Introduction

Welcome to *Upgrading and Repairing PCs*, 4th Edition. This book is for people who want to upgrade, repair, maintain, and troubleshoot computers. It covers the full range of IBM and IBM-compatible systems.

In addition, this book covers state-of-the-art hardware that makes the most modern personal computers easier, faster, and more productive to use. Hardware coverage includes systems based on the 486 and Pentium CPU chips, local bus technology, CD-ROM drives, tape backups, sound boards, PCMCIA devices for laptops, IDE and SCSI-interface devices, larger and faster hard drives, and increased system memory capacity.

The comprehensive coverage of the IBM-compatible personal computer in this book has consistently won acclaim. With the release of this 4th edition, *Upgrading and Repairing PCs* takes its place as one of the most comprehensive and easily used references on even the most modern systems—those based on cutting-edge hardware and software. The book examines personal computer systems in depth, outlines the differences among them, and presents options for configuring each system at the time you purchase it.

Sections of this book provide detailed information about each internal component of a personal computer system, from the processor to the keyboard and video display. The book examines the options available in modern, high-performance PC configurations, and how to use them to your advantage; it focuses on much of the hardware and software available today and specifies the optimum configurations for achieving maximum benefit for the time and money you spend. At a glance, here are the major system components and peripherals covered in this edition of *Upgrading and Repairing PCs*:

- Pentium, 486, and earlier central processing unit (CPU) chips
- The latest processor upgrade socket specifications
- Special bus architectures and devices including high-speed PCI (Peripheral Component Interconnect) and VL-Bus (Video Local), EISA (Extended Industry Standard Architecture), and MCA (Micro Channel Architecture)
- Plug-and-play architecture
- Larger, faster hard drives and hard drive interfaces, including IDE and SCSI
- Floppy drives, including 360K, 1.2M, 1.44M, and 2.88M drives

- New storage devices such as CD-ROM and magneto-optical drives

- Increased system memory capacity

- Large-screen Super VGA monitors and high-speed graphics adapter cards

- Peripheral devices such as CD-ROM drives, sound boards, and tape backups

- PCMCIA devices for laptops

- Multimedia

This book also shows you how to troubleshoot the kind of hardware problems that can make PC upgrading and repairing difficult. Troubleshooting coverage includes DMA channel and IRQ problems, and memory address conflicts. This book tells you how to avoid these kinds of problems, and how to make installing a new adapter board in your computer a simple plug-and-play operation. This book also focuses on software problems, starting with the basics of how DOS or another operating system works with your system hardware to start up your system. You also learn how to troubleshoot and avoid problems involving system hardware, the operating system, and applications software such as word processors or spreadsheets.

This book is the result of years of research and development in the production of my PC hardware, operating system, and data recovery seminars. Over the years I have personally taught thousands of people about PC troubleshooting, upgrading, maintenance, repair, and data recovery. This book represents the culmination of many years of field experience as well as knowledge culled from the experiences of thousands of others. What originally started out as a simple course workbook has over the years grown into a complete reference on the subject. Now you can benefit from this experience and research.

What Are the Main Objectives of This Book?

Upgrading and Repairing PCs focuses on several objectives. The primary objective is to help you learn how to maintain, upgrade, and repair your PC system. To that end, *Upgrading and Repairing PCs* helps you fully understand the family of computers that has grown from the original IBM PC, including IBM and IBM-compatible systems. This book discusses all areas of system improvement such as floppy disks, hard disks, central processing units, math coprocessors, and power-supply improvements. The book discusses proper system and component care; it specifies the most failure-prone items in different PC systems, and tells you how to locate and identify a failing component. You learn about powerful diagnostics hardware and software that enable a system to help you determine the cause of a problem and how to repair it.

The IBM-compatible microcomputer family is moving forward rapidly in power and capabilities. Processor performance increases with every new chip design. *Upgrading and Repairing PCs* helps you gain an understanding of each of the CPU chips used in IBM and IBM-compatible computer systems.

This book covers the important differences between major system architectures—the original Industry Standard Architecture (ISA), Extended Industry Standard Architecture (EISA), and Micro Channel Architecture (MCA). The most modern systems use special local bus architectures and adapter cards to get top speed from system peripherals like video adapter cards and hard drives. Besides ISA, EISA, and MCA, these local bus architectures include PCI (Peripheral Component Interconnect) and VL-Bus devices. *Upgrading and Repairing PCs* covers each of these system architectures and their adapter boards to help you make decisions about which kind of system you may want to buy in the future, and how to upgrade and troubleshoot such systems.

The amount of storage space available to modern PCs is increasing geometrically. *Upgrading and Repairing PCs* covers storage options ranging from larger, faster hard drives to state-of-the-art storage devices. In addition, this book provides detailed information on upgrading and troubleshooting system RAM.

When you finish reading this book, you should have the knowledge to upgrade as well as troubleshoot and repair almost all systems and components.

Who Should Use This Book?

Upgrading and Repairing PCs is designed for people who want a good understanding of how their PC systems work. Each section fully explains common and not-so-common problems, what causes problems, and how to handle problems when they arise. You will gain an understanding of disk configuration and interfacing, for example, that can improve your diagnostics and troubleshooting skills. You'll develop a feel for what goes on in a system so that you can rely on your own judgment and observations and not some table of canned troubleshooting steps. This book is for people who are truly interested in their systems and how they operate.

Upgrading and Repairing PCs is written for people who will select, install, configure, maintain, and repair systems they or their companies use. To accomplish these tasks, you need a level of knowledge much higher than that of an average system user. You must know exactly which tool to use for a task and how to use the tool correctly. This book can help you achieve this level of knowledge.

What Is in This Book?

Part I serves primarily as an introduction. Chapter 1 begins this part with an introduction to the development of the IBM PC and compatibles. Chapter 2 provides information about the different types of systems you encounter and what separates one type of system from another, including the types of system buses that differentiate systems. Chapter 2 also provides an overview of the types of PC systems that help build a foundation of knowledge essential for the remainder of the book. Chapter 3 discusses the physical disassembly and reassembly of a system.

Part II covers the primary system components of a PC. Chapter 4 begins this discussion of the components in a PC system by covering the motherboard. Chapter 5 continues this discussion by focusing on the different types of expansion slots and bus types found in PC systems. Chapter 6 goes into detail about the central processing unit (CPU), or main processor, including those from Intel as well as from other companies. Chapter 7 gives a detailed discussion of PC memory, from basic architecture to the physical chips and SIMMs themselves. Chapter 8 is a detailed investigation of the power supply, which remains as the primary cause for PC system problems and failures.

Part III is about input/output hardware and begins with Chapter 9 on input devices. This chapter includes coverage of keyboards, pointing devices, and the game port. Chapter 10 discusses video display hardware, including video adapters and monitors. Chapter 11 is a detailed discussion of communications and networking hardware, and Chapter 12 focuses on audio hardware, including sound boards and speaker systems.

Part IV is about mass storage systems and leads off with Chapter 13 on floppy disk drives and controllers. Chapter 14 is a detailed discussion of hard disk drives and controllers, including IDE and SCSI in depth. This information is invaluable when you install drives as either replacements or upgrades in a system, and if you troubleshoot and repair malfunctioning drives. Chapter 15 is about CD-ROM drives, and Chapter 16 covers tape and other mass storage drives.

Part V covers system assembly and maintenance. Chapter 17 discusses system upgrades and improvements. Chapter 18 covers system preventive maintenance, backups, and warranties.

Part VI covers troubleshooting and diagnostics and starts off with Chapter 19 on diagnostic tools. Chapter 20 covers operating system software and troubleshooting.

Part VII is a technical reference section that covers in considerable depth each IBM PC and PS/2 model and lists differences among individual versions of each system. Technical specifications for each system are highlighted in these chapters also. This information is useful not only for supporting actual IBM equipment, but also for IBM-compatible systems not supplied with extensive documentation. You learn how to compare systems with the IBM standard. This part begins with Chapter 21 on the IBM classic PC family hardware. Chapter 22 is a reference to the IBM PS/1, PS/Valuepoint, and PS/2 system hardware.

Appendix A provides an extensive PC technical reference section, including a variety of technical information tables. Appendix B provides an extremely detailed vendor list useful for finding suppliers and vendors of necessary hardware and software.

I believe that *Upgrading and Repairing PCs*, 4th Edition, will prove to be the best book of its kind on the market. It offers not only the breadth of IBM and compatible equipment, but also much in-depth coverage of each topic. This book is valuable as a reference tool for understanding how various components in a system interact and operate, and as a guide to repairing and servicing problems you encounter. *Upgrading and Repairing PCs* is far more than just a repair manual. I sincerely hope that you enjoy it.