287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xiii

Contents

Foreword xxvii

Introduction xxxv

Part I Introduction to Hardware Hacking 1

Chapter 1 Tools of the Warranty Voiding Trade 3

Introduction 4
The Essential Tools 4
Taking it to the Next Level 6
Hardcore Hardware Hackers Only 8
Where to Obtain the Tools 10

Chapter 2 Electrical Engineering Basics 13

Introduction 14
Fundamentals 14
Bits, Bytes, and Nibbles 14
Reading Schematics 18
Voltage, Current, and Resistance 20
Direct Current and Alternating Current 21
Resistance 22
Ohm's Law 22
Basic Device Theory 23
Resistors 23
Capacitors 25
Diodes 28
Transistors 30
Integrated Circuits 32
Soldering Techniques 34

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xiv

Hands-On Example: Soldering a Resistor to a Circuit Board 34
Desoldering Tips 36
Hands-On Example: SMD Removal Using ChipQuik 37
Common Engineering Mistakes 40
Web Links and Other Resources 41
General Electrical Engineering Books 41
Electrical Engineering Web Sites 42
Data Sheets and Component Information 43
Major Electronic Component and Parts Distributors 43
Obsolete and Hard-to-Find Component Distributors 43

Part II Hardware Hacks 45

Chapter 3 Declawing Your CueCat 47
Introduction 48
Model Variations 49
Opening the CueCat 51
Preparing for the Hack 51
Opening the Four-Screw PS/2 CueCat 51
Opening the Two-Screw PS/2 CueCat 54
Opening the USB CueCat 55
Removing the Unique Identifier 56
Preparing for the Hack 57
Removing the UID: Four-Screw PS/2CueCat 57
Removing the UID: Two-Screw PS/2CueCat 60
Removing the UID: USB CueCat 62
Under the Hood: How the Hack Works 64
Removing the Proprietary Barcode Encoding 68
Preparing for the Hack 68
Removing the Encoding from the Four-Screw PS/2 CueCat 69
Removing the Encoding from the Two-Screw PS/2 CueCat 71
Removing the Encoding from the USB CueCat 73
Under the Hood: How the Hack Works 74

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xv

Technical Information 76
The CueCat Encoding Scheme 76
More Physical Model Variations 78
More History of Political and Legal Issues 80
CueCat Litter Box: Web Links and Other Resources 82
Open-Source CueCat Software and Drivers 83
DigitalConvergence Patents for CueCat Technologies 83

Chapter 4 Case Modification: Building a Custom Terabyte FireWire Hard Drive 83
Introduction 84
Case Mod Primer 84
Creating a 1.2TB FireWire RAID 85
Preparing for the Hack 85
Performing the Hack 86
Under the Hood: How the Hack Works 92
Custom Case Modification for the FireWire RAID 94
Preparing for the Hack 94
Performing the Hack 95
Under the Hood: How the Hack Works 105
Additional Resources 108
Case Modifications 109

Chapter 5 Macintosh 111
Compubrick SE 112
Preparing for the Hack 113
Performing the Hack 114
Taking Apart the Mac 114
Encasing the Speaker 120
Covering the Mouse and the Keyboard 121
Encasing the Disk Drive 123
Encasing the Hard Drive 125
Encasing the Motherboard 127
Encasing the CRT 129
How the Hack Works 131
Building a UFO Mouse 132

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xvi

Preparing for the Hack 133
Performing the Hack 134
Opening the Mouse 134
Drilling the Hole 136
Soldering the LED 137
Reassembling the Mouse 138
How the Hack Works 140
Adding Colored Skins to the Power Macintosh G4 Cube 140
Preparing for the Hack 141
Performing the Hack 142
Under the Hood: How the Hack Works 145
Other Hacks and Resources 145
Desktop Hacks 145
Laptop Hacks 146
Electrical and Optical Hacks 146
Case Mods 146
Software 147
Discussion 147

Chapter 6 Home Theater PCs 149

Introduction 150
Before You Begin: Research and Plan 151
How Much Could It Cost? 152
Did Someone Already Build It? 153
The Components of an HTPC Project 154
The Display 155
What Are Your Options for Higher-Quality Video Display? 157
The Video Card 160
The Case 160
The Hard Drives 161
Speed Considerations 163
Sshhhh... Quiet Operations 164
Optical Drives 164
The CPU 165
The Sound Card 166

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xvii

The Controller 167
The Software 167
Building a Windows HTPC 171
Preparing for the Hack 171
Performing the Hack: Software 175
Eazylook 177
Using the Launcher 178
Using Guide Plus+ 178
CDex 180
FairUse 180
Windows Summary 185
Building a Linux HTPC 185
Preparing for the Hack 185
Performing the Hack: Hardware 185
Performing the Hack: Software 192
Installing the Video Capture Drivers 192
Install MPlayer and CODECs 194
Installing MythTV 194
Linux Summary 197
Further Hacking and Advanced Topics 198

Chapter 7 Hack Your Atari 2600 and 7800 199

Introduction 200
The Atari 7800 ProSystem 201
Hacks in This Chapter 202
Atari 2600 Left-Handed Joystick Modification 202
Preparing for the Hack 203
Performing the Hack 204
Use an NES Control Pad with Your 2600 207
Preparing for the Hack 207
Performing the Hack 209
Atari 2600 Stereo Audio Output 214
Preparing for the Hack 216
Performing the Hack 216
Under the Hood: How the Hack Works 223
Atari 7800 Blue LED Modification 223

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xviii

Preparing for the Hack 223
Performing the Hack 224
Under the Hood: How the Hack Works 227
Atari 7800 Game Compatibility Hack to Play Certain 2600 Games 228
Preparing for the Hack 229
Performing the Hack 230
Under the Hood: How the Hack Works 232
Atari 7800 Voltage Regulator Replacement 232
Preparing for the Hack 233
Performing the Hack 233
Under the Hood: How the Hack Works 236
Atari 7800 Power Supply Plug Retrofit 237
Preparing for the Hack 238
Performing the Hack 239
Other Hacks 242
2600 Composite/S-Video Modifications 242
Atari 7800 Composite and S-Video Output 243
Sega Genesis to Atari 7800 Controller Modification 243
NES Control Pad to Atari 7800 Controller Modification 243
Atari 7800 DevOS Modification and Cable Creation 243
Atari Resources on the Web 244

Chapter 8 Hack Your Atari 5200 and 8-Bit Computer 247
Introduction 248
The Atari 5200 SuperSystem 249
Hacks in This Chapter 250
Atari 5200 Blue LED Modification 250
Preparing for the Hack 251
Performing the Hack 251
Under the Hood: How the Hack Works 256
Creating an Atari 5200 Paddle 256
Preparing for the Hack 257
Performing the Hack: Disassembling the Paddle Controller 258

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xix

Performing the Hack: Building the 5200 Paddle Controller 260
Performing the (Optional) Hack: Weighted Dial 266
Under the Hood: How the Hack Works 267
Free Yourself from the 5200 Four-Port Switchbox 268
Preparing for the Hack 269
Performing the Hack 271
Under the Hood: How the Hack Works 279
Build Atari 8-Bit S-Video and Composite Cables 280
Preparing for the Hack 281
Performing the Hack 282
Cable Hack Alternatives 288
Under the Hood: How the Hack Works 289
Technical Information 289
Other Hacks 290
Atari 5200 Four-Port VCS Cartridge Adapter Fix 290
Atari 5200 Composite/S-Video Modification 290
Atari 8-Bit SIO2PC Cable 291
Atari Resources on the Web 291

Chapter 9 Hacking the PlayStation 2 293

Introduction 294
Commercial Hardware Hacking: Modchips 294
Getting Inside the PS2 296
Mainboard Revisions 296
Identifying Your Mainboard 297
Opening the PS2 298
Installing a Serial Port 302
Preparing for the Hack 303
Performing the Hack 304
Testing 309
Under the Hood: How the Hack Works 310
Booting Code from the Memory Card 310
Preparing for the Hack 310
Performing the Hack: Preparing Title.DB 311
Choosing BOOT.ELF 313

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xx

Saving TITLE.DB to the Memory Card 314
Independence! 314
Under the Hood: How the Hack Works 314
Other Hacks: Independent Hard Drives 316
PS2 System Overview 316
Understanding the Emotion Engine 317
The Serial I/O Port 318
The I/O Processor 321
The Sub-CPU Interface 321
Additional Web Resources 321

Chapter 10 Wireless 802.11 Hacks 323

Introduction 324
Wireless NIC/PCMCIA Card Modifications: Adding an External Antenna Connector 325
Preparing for the Hack 326
Performing the Hack 327
Removing the Cover 327
Moving the Capacitor 329
Attaching the New Connector 331
Under the Hood: How the Hack Works 332
OpenAP (Instant802): Reprogramming Your Access Point with Linux 332
Preparing for the Hack 333
Performing the Hack 334
Installing the SRAM Card 335
Power Me Up, Scotty! 338
Under the Hood: How the Hack Works 338
Having Fun with the Dell 1184 Access Point 338
Preparing for the Hack 339
Performing the Hack 340
Under the Hood: How the Hack Works 345
Summary 345
Additional Resources and Other Hacks 345
User Groups 345
Research and Articles 346

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xxi

Products and Tools 346

Chapter 11 Hacking the iPod 349

Introduction 350
Opening Your iPod 353
Preparing for the Hack 354
First Generation iPods 355
Second and Third-Generation iPods 356
Replacing the iPod Battery 359
Preparing for the Hack 360
Battery Replacement: First- and Second-Generation iPods 361
Battery Replacement: Third-Generation iPods 365
Upgrading a 5GB iPod's Hard Drive 371
Preparing for the Hack 372
Performing the Hack 372
From Mac to Windows and Back Again 381
Preparing for the Hack 381
Going from Windows to Macintosh 381
Going from Macintosh to Windows 383
iPod Diagnostic Mode 384
The Diagnostic Menu 384
Disk Check 387
Additional iPod Hacks 388
Installing Linux on an iPod 388
Repairing the FireWire Port 388
Scroll Wheel Fix 389
iPod Resources on the Web 390

Chapter 12 Can You Hear Me Now? Nokia 6210 Mobile Phone Modifications 391

Introduction 392
Nokia 6210 LED Modification 393
Preparing for the Hack 393
Performing the Hack 395
Opening the Nokia 6210 395
Removing the Old LEDs 400

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xxii

Inserting the New LEDs 401
Increasing the LED Power 402
Putting the Phone Back Together 403
Under the Hood: How the Hack Works 404
Data Cabling Hacks 406
Data Cables 407
Flashing Cables 410
Net Monitor 411
Other Hacks and Resources 415

Chapter 13 Upgrading Memory on Palm Devices 417
Introduction 418
Model Variations 419
Hacking the Pilot 1000 and Pilot 5000 420
Preparing for the Hack 420
Removing the Memory Card 422
Adding New Memory 423
Under the Hood: How the Hack Works 427
Hacking the PalmPilot Professional and PalmPilot Personal 429
Preparing for the Hack 429
Removing the Memory Card 429
Adding New Memory 430
Under the Hood: How the Hack Works 433
Hacking the Palm m505 436
Preparing for the Hack 436
Opening the Palm 437
Removing the Main Circuit Board 439
Removing the Memory 441
Adding New Memory 442
Under the Hood: How the Hack Works 445
Technical Information 447
Hardware 447
File System 448
Memory Map 448

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xxiii

Database Structure 449
Palm Links on the Web 450
Technical Information 450
Palm Hacks 450
More Memory Upgrades 450

Part III Hardware Hacking Technical Reference 451

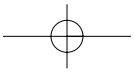
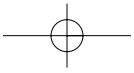
Chapter 14 Operating Systems Overview 453
Introduction 454
OS Basics 454
Memory 455
Physical Memory 455
Virtual Memory 457
File Systems 458
Cache 459
Input/Output 460
Processes 460
System Calls 461
Shells, User Interfaces, and GUIs 461
Device Drivers 462
Block and Character Devices 464
Properties of Embedded Operating Systems 466
Linux 467
Open Source 467
History 468
Embedded Linux (uCLinux) 469
Product Examples: Linux on Embedded Systems 470
VxWorks 470
Product Examples: VxWorks on Embedded Systems 470
Windows CE 471
Concepts 471
Product Examples: Windows CE on Embedded Systems 472
Summary 473
Additional References and Further Reading 473

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xxiv

Chapter 15 Coding 101 **475**
Introduction 476
Programming Concepts 476
Assignment 477
Control Structures 478
Looping 479
Conditional Branching 480
Unconditional Branching 481
Storage Structures 482
Structures 483
Arrays 484
Hash Tables 485
Linked Lists 486
Readability 488
Comments 488
Function and Variable Names 488
Code Readability: Pretty Printing 489
Introduction to C 490
History and Basics of C 490
Printing to the Screen 490
Data Types in C 493
Mathematical Functions 493
Control Structures 496
For Loops 496
While Loops 496
If/Else 498
Switch 500
Storage Structures 501
Arrays, Pointers, and Character Strings 501
Structures 506
Function Calls and Variable Passing 507
System Calls and Hardware Access 508
Summary 509
Debugging 509
Debugging Tools 509

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xxv

The *printf* Method 510
Introduction to Assembly Language 512
Components of an Assembly Language Statement 513
Labels 513
Operations 515
Operands 515
Sample Program 516
Summary 518
Additional Reading 518

Index 519

287_HRD_HACK_TOC.qxd 1/14/04 7:45 PM Page xxvi