core Hardware Service Technician test (Part II A, **Chapters 15** through **22**). The second two exams contain practice questions for the Operating Systems Technologies test (Part II B, **Chapters 23** through **28**). Each exam has 80 questions and has a review feature to identify incorrect answers. It is recommended that you take these tests until you score 100% every time. This will ensure your best chance to score well on the real CompTIA A+ examinations. For more information regarding the CD-ROM, please see the Appendix: About the CD-ROM.

Introduction

Personal computers are, at once, horrendously complicated yet simpler than one might expect. How can this be? Computer professionals spend years working on computers, but never learning all there is to know. There's just too much information for one human being to absorb in a lifetime, especially because the technology changes continually and there are so many different types of each component. However, it is not necessary to know anything close to “everything” to be able to repair or even build computers. Because the parts are all modular, most technicians rarely, if ever, use a soldering iron. When a component such as a

modem has a hardware problem, you wouldn't spend hours trying to repair it. You simply replace it—a procedure that normally takes a few minutes. Other problems can be corrected through software. So, while it cannot be said that repairing computers is “simple,” it is nowhere near as complicated as the complexity of the computer would suggest.

Part I of this book, *PC Repair and Maintenance*, is designed to enable the reader to repair personal computers running Microsoft® Windows®, primarily Windows 9x (which includes 95, 98, and Millennium Edition, or “Me”), 2000 (mainly 2000 Professional), and XP. This book gives you hints and tricks that few other books provide. Many actions that Microsoft documentation would seem to suggest are impossible are often quite possible with software that is available for download, sometimes even at no charge, from the Internet. These kinds of tips might help you succeed in repairing a computer, or at least saving data, when other technicians might fail.

We don't believe it is necessary to have a deep understanding of every facet of how a computer works in order to diagnose and repair computer problems, so we explain only as much as necessary for each scenario. Furthermore, it is impossible for any book to cover all computer issues. Our goal with this book is to give you the basic information needed to make common repairs and to help you to be able to find information necessary to make other repairs. We decided not to spend much time with monitors, printers, imaging devices, or networking; repairing these devices takes highly specialized skills. Moreover, the software that comes with these devices often modifies the Windows interface from the standard, so configuration screens can differ from one computer to another. Additionally, there are many different types of these devices, each requiring different skill sets. In fact, there are entire books on some of these and on networking, so we don't feel that mere chapters can do them justice. We will limit our coverage to some common issues regarding these devices.

One theme evident throughout the book can be summed up in the phrase “Quality in, performance out.” We explain how to select quality replacement and expansion components—even some relatively unknown manufacturers make satisfactory components. Moreover, it is often not necessary to pay top dollar to get quality components. Additionally, we want to make it clear that there's no shame in asking for advice from manufacturers and other experts. Getting appropriate advice can prevent serious problems and save huge amounts of time and money.

This book and accompanying CD-ROM contain many photographs, diagrams, and videos showing the right and wrong ways to perform various tasks, even to the level of physically connecting connectors.

SPECIAL NOTES

1. Due to version and configuration differences, some computers might not have items described in tutorials. In this case, please use Windows Help if you can't find what you're looking for.
2. This book often uses greater-than signs (>) to indicate the next step in a software command. For example, Start > Settings > Control Panel > System.
3. Windows versions are usually referred to by the following designations:

9x: Windows 95, 98, and Me. These versions are sometimes referred to individually.

2000: Windows 2000 Professional. Much of the information also covers Windows 2000 Server and Advanced Server.

XP: Windows XP Home and Professional Editions. These are also referred to individually in places.

4. We use URLs in this book to direct you to helpful Web sites. In **Part I** of the book, we leave out the “http://www.” from each URL that starts that way. URLs without “www” are shown in full. Please note that just as telephone directories are out of date by the time they are printed, some of these URLs won't be in service by the time you read this book. However, there is little or no exclusivity on this type of information, and we encourage you to look up any information you need.

5. Most changes in 2000 and XP require that the user be logged on as an administrator. We don't point that out in subsequent chapters.

Part I: PC Repair and Maintenance

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Chapter 1: Overview

This chapter describes the basic structure of a personal computer, along with a list of tools needed by a PC technician, and some general advice on computer repair.

THE PC

[Figure 1.1](#) shows a typical personal computer.

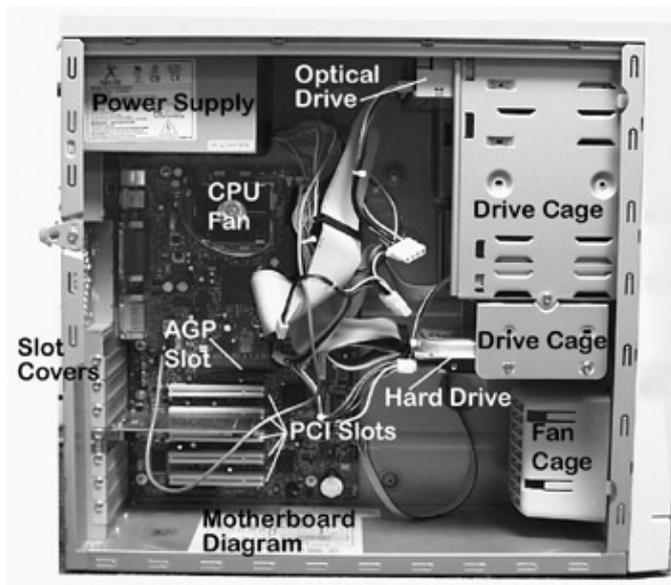


Figure 1.1: A typical PC system.

Proper Terminology

Some terms are commonly misused. The most basic of these is the computer itself, which is the box containing all the main components. All peripherals are connected to the computer. The computer is not the modem, hard drive, or CPU. These three terms represent individual components that are part of the computer. They, along with other terms, are defined here.

Case: The cabinet that holds the main components of a computer.

Power supply: A box-shaped device that converts wall-outlet AC power to low-voltage DC used to power the devices in the computer.

Motherboard (system board, main board, desktop board): The large printed-circuit board to which all other parts are connected.

Expansion slots: Slot connectors on the motherboard for attaching various components. Motherboards typically have several expansion slots.

Central Processing Unit (CPU, or processor): The chip that performs all of the calculations necessary for the computer to do its job.

Random Access Memory (RAM, or memory): Chip assemblies that store data for very quick recall. The main memory in a computer requires constant power to be able to hold data. Every task performed by a computer requires the program and data to be loaded into memory.

Hard drive (hard disk drive, HDD): A device that stores data on permanently enclosed magnetic disks. The vast majority of computers have at least one hard drive. Data stored on a hard drive remains after the power is disconnected. The *operating system* (OS) (such as Windows), along with programs and data, are almost always stored on a hard drive.

Basic Input Output System (BIOS): A program that works as soon as the computer is powered on to test hardware, locate the OS startup files on the hard drive in order to start the OS, and support the transfer of data among hardware devices. The BIOS is usually stored on a *Complementary Metal Oxide Semiconductor* (CMOS) flash memory chip. *Flash memory* is expensive memory that holds its data indefinitely after the power has been disconnected, but the data can be changed. See [Chapter 2, “System Configuration and Computer Hygiene,”](#) and

Chapter 3, “Motherboards and Their Components,” for more information.

Optical drives: Including CD-ROM, CD-RW, DVD-ROM, and various writable DVD drives, optical drives are devices that read, or read *and* write data from or onto discs using laser beams.

Floppy disk drives (FDD, floppy drives, diskette drives): Devices that store data on removable magnetic disks. Virtually all floppy drives sold since the mid-1990s have been of the 3.5" variety. These floppy disks are enclosed in a thin, hard plastic shell. Because of this, they are sometimes confused with hard drives. However, because of their limited capacity, their susceptibility to data loss, and other reasons, floppy disks have become much less useful in recent years. However, as you will see in subsequent chapters, floppy disks can be indispensable for certain repairs.

Ports: Connectors, usually on the back of the computer, to which peripheral devices can be connected.

Modem: A device that allows the computer to access a telephone line for the purpose of faxing, Internet access, data transfer between computers, or other telephone-related uses. Internal modems plug into expansion slots, while an external modem connects to a port on the computer.

Monitor (display): A device resembling a television that displays the computer’s video images.

Sound card (multimedia device): A device whose primary function is to allow a computer to play and record sound. A sound card can either be a separate card that plugs into an expansion slot, or a component built into the motherboard.

Video card (video adapter, graphics adapter, display adapter): A device whose primary function is to generate a video signal (“picture”) to be shown on the monitor. A video card can either be a separate card that plugs into a slot on the motherboard, or a device built into the motherboard.

Network card (network adapter, network interface card, NIC): A device that connects the computer to the network. A *network* is a group of computers connected together so that they can communicate with each other. Network cards either come as a separate card, or are built into the motherboard.

COMPUTER REPAIR TOOLS

Table 1.1 lists various PC repair tools and the importance of each.

Table 1.1: PC Repair Tools

Tool	Comments
Standard screwdrivers (not magnetic)	High-quality Phillips® screwdrivers are indispensable. At the very least, you’ll need small and larger Phillips screwdrivers with various shaft lengths. A few

	different sized flat-head screwdrivers are very helpful to have. <i>Do not use magnetic screwdrivers inside computers.</i>
Cordless rechargeable screwdriver	Saves time and effort; especially useful when fixing multiple computers.
Paper clips	An unbent paper clip makes a perfect tool for releasing the drawer of an optical disc drive (see Chapter 7, “CD and DVD Drives”).
Multitester/voltmeter	Essential. A multitester has many uses, the most common of which is testing power supplies. It can test voltage, continuity, resistance, and more. Unlike a multitester, a voltmeter’s only function is to measure voltage.
ATX power supply tester	A simple tool that indicates whether the power supply is indeed outputting power, and provides convenient terminals that allow you to easily test the voltage using a voltmeter or multitester.
Cable testers	Testers are available for most types of cables used with a computer. While there are other ways to test cables, such as swapping them with known good cables, cable testers save time and trouble.
Port-testing software	Used to determine whether various ports are working correctly.
Breakout boxes	Another device used for testing cables and ports. Allows complete flexibility in changing the electrical configuration of cables and ports for testing purposes.
Loopback adapters	Available for serial and parallel ports, loopback adapters simulate signals that are input into a computer. Works with port-testing software, described earlier.
Anti-static (ESD) wristbands or anklebands	Tool to protect computer circuits against the damage even carpet shocks can cause.
Anti-static (ESD) spray	Very effective in reducing static electricity on fabric and carpet.
Anti-static (ESD) mats	Provides a static-free surface. Can be used with anti-static wristbands. Includes anti-static floor mats.
POST card	A card that can be plugged into an expansion slot and contains a small display to show a problem code, POST cards are timesavers that provide accurate and specific diagnoses.
Diagnostic software such as Micro-Scope and PC Certify	A worthwhile investment. These products can significantly reduce the time needed to diagnose all sorts of computer problems.
Disk drive installation software	Software utilities that are provided by the drive manufacturers and from other sources, many of which are available at no charge. These sometimes come with the drives, but can also be downloaded.
BIOS flashing utilities (by companies such as MR BIOS®)	Use these to flash BIOSs and to perform other rescue operations on BIOSs and CMOS chips with problems. See Chapter 3 .
USB network adapter	

	Allows for easy network access on a computer that has USB ports but no internal network adapter. Used for data transfer and Internet access on networks set up for it.
Internet access	Allows access to Web-based virus-scanning software and other utilities, and easy downloads of device drivers. See Chapter 2 . It is also essential for obtaining technical support. See Chapter 11 , “ Troubleshooting .”
Data transfer cables	Cables of various types such as serial (null-modem), parallel, and USB that allow for different methods of data transfer. Very often, the best solution for a computer with serious OS trouble is to format the hard drives (which erases all content), and reinstall the OS and all software. Data transfer is often the most efficient method of saving data that will be erased by formatting the drive. Various software utilities, some of which are supplied with Windows, allow for data transfer through these cables.
Cleaning and maintenance tools: vacuums and dust-cleaning sprays	Computers get dusty inside, and dust build-up interferes with proper cooling. Use sprays such as Blow Off™ while vacuuming to clean out the dust. See Chapter 2 for details. In addition, the accompanying CD-ROM has a visual presentation of the proper cleaning methods.
CD/DVD scratch repair kits	These can often save damaged software and data discs.
Uninterruptible Power Supply (UPS)	These provide continuous power to a computer when there is a power failure. Indispensable when making changes to a computer’s BIOS, because a power failure during these operations will render a computer useless unless a replacement BIOS chip is obtained, which isn’t always possible.
Data-recovery software	Software that can often recover data from damaged hard drives.
Data-recovery companies (such as Ontrack®)	When a hard drive crashes and the data on the drive is extremely valuable, these companies can often recover data from these drives for a substantial fee.
Problem-solving software	Various software programs such as Norton Utilities™ and McAfee® Clinic that solve many different computer problems and optimize performance.
Infrared temperature sensor	Available from companies such as Raytek® (raytek.com), this uses a laser to point at an object such as a CPU to detect its temperature. Can be very helpful in detecting bad connections or heat-related problems.
Emergency boot disks	These are floppy disks that allow the user to boot a PC when it can’t boot on its own or to boot an Me machine to DOS when a repair can’t be made in Windows. See Chapter 11 for more information.

GENERAL ADVICE

There are some basic recommendations that will make repairs run as smoothly as possible and ensure good post-repair performance.

Quality In, Performance Out

Obviously, the quality of replacement parts is one factor in determining performance after the repair. When it comes to selecting replacement parts, there can be dozens or even hundreds of choices, and naturally, there are wide variations in quality and price. For example, while most computer-literate people can differentiate hard drives solely by their data-storage capacity, overall computer performance is affected by differences in hard drives such as rotation speed and whether the manufacturer uses quality components and quality production methods.

How to Spot Quality Components

How do you determine which parts are high quality? It's not necessarily a matter of selecting the most expensive components. There are many clues to help guide you in this matter. The most obvious are that the components come with some type of manual or guide, and the company supplies you with a way of contacting them for support or warranty needs. The manual might be in the form of a file on the installation CD, and the contact might be an address, a telephone number, or more likely these days just a Web site or e-mail address. You want to be able to reach customer service and tech support. Some vendors have excellent customer service and tech support, but other vendors are virtually impossible to reach. Often, you can't reach the company unless you can provide the product's serial number.

Additionally, look at the packaging and the actual components themselves. If they look cheap and shoddy, you should be wary. Moreover, if the price is so low that it seems too good to be true, then most times it is. However, that doesn't mean that real bargains aren't available. Let common sense be your guide.

Be Careful with Components

While hardware components are not extremely delicate, they aren't indestructible either, or else you wouldn't need to replace them. They are susceptible to physical and electrical damage due to mishandling and power surges. Follow these guidelines to minimize the risk of damage:

Make sure the power supply is set to the correct voltage: In North America, electric utilities provide 110–120 volts AC to wall outlets. In much of the rest of the world, the standard is 220–240 volts. Check the power supply at the back of the computer. Most have switches labeled 120/240. Make sure the voltage setting matches the actual voltage, or you could face catastrophic results.

Use surge suppressors and UPSs whenever possible: Power surges and undervoltages can damage or even destroy components. See [Chapter 2](#) for more information.

Don't force components: Connectors should be pushed in directly, not at an angle, and most go in only one way. Match up the pins with the holes. If you try to force a connector in the wrong way, you can bend or push in pins, damaging the connector and most likely causing the device to malfunction. In the case of a device with a permanently connected cable, which is common with monitors, damaging the connector requires that a qualified monitor technician repair the monitor.

There are different procedures for inserting expansion cards, memory chips, and CPUs, although the same “no-force” warning applies. See [Chapter 3](#) for more information.

Prevent static damage: Discharge as much static as possible by touching a ground—any large metal object. Avoid carpet. Use anti-static floor mats, surface mats, and wrist ground straps. Make sure all circuits are wired correctly, including grounding.

Wire organizing tip: Do not use rubber bands or metal twist-ties inside a computer. Use plastic wire ties and snip off the ends to avoid scratching your hands and arms.

Document all changes: Keep a record of every change you make; you might have to undo certain changes. Mark all jumper and wire positions, before changing them, with a fine-tipped permanent marker. Make notes and diagrams of wire and jumper positions, and keep a record of all software configuration changes.

IT'S NO SHAME TO SEEK ASSISTANCE

Obtain the correct information before starting or continuing with a repair. This saves not only time but even damage that can sometimes be caused by doing something wrong. In addition to the information found in this and other books, a vast amount of information is available on the Internet from manufacturer's Web sites and from sites dedicated to assisting computer technicians. See [Chapter 11](#) for information on finding assistance. The Industry Contacts document on the accompanying CD-ROM has contact information for many hardware and software providers, along with helpful Web sites.

Chapter 2: System Configuration and Computer Hygiene

BIOS OVERVIEW

When a computer is first started, it needs some direction as to what to do. It needs to know where to find the OS's startup files, how hardware is to be accessed by the OS, and what hardware is installed on the system, among other things. It is the job of the BIOS to perform these tasks. BIOSs are made by a number of different companies, often customized by the motherboard manufacturers or system builders for a particular motherboard or computer. Some common BIOS brand names are Phoenix™, AMIBIOS®, Award™, IBM®, and MR BIOS®. They are in the form of CMOS chips that store the information.

Power On Self Test (POST)

The first event that happens when a computer is powered on is the POST, performed by the BIOS. The POST consists of a quick series of diagnostic tests, mostly to make certain that essential hardware is present and operating. The most essential hardware is the BIOS itself, processor, memory, video system, and a source of OS startup files (almost always a hard drive). The POST first checks the BIOS, and then the other items. If any of these are not operating correctly, the computer might not start or run correctly. As long as the BIOS program is not set to “Quiet Boot,” the POST will give a single beep to let you know that all the

tests were successful. If the POST detects problems, it will give a beep code and/or a text message to let you know what is wrong. You can find a list of common beep codes on the accompanying CD-ROM.

Setup Program

The program run by the BIOS is usually called the *setup* program. Different motherboard manufacturers vary as to how to access the setup program. The most common method is to press a given key just after the first information appears on the screen after the computer is powered on. Often, the screen will give a prompt such as “Press Delete to access Setup.” <Delete> is the most common key. Others include <F2> on Dells and Hewlett-Packards, <F10> on Compaqs, and <F1> on some Gateways. Setup screens vary widely, so we will cover the most common and important BIOS settings.

Note Before you go into a setup program, make sure that you are ready to write down any changes you make.

Some setting changes can render a computer unbootable, and if you don't know which changes you made, you'll have a difficult time finding the change that caused the problem.

To help prevent changes from causing serious problems, BIOS manufacturers offer a way out. After you have changed BIOS settings, setup programs offer you a choice to accept or discard changes as you exit the program. Use this function if you are unsure of any changes you have made, or if you haven't recorded those changes on paper. You can always go back and make the changes again. Figures 2.1 and 2.2 show examples of setup screens.

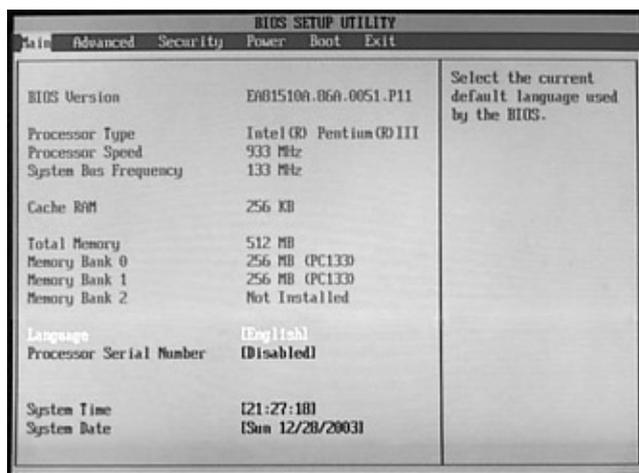


Figure 2.1: A sample of a setup screen.

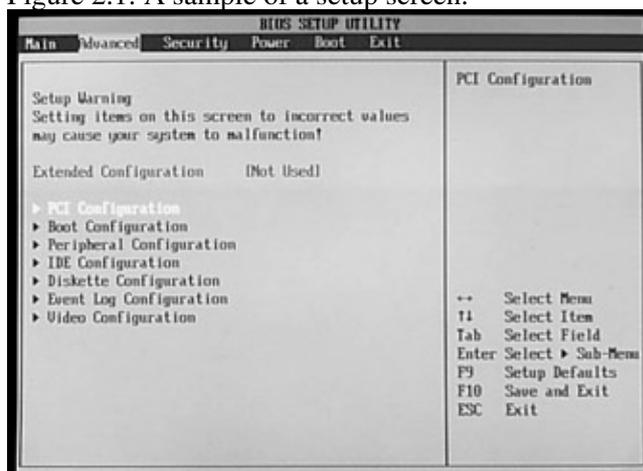


Figure 2.2: Another setup screen.

Important BIOS Settings and Information

Because there is so much variability among setup programs on different BIOSs, we will cover common and important items only:

System Date and Time: This can also be set in Windows.

BIOS version number: Sometimes it is necessary to update the BIOS. BIOS programs are delineated by version numbers; if the motherboard or computer manufacturer's website provides instructions, follow them. For more information on updating BIOSs, see [Chapter 3, "Motherboards and their Components,"](#)

Port assignments: If the computer has ports (serial, parallel, etc.) that are not being used, and it is necessary to free up their resources, you can disable them in the setup program. Conversely, if you need to use them and they are disabled, you can re-enable them in Setup.

Supervisor and user passwords: You can set passwords for the computer.

Note If you set a supervisor password and forget what it is, you can also forget about retrieving it, and you might not be able to finish booting the computer. Sometimes, there are steps you can take to reset the password. See [Chapter 3](#) for more information.

Power settings (Advanced Configuration and Power Interface, ACPI): Contains power use settings including those for hibernation, standby, and in battery-powered computers, power conservation settings. Often, BIOSs contain settings that allow proper shutdown of Windows just by pressing the power button on the computer or keyboard once. Some systems have different levels of standby types.

Boot order: Traditionally, a computer is set to boot first from the floppy drive, and then from the main hard drive (Drive C). This means that the computer will check the floppy drive first for boot files. If there is no disk in the floppy drive, the computer will then go to the hard drive to look for boot files. That is why if you leave a nonbootable floppy disk in the drive and try to boot up, you'll get an error message such as "NTLDR is missing. Press any key to restart." or "Non-system disk or disk error." This can be changed to pretty much any order, including CD-ROM and DVD drives. It is useful when installing Windows on a new or just-formatted computer to set the computer to boot first from a CD-ROM drive, and then insert the Windows installation CD-ROM into that drive. This saves you from having to use boot floppies that might or might not come with the Windows CD-ROM.

Memory settings, DRAM Timing: Don't change these unless so instructed by a support technician.

AGP Aperture Size: Don't change this unless you are familiar with troubleshooting techniques and feel comfortable in this area. The main thing to remember here is that the AGP Aperture Size should almost always be set to at least 16MB and never to more than the actual physical RAM installed in the system. This setting will allow a possible increase in graphics (video) performance by permitting the graphics system to share system memory if needed. A higher setting often (but not always) means better graphics performance, so test the results of any change you make here by viewing the graphics performance.

CPU Frequency, Voltage Control, and other settings such as frequency (speed): On many BIOSs, this can be set automatically or manually. If you're setting them manually, you have to know the exact settings for your CPU so you don't damage your motherboard or

CPU. Settings other than those specified by the CPU manufacturer should be made only by very experienced technicians.

PC Health: These include CPU and system temperatures at which warnings are made and shutdowns occur.

Integrated peripherals: These are items such as sound “cards” and network adapters that are part of the motherboard. The most common use of these settings is to disable these devices when additional peripherals of the same type are installed. For example, if the user installs an expansion sound card on a system that has onboard sound (because the onboard sound device has failed or because the user wants to upgrade to a better sound device), the onboard sound needs to be disabled to prevent problems that can occur with two active sound cards.

Interrupts (IRQs): These settings can also be changed in the Windows Device Manager (we provide more information later in this chapter).

Extended System Configuration Data (ESCD): If this setting is available, it should be enabled every time a new component is installed in the computer. Each time ESCD is enabled, the configuration resets at next boot. If a computer won't boot after installation of a new component, enabling ESCD and rebooting the system can sometimes solve the problem.

IDE Detection: This is normally set to Auto for automatic detection of IDE disk drives. Disabling auto-detection on unused drive channels can speed the boot process. See [Chapter 6, “Magnetic Disk Drives,”](#) for more information on IDE drives.

Self-Monitoring Analysis and Reporting Technology (S.M.A.R.T.) drives: This technology, incorporated into most modern IDE hard drives, can alert the user of possible impending hard drive failure and most likely allow for data backup before this happens. Because of this, S.M.A.R.T. drive support should always be enabled in the setup program. Interestingly, computers are often delivered from the factory with S.M.A.R.T. drive support disabled.

Plug and Play (PnP) settings: We describe Plug and Play capability later in this chapter. PnP should be enabled in the vast majority of cases. Sometimes in Windows 95, you will have to disable Plug and Play support. There are certain other unusual situations that require you to disable Plug and Play, as you might find when researching certain problems or reading installation manuals.

Load defaults: Setup programs have default settings. Loading default settings is a good way to get your computer back to its original configuration. Do this only if all else fails. Before loading the default settings, *go through each screen and write down every setting*. Some devices might not work with the default settings.

WINDOWS CONTROL PANEL

Control Panel is one of the most important areas in Windows for configuring your computer. Although many of the applets in Control Panel can be accessed from elsewhere, Control Panel is the central location for these tools. There are several ways to access Control Panel, and these vary depending on Windows version and configuration. [Tutorial 2.1](#) explains three ways to access Control Panel. If none of these applies to the computer you're working on, please consult Windows Help.

Tutorial 2.1: Accessing Control Panel

- I. **Windows 9x, 2000, and XP with classic Start menu:** Go to Start > Settings > Control Panel.
 - II. **Windows XP with standard Start menu:** Go to Start > Control Panel.
 - III. **All versions if so configured:** Open My Computer and click or double-click Control Panel.
-

Applets

In Control Panel, *applets* are small programs that are used to configure individual components of the OS and hardware. Control Panel contains many applets. The applets and their names vary from version to version. Certain third-party programs install additional applets in Control Panel. This section covers pertinent applets not covered elsewhere in the book.

Wizards

A *wizard* is a program that leads the user through various steps of configuring software or hardware by prompting for answers to questions. Wizards facilitate simpler configuration of hardware and software by making sure that all of the necessary components are properly configured and that none are missed. Many of the applets in Control Panel contain wizards. The disadvantage to wizards is that they sometimes can limit options available in traditional configuration screens. However, most components can be configured from traditional screens after the wizard has been completed.

The remainder of this section deals with the more important applets.

Note For XP users, if you reach Control Panel and find that it shows none of the applets described in the following paragraphs, click the Switch to Classic View link that should appear at the top of the menu on the left side of the screen. The default “Category View” is designed more for end users than for technicians.

Accessibility Options

Accessibility Options are aids for people with various disabilities. They are also available in most versions in Start > Programs > Accessories, along with an Accessibility Wizard. This applet is fairly self-explanatory. Check here if you are experiencing unusual keyboard behavior such as ignored brief or repeated keystrokes, sounds such as beeps when certain keys are pressed, exceptionally large or high-contrast video, and so forth. Make sure the user doesn't need these settings before disabling them. If you do need to disable them to work on the machine and the user needs them, make sure to write down all settings and restore them before returning the machine to the user.

Add/Remove Hardware

This goes by different names in the various versions of Windows. Its purpose is to scan the computer for new hardware components and to install the drivers for them. In the event that Windows doesn't automatically detect new hardware, compatible hardware can often be installed by following the wizard. This applet is becoming less important as Windows installs almost all Plug and Play hardware automatically. We cover this and related wizards, plus Plug and Play technology, in greater detail in the upcoming section on device drivers.

Administrative Tools: Computer Management

The Administrative Tools folder is available in 2000 and XP only, although there are versions of a few of the tools in 9x. This is a series of tools, most of which are not intended for the average end user. These tools are accessible by themselves, and many are accessible through one of them: Computer Management. Computer

Management is also accessible by right-clicking the My Computer icon and clicking Manage from the menu that appears, and from the programs list in the Start menu if so configured. Computer Management is divided into the following three categories:

System Tools

System Tools comprises a collection of tools allowing you to monitor performance and events, view information about hardware and software, and manage shared folders and user and group accounts.

Note There is another set of tools in all versions called System Tools. These are accessible from the programs in the Start menu and are discussed later in this chapter.

The pertinent tools in this folder vary between 2000 and XP and are:

Event Viewer: You might be directed by a support technician or article to use Event Viewer. For detailed information on Event Viewer, go to <http://support.microsoft.com>, click the link for searching Knowledge Base articles by number, and enter 308427.

Device Manager: We discuss Device Manager in detail later in this chapter.

Storage

Disk Management: Disk Management is the one very useful program here that isn't readily available elsewhere. It allows you to view a graphical depiction of the condition of all disk drives installed in the computer. Indicators show the type of partition (system, logical, primary, etc.), its condition (healthy, failed, formatting, healthy [at risk], etc.), file system (FAT, FAT32, NTFS), and other information. As long as the system is bootable, Disk Management allows you to repair some types of disk problems (of course, if the system isn't bootable, you won't be able to start Disk Management).

Management of hard drives at this level is rather complicated. To understand more, see reference books on Windows 2000. We discuss some disk restoration techniques in [Chapter 6](#).

Services and Applications

Services: Shown in [Figure 2.3](#), this is the important subcomponent here. It allows management of services on the computer. A *service* is a small program or part of a program whose purpose is to support larger programs or OS components. Many services need to run for Windows and certain installed programs to operate. Some should start automatically with Windows, and some should be started manually only when called on by a program or OS process. If you get a message that says that something isn't working because a needed service isn't started, go to Services. Locate the service (hopefully the error message identified the particular service) and double-click on its line in the list. Here, as shown in [Figure 2.4](#), you'll see controls that allow you to start the service manually, set it to automatic so it starts when Windows starts, set it to manual so it waits for a command to start, or disable it so it never starts. If you attempt to start the service and it won't start, it's time to troubleshoot. See [Chapter 11](#), "Troubleshooting," for general troubleshooting information.

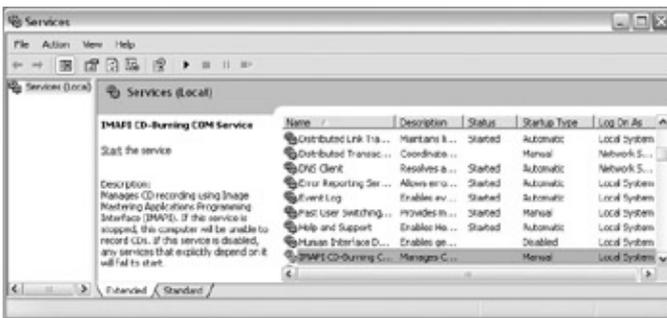


Figure 2.3: Services applet.



Figure 2.4: Configuring a service.

Tip You can also use the XP version of MSCConfig to set services to start or stop with Windows. We discuss MSCConfig later in this chapter.

Add/Remove Programs

Known as &"temp0070.html#607" target="_parent" class="chapterjump">Chapter 11). This applet has several uses:

Installation of programs: This applet is no longer frequently used for installing programs. Usually, to install programs, you can simply insert the program installation disc and follow the prompts, or double-click on a program installation file icon and follow the prompts. If you do decide to use this to install a program, click the Install button on 9x or the Add New Programs button on 2000 or XP, and follow the simple prompts.

Uninstallation of programs: The Uninstall Wizard is a very useful tool. It is a good idea to uninstall programs that are no longer likely to be used, in order to free up space on the hard drive. One common problem computers have is that their hard drives become nearly full. A computer might run badly or not at all unless the hard drive has enough free space to hold the *swap file* for *virtual memory* (we define these terms later in this chapter). Other reasons to uninstall programs are if they are causing problems on the computer or if installation of a new version of the program requires that the old version be uninstalled first. Click the name of the program in the list and follow the prompts. You might be asked while running this wizard to decide if certain files should be retained or deleted. Usually, your choices will be “Yes” (delete the file), “Yes to all” (delete all such files), “No” (retain the file), or “No to all” (retain all such files). Unless you are certain, it is safest to select “No to all.” At the end, you’ll usually get the message that not all of the items were deleted and that you should remove the remaining items manually. You can safely forgo doing so, although you might want to delete shortcuts. *Shortcuts* are small files that allow you to access other files. Most of the icons on