

Contents

Preface	ix
Acknowledgments	xiii

Part I: Introduction 1

Chapter 1: Getting Ready 3

You Can Do What You Can Imagine	3
What do you do with your computer?	4
Which operating system do you want, and why?	5
Should you upgrade your computer?	6
What new computer should you buy?	6
What about support and maintenance?	7
What about future upgrades?	7
Basic Techniques	8
Static electricity	8
Tools	9
Summary	11

Chapter 2: Why Isn't the Same Computer Right for Everyone? 13

Buying into a Moving Target	16
Choosing an Operating System	19
Windows	19
Linux and UNIX	20
What You Need to Run Windows	21
Support and Maintenance Service	25
Summary	26

Chapter 3: PC Overview 27

What's Inside Your Computer?	27
Processors and instructions	30
Buses	32
Memory	34
Disk drives and I/O channels	36
Video cards and monitors	39
What's Outside Your Computer?	42
Summary	42

Part II: Processors and Motherboards**43****Chapter 4: Processors, Cache, and Memory 45**

Executing Instructions	45
Cache Memory	48
Big, Fast Memory	50
Motherboard Choices	51
Intel: Celeron and Pentium 4 Processors	53
Pipelining and superscalar execution	53
Dynamic branch prediction	54
Dynamic execution	55
Extensions to the instruction set	56
Hyperthreading and multiprocessors	57
Expected performance gains	58
AMD	60
Power Management	62
Summary	63

Chapter 5: Buses, Chipsets, and Motherboards 65

The ISA Bus: It's Old and Slow, and (Finally) Almost Gone	67
PCI	69
PCI Express	70
Chipsets	70
Motherboards	72
External Buses	75
Universal Serial Bus	75
IEEE 1394 (FireWire)	75
PC Card	75
Summary	76

Part III: Video**77****Chapter 6: Video 79**

A Computer Monitor Is Not the Same as a Television	79
The Video data path	81
Sixteen million is a whole lot of colors	81
Video Buses	83
What a 3D Video Accelerator Does	83
Video Compression	87
Television in a Window	90
Choosing a Video Card	91
Video Drivers	92
Summary	92

Chapter 7: Monitors and Flat Panels 93

- Flat Panel Displays 94
 - LCDs and active matrix technology 94
 - Keeping the LCD image sharp 94
- CRT Specifications and Measurements 97
 - Focus and convergence 97
 - Color balance, tracking, purity, and saturation 99
 - Incident static magnetic fields 100
 - Incident dynamic fields 101
 - Ghosting 101
 - Geometric distortion 102
- Controls 102
- Multimedia Monitors 104
- Display Data Channel 105
- Choosing a Monitor 106
- Summary 107

Part IV: Storage 109

Chapter 8: Hard Disks and Disk Arrays 111

- Disk Drive Performance 113
- Disk Drive Reliability 115
- Redundant Array of Inexpensive Disks (RAID) 117
 - What RAID does 117
 - RAID levels 118
 - RAID level 0 118
 - RAID level 1 119
 - RAID level 2, level 3, and level 4 120
 - RAID level 5 121
- Adding a Disk Drive 122
- Top Disk Support Questions 124
- Summary 128

Chapter 9: CD and DVD 129

- What Is a CD-ROM? 129
- Bootable CD-ROM 135
- Recordable CD-ROMs 137
- DVD 137
- Recordable DVD 140
- Top Support Questions 142
- Summary 143

Chapter 10: Removable Storage 145

- Floppy Disks and Competitors 145
- Universal Serial Bus 147
- External USB Storage 149
- Small Scale File Transfer and Backup 150
- Backup with External Disk 152
- Summary 153

Part V: Networks and Communications 155

Chapter 11: Modems 157

- Signals and Very Long Wires 158
- Dial-up Analog Modems 159
- DSL 164
- Cable Television 165
- Fixed Wireless and Satellite 168
- Choosing Your Internet Access 170
- Choosing a Modem 172
 - Choosing a dial-up modem 172
 - Choosing an internal or external modem 173
- Summary 174

Chapter 12: Wired and Wireless Networking 175

- Network Characteristics 176
 - Point-to-point or shared media 176
 - Baseband or modulated 176
 - Full- or half-duplex 177
 - Access methods 177
- Network Technologies 179
 - Ethernet 179
 - Wireless transmission 184
- Choosing Your Network Technologies 191
- Summary 191

Chapter 13: Hubs, Switches, Routers, and Firewalls 193

- Designing Small Local Area Networks 193
- Ethernet Switches 195
- Expanding Your Network 196
- Routers 198
 - Transmission Control Protocol 201
 - User Datagram Protocol 203
 - Domain Name Service 203
- Network Security and Firewalls 204
 - Packet filters 205
 - Network Address Translation 206
 - Standalone firewalls 207
 - On-computer firewalls 209
- Summary 210

Chapter 14: Configuring a Windows Network 211

- Network Protocols 211
- Inside the Network Pipes 212
 - Media and network addresses 213
 - Domain Name Service and Address Resolution Protocol 215
 - Dynamic Host Configuration Protocol (DHCP) 215
- Configuring TCP/IP 218

Configuring File Sharing	219
Windows 2000 and Windows XP	220
Windows 98	222
Configuring Printer Sharing	222
Summary	223

Chapter 15: Internet Services, Antivirus, and Anti-Spam 225

Internet Services	225
Ping	225
World Wide Web	226
File transfer	228
Electronic mail	229
Telnet	231
Newsgroups	232
Time	233
Instant messaging	234
Internet Relay Chat	234
Proprietary messaging	234
Viruses and Worms and Trojans, Oh My!	234
Viruses	235
Worms	238
Trojans	240
Cracks	241
Antivirus and anti-adware software	242
Dealing with Spam	245
Summary	248

Part VI: Multimedia and Peripherals 249

Chapter 16: Sound Cards, Speakers, Microphones, and MP3 Players 251

What Is Sound?	251
Analog Audio	254
Waveform Audio	255
Waveform audio hardware	257
Audio compression	259
Musical Instrument Digital Interface	262
CD Audio and Line Interfaces	263
USB Audio	264
Choosing Speakers	264
MP3 Players	267
Working with Microphones	268
Voice annotation	269
Speech recognition	269
Voice over IP and Internet phones	270
Picking a Sound System	271
Top Support Questions	272
Summary	273

Chapter 17: Digital Cameras, Video Capture, and DVDs	275
Still Image Photography	276
Image resolution and memory	277
A darkroom on your desk	280
Choosing a digital camera	281
Video	283
Video capture and editing	284
Making DVDs from video	286
Summary	288
Chapter 18: Keyboards and Game Controllers	289
Keyboards	289
Switches and tactile feedback	289
Keyboard layouts	293
Ergonomics and repetitive stress	293
Impaired access	296
Game Controllers	296
Joysticks	297
Game pads	299
Wheels	299
Summary	300
Chapter 19: Mice, Trackballs, and Tablets	301
Mice	302
Mouse cursors	304
Microsoft Intellimouse	304
Trackballs	306
Tablets	308
Top Support Questions	309
Mouse	309
Tablet	310
Summary	310
Chapter 20: Printers, Scanners, and All-in-One Units	311
Printers: Getting the Ink (Only) Where It Belongs	311
Ink jet printers	312
Laser printers	314
Page description languages	315
Choosing a printer	317
Scanners	319
Mechanisms	320
Number and accuracy of colors	321
Resolution	321
Interfaces	324
Software	324
All-in-One Units: Combining Printing, Fax, and Copying	325
Summary	326

Part VII: Integration**327****Chapter 21: Cases, Cooling, and Power 329**

Cases, Fans, and Cooling	329
Airflow and heat buildup	333
Cooling	333
The ATX form factor	337
Choosing a case	339
Power Supplies	340
Selecting good power supplies	341
Uninterruptible power supplies	341
External Connectors	343
Summary	346

Chapter 22: Laptops and Handheld Computers 347

What's in Your Laptop?	347
Processor, memory, and bus	348
PC Card and PC CardBus	350
Laptop displays	351
Disk	351
Communications and ports	351
Batteries	352
Docking Stations	353
Handheld Computers	354
Global Positioning System	355
Communications Security	356
Upgrades	357
Summary	357

Chapter 23: You're Going to Put That Where? 359

Never Be Out of Reach	360
Sensors and Alerts	360
Building and Using Your Surveillance System from Kits	361
Parts list	361
Working with the TrackerCam software	364
Live Internet surveillance	365
Recorded Internet surveillance	368
Motion detection and tracking	369
Videoconferencing	371
Building a Surveillance System to Your Own Design	372
Multiple cameras	372
Long cables and wireless cameras	373
Long cables	373
Wireless	373
Integrated home automation	373
Archiving to removable storage	374
Summary	374

Chapter 24: Diagnosis and Repair	375
Basic Techniques	376
Mechanical Procedures	376
Disassembly tips	378
Which slot is the board in?	378
What cables connect to the card?	378
Where is pin number one?	379
Top-level disassembly	380
Isolation Procedures	381
Rules of thumb	381
Observation and low-level isolation	382
System unresponsive	383
Monitor unresponsive	384
Video operational during boot	384
Memory failures	386
Diagnostics	386
Problems in Functioning Machines	387
Configuration problems	387
It doesn't work right	388
Network Diagnosis	389
Viruses	390
Case Study: A Dead Machine	390
Summary	393
Chapter 25: Building an Extreme Machine	395
Hardware Planning	395
Preliminary Mechanical Assembly	398
Chassis layout and assembly	398
Mounting the drives	400
Installing the Motherboard	402
Installing the processor	404
Inserting the memory	407
Cabling in the power supply	409
Wiring the chassis to the motherboard connectors	411
Final Cabling	413
Installing Adapter Cards	415
Planning Your Software	416
Configuring BIOS	417
Configuring the Disk and Installing Windows	418
Checking Your Configuration	419
Installing Applications	419
Summary	420
Glossary	421
Index	447