
***Wiring Your
Digital Home***
FOR
DUMMIES®

by Dennis C. Brewer and Paul A. Brewer



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About the Authors

Dennis C. Brewer is also the author of *Security Controls for Sarbanes-Oxley Section 404 IT Compliance: Authorization, Authentication, and Access* (Wiley). He earned a BSBA degree from Michigan Technological University and a Novell Network Engineer Certification, and he spent over a dozen years as an information technology specialist with the state of Michigan. Over the last ten years, Dennis has worked on networking and computer technology projects from the level of hands-on integration, maintenance, and operations to developing policy and charting future direction. He retired from his position as an information technology security solutions specialist in January 2006 from the state of Michigan, Department of Information Technology, Office of Enterprise Security. He currently operates his own IT consulting practice and works on additional book projects.

Dennis's on-the-ground and on-the-sea experience with electricity, wiring, building design, and construction, repairing, and maintenance includes 12 years in the U.S. Navy Reserve (where he attained the rank and rating of Chief Petty Officer, Interior Communications Electrician) and 12 years in the Michigan National Guard as a Combat Engineer Officer (which he retired from as a Captain in 1993).

Dennis currently resides in the quiet little town of Laurium, in the Upper Peninsula of Michigan, with his wife, Penny. Their shared hobbies and pastimes include reading, camping in the "little house," biking, walking when weather permits, and auto rides in sun, rain, sleet, or snow through the highways and byways of the Keweenaw peninsula (which almost always includes sightings of white-tailed deer, an occasional black bear or wolf, or a bald eagle busying itself "fishing" the mouth of the Eagle River, where it empties into Lake Superior). Dennis says, "There is nothing more rewarding than watching the sun set over the big lake after an engaging afternoon of writing, except for maybe helping someone install a home network!"

Paul A. Brewer has earned a state of Michigan Masters Electrician License and Michigan Residential Builders License. He studied electrical engineering at Michigan Technological University, in Houghton, Michigan. He is currently the vice president of the electrical contracting firm of All Systems Electric (run by his sons) located in Ishpeming, Michigan, and he also works on writing projects.

While in the U.S. Navy, Paul worked on electro-mechanical systems of the submarines of the Sunshine Squadron out of Key West Florida and later out of Charleston, South Carolina, as an Interior Communications Electrician Petty Officer Second Class. He also worked as an expeditor for a general contractor and as an electrician in several states. For the final three years that Callahan Mining Company operated the Ropes Gold Mine near Ishpeming, he ran the

electrical department for a developing underground mine; he also ran his own electrical contracting firm from 1976 to 2005. While at the Ropes Gold Mine, he designed and built an automatic control system that was CCTV monitored and could load skips by remote control. In addition, he maintained the high- and low-voltage distribution systems and the dewatering pumps as they advanced deeper with the mine's descent. In his contracting business, he has completed wiring projects that included department stores, offices, restaurants, homes, saw mills, and roller mills. On off-the-grid sites, he has installed generators, solar panels, and battery-powered inverter systems, which includes volunteering his time to the U.S. National Park of Isle Royal to install a solar-inverter-powered system on the beautiful island national park in Lake Superior.

Paul currently resides in the city of Ishpeming, Michigan, in the Upper Peninsula. He takes advantage of the area's seasonal amenities: skiing, skating, and — when the freeze precedes the snow — clears off the lake in front of his house to share the rink, where everyone is welcome to skate. Presque Isle Park in Marquette is a favorite place to ski in the winter. In the summer, he hits the rollerblade trails and concerts in the park. Paul says, "The park deer population in past years included two albino deer, which once cooperated by showing themselves when I took my only sister, Peggy, and her husband, Joe, to see them."

Dedication

Paul A. Brewer: I dedicate this book to our late brother, Edward Leslie Brewer. Ed, the oldest of us five children, was the spark that ignited our interest in the subject of electricity. As an extensive reader of all matters, Ed's knowledge of the electrical code book is best described as "a walking code book." When I first started in the business, he steered me to the right track by freely and enthusiastically giving me the code-compliant way to do a job. In later years, I still found good advice upon request and sometimes it came unsolicited. I do miss him.

Dennis C. Brewer: This book is dedicated to all those (too many to count or mention by name) who showed me how to actually do or make something with hand tools, power tools, and motorized equipment — particularly to my older brothers, Edward, Alfred, and Paul for their early encouragement toward learning to use tools and the trades. I also dedicate this book to those who want to learn how to do new things and pass that fresh knowledge, skill, or ability on to someone else who could benefit from the doing.

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Paul A. Brewer: I would like to thank my family for their support, acknowledging my three beautiful daughters and their spouses: Joyce and Joe, Paula and Dave, and Sandy. I would especially thank my two sons, Gary (and his wife Lisa), and Ricky, who both by chance also happen to be electricians, for helping me with this book. I received help from many vendors; the vendors that went out of their way to be of assistance, include Rex TV, Midwest Security, and Wal-Mart, all of Marquette, MI. I want to thank the owners, as well as the contractors, of the many projects we wired and photographed. Our electrical suppliers were very helpful, especially Joe Rahoi at Prime Supply and Holly Bluebaugh, Scott Schwenke, and Paul Klarich at UP Electric Supply. I am grateful to my friend, John Wirtanen, for the entertaining tales he tells and also for the wisdom and water that I received at his establishment.

Dennis C. Brewer: Thanks to my wife, Penny, for her relentless patience and support; my friend Joe, for always asking the tough technical questions; my oldest son, Jason, for the inspiration to always do quality work; my youngest son, Justin, for pointing out that sometimes designs need to go a little bit outside of the lines; and my mother, Verna, for reminding me recently that finding the right answer to a problem is worth some degree of celebration.

I want to thank the many electrical, electronic, and networking product vendors and sales representatives who answered or found answers to my questions. They know who they are because I will give each of them a copy of this book!

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Contents at a Glance

.....

<i>Introduction</i>	1
<i>Part I: Installing Power Distribution and Basic Wiring</i>	9
Chapter 1: Designing Your Digital Dream Home	11
Chapter 2: Bringing In the Services	21
Chapter 3: Roughing In the Wiring	43
Chapter 4: Trimming Your Home's Electrical System	69
Chapter 5: Controlling Your Life Remotely	89
<i>Part II: Adding Communication, Audio, and Video Systems</i>	99
Chapter 6: Wiring Your Home Phone System	101
Chapter 7: Installing a Public Address System	119
Chapter 8: Installing Cable TV and Advanced Digital Services	131
Chapter 9: Adding Stereo and Surround Sound	143
Chapter 10: Wiring Family Rooms and Home Theaters	159
Chapter 11: Installing Video Systems and Cameras	175
<i>Part III: Installing Home Networks and Advanced Technology</i>	183
Chapter 12: Home Networks and Internet Connections	185
Chapter 13: Integrating Computer Controls and Voice Technology	205
<i>Part IV: Security and Safety Systems</i>	219
Chapter 14: Working with Security Zones and Alarm Systems	221
Chapter 15: Backup and Alternative Power	239
<i>Part V: Extending Technology to Outdoor Living Spaces</i>	253
Chapter 16: Wiring Outside the House	255
Chapter 17: Outdoor Electronics	279
<i>Part VI: The Part of Tens</i>	289
Chapter 18: The Ten Best Wiring Web Sites	291
Chapter 19: The Ten Biggest Wiring Mistakes	295
Chapter 20: Ten Troubleshooting Tips	305

<i>Part VII: Appendixes</i>	313
Appendix A: Product Sources	315
Appendix B: What Mr. Ohm Wanted You to Know	319
Appendix C: About the CD	335
<i>Index</i>	339

Table of Contents

.....

<i>Introduction</i>	1
About This Book.....	1
Conventions Used in This Book.....	2
What You Don't Have to Read.....	2
Foolish Assumptions.....	2
How This Book Is Organized.....	3
Part I: Installing Power Distribution and Basic Wiring.....	3
Part II: Adding Communication, Audio, and Video Systems.....	4
Part III: Installing Home Networks and Advanced Technology.....	5
Part IV: Security and Safety Systems.....	5
Part V: Extending Technology to Outdoor Living Spaces.....	5
Part VI: The Part of Tens.....	6
Part VII: Appendixes.....	6
Icons Used in This Book.....	7
Where to Go from Here.....	7

Part I: Installing Power Distribution and Basic Wiring **9**

Chapter 1: Designing Your Digital Dream Home	11
Living on Digital Easy Street.....	12
Planning Your Digital Dream Home.....	13
Designing for new construction.....	13
Remodeling an existing residence.....	14
Completing single-focus projects.....	14
Choosing the Contractor — or Being Your Own.....	15
Selecting a contractor.....	15
Being your own contractor.....	18
Gathering Tools and Equipment.....	18
Hand tools.....	18
Power tools.....	19
Test equipment.....	20
Chapter 2: Bringing In the Services	21
Understanding the Power You Need.....	21
Alternating stuff.....	22
Transforming current with transformers.....	22
Amps and volts and other terms.....	23
Meeting Power Company and Code Requirements.....	26
Getting permitted.....	26
Installing in light of code requirements.....	27

Choosing a circuit panel.....	29
Choosing a distribution-panel location	30
Installing Electrical Services.....	31
Setting up temporary service	32
Looking up to overhead electrical service.....	33
Going underground	36
Connecting the electrical distribution panel	37
Grounding your service.....	39
Chapter 3: Roughing In the Wiring	43
Laying Out Receptacles (Legally)	43
Spacing receptacles	44
When to use GFI receptacles.....	45
Setting box heights.....	49
Making sure the box is flush	51
Mounting boxes during rewiring projects	51
Calculating box fill.....	53
Drilling Holes for Wiring.....	54
Drilling the framing	54
Drilling joists	56
Pulling Wires	58
Wiring to Code.....	59
Diagramming.....	61
Wiring the rest of the house.....	65
Wiring dryers and ranges.....	65
Wiring closets	66
Chapter 4: Trimming Your Home's Electrical System	69
Selecting Device Styles and Colors	69
Working with Receptacles and Switches.....	71
Installing receptacles and GFIs	71
Installing switches.....	75
Flushing and Leveling Electrical Devices	85
Testing Your Installations.....	87
Chapter 5: Controlling Your Life Remotely	89
Controlling Your Gadgets Remotely	89
Infrared and radio frequency remotes.....	90
Motion sensors	90
X10 remotes and devices.....	91
Using Timers for Around-the-Clock Control	96

Part II: Adding Communication, Audio, and Video Systems	99
Chapter 6: Wiring Your Home Phone System	101
Wiring Your Phone Service	102
Planning service entrances	102
Planning internal house wiring	106
Wiring for Conventional Phones	108
Installing a Home PBX System	111
Integrating VoIP	112
Understanding how VoIP works	112
Choosing a VoIP phone adapter	113
Choosing a VoIP service provider	116
Videoconferencing from Home	116
Equipping for videoconferencing	117
Using gateways for multi-point conferencing	118
Chapter 7: Installing a Public Address System	119
Planning a Home Communications System	120
Selecting locations	120
Choosing wire	122
Selecting amplifiers and speakers	123
Choosing intercom components	124
Installing the Hardware	125
Installing LV rings	125
Installing a central control unit	126
Connecting radio antennas	127
Installing and wiring remote locations	128
Chapter 8: Installing Cable TV and Advanced Digital Services . . .	131
Readying Your Home for Prime Time	131
Bringing TV service into your home	132
Installing TV cable jacks	132
Installing TV cable	134
Connecting the common distribution point	136
Installing for a Fiber Optic Future	138
Understanding fiber optic cable	138
Consider your fiber optic strategy	139
Choosing home fiber optic service	140
Connecting to fiber optic devices	141
Hooking up to the ONT	141
Checking availability	142

Chapter 9: Adding Stereo and Surround Sound143

Considering Whole-House Sound Systems	143
Using monophonic sound	145
Enhancing audio with stereo sound	145
Selecting stereo speaker locations.....	145
Encompassing your listeners with surround sound.....	146
Choosing and Installing Speakers	153
Wiring multi-room systems	154
Choosing speakers	155
Wiring in the speakers	155

Chapter 10: Wiring Family Rooms and Home Theaters159

Designing for Adaptable Family Rooms	159
Lighting Your Family Room.....	161
Measuring light levels	162
Selecting fluorescent fixtures.....	163
Using recessed fixtures.....	164
Using track fixtures	166
Supplementing with lamps and task lighting.....	167
Controlling your family room lights.....	168
Planning Family Room Outlets	169
Designing Your Dedicated Home Theater	170
Maintaining access to the equipment.....	171
Including a control center	172
Maintaining clear sound zones	173

Chapter 11: Installing Video Systems and Cameras175

Selecting Video Components.....	175
Reviewing camera features	176
Choosing a video surveillance system	178
Installing Your Video System.....	179
Positioning cameras.....	179
Supplying power to your cameras	180
Connecting cameras to the network.....	181

***Part III: Installing Home Networks
and Advanced Technology183*****Chapter 12: Home Networks and Internet Connections185**

Understanding Internet Terminology: Stirring the Alphabet Soup.....	186
POTS (Plain Old Telephone System).....	186
IP (Internet Protocol) addresses	187
DNS (Domain Name Services).....	187
DHCP (Dynamic Host Configuration Protocol).....	188

Reviewing Your Internet Connection Options	188
Dial-up service	190
ISDN (Integrated Services Digital Network)	190
T-1 lines	190
Fractional T-1	191
Broadband cable	191
DSL (Digital Subscriber Line) or ADSL (Asymmetric Digital Subscriber Line)	191
Fiber optic service	191
BPL (Broadband Over Power Lines)	192
Area wireless services	192
Connecting Your Home Network to the Internet	192
Installing a DSL or cable modem	193
Installing and configuring a router	194
Using firewalls	196
Understanding hubs and switches	196
Preparing to Wire Your Digital Home for Networking	197
Understanding Wireless “Wiring”	199
Setting Up Your Home Network	200

Chapter 13: Integrating Computer Controls and Voice Technology 205

Selecting Home Automation Components	205
Choosing automation software	206
Selecting a computer to run HAL	207
Wiring Your Home Automation Computer	209
Connecting HAL to the telephone	209
Installing voice-command stations	209
Interfacing with the home’s electrical system	212
Providing backup power to the automation system	214
Networking your automation system	215
Programming the automation interfaces	215

***Part IV: Security and Safety Systems*..... 219**

Chapter 14: Working with Security Zones and Alarm Systems . . . 221

Protecting Your Home with Alarms	221
Comparing intrusion alarms	222
Understanding sensors	223
Wiring and installing sensors	224
Increasing safety with supplemental alarms	225
Surveilling Your Surroundings	231
Digital cameras	231
Closed-circuit television (CCTV)	231
Webcams	232

Integrating Alarm and Communication Systems.....	233
Improving Your Home's Safety	234
Get the facts for your area	234
Screen visitors	235
Make some security elements visible.....	236
Secure your home	236

Chapter 15: Backup and Alternative Power 239

Identifying Your Home's Critical Systems	239
Comparing Types of Backup Power.....	241
Uninterruptible power supplies	241
Inverter systems.....	242
Green power systems	243
External combustion steam systems.....	245
Internal combustion systems	246
Interfacing Backup Systems to Your Electrical System.....	246
Alternative Energy Systems	248
Choosing an inverter.....	249
Caring for batteries	249

Part V: Extending Technology to Outdoor Living Spaces.....253

Chapter 16: Wiring Outside the House 255

Powering Sunrooms	255
Installing power and lighting	256
Bringing entertainment to the sunroom.....	257
Electrifying Patios and Decks	257
Lighting Your Garden.....	259
Delivering Electricity to Outbuildings	260
Retrofitting power to existing outbuildings	262
Wiring in workshops	264
Lighting outbuildings	267
Installing network, phone, TV, and intercom service	268
Wiring for sheds	268
Installing Saunas.....	269
Selecting a sauna stove.....	269
Supplying power.....	271
Installing the sauna stove control.....	272
Wiring near Pools and Hot Tubs	273
Pumping Water on Your Property	274
Powering well pumps.....	274
Installing garden and waterfall pumps	277
Using waste system pumps.....	277

Chapter 17: Outdoor Electronics	279
Designing around the Weather	279
Running wires in bulkheads	280
Wiring directly to the point of use	280
Using Electronic Devices in Outdoor Kitchens	282
Wiring Outdoor Theaters or Sound Systems.....	283
Controlling outdoor theaters or sound systems.....	283
Planning the theater space	284
Installing a Home Weather Station.....	284

Part VI: The Part of Tens.....**289**

Chapter 18: The Ten Best Wiring Web Sites	291
Wiring Devices.....	291
Wire and Cable	291
Home Electronics	292
Home Security	292
Networking and Electronics Technology	292
Networked Video Surveillance	293
Solar and Alternative Energy.....	293
Digital Home Media.....	293
Outdoor Living	293
Remodeling and Repair Projects.....	294

Chapter 19: The Ten Biggest Wiring Mistakes	295
Not Leaving Enough Slack.....	295
Not Paying Attention to Details.....	296
Including Lighting Loads on Receptacle Circuits.....	297
Ignoring Physics	297
Gravity	297
Wind	298
Water	298
Fire.....	299
Installations Not Designed for Use and Abuse	299
Improperly Interpreting the National Electrical Code.....	299
When Grounding Is Not Grounding.....	300
Ignoring the BOCA or IRC Codes.....	301
Not Following Your Own Consistency Rules.....	302
Minimizing Wiring Runs and Circuit Counts.....	302

Chapter 20: Ten Troubleshooting Tips	305
Collect the History.....	305
Who witnessed the point of failure?	306
What was happening at the time?	306

Where was the device when it failed?.....	307
How did it fail?	307
When did the failure occur?	307
Why did it fail?	307
Understand the Process	308
Plan the Approach	308
Follow Safety Procedures	309
Eliminate the Obvious	309
Begin at the Beginning.....	310
Avoid the Replacement Trap	310
Check the Vital Signs	311
Eliminate the Cause	311
Verify the Repair.....	311

Part VII: Appendixes.....313

Appendix A: Product Sources315

Big-Box Stores.....	315
Best Buy.....	315
Circuit City	315
The Home Depot.....	316
Lowe's	316
Small-Box Stores.....	316
Micro Center	316
RadioShack.....	316
Wholesale Electric and Contractor Suppliers	316
Crescent Electric Supply Company.....	317
GE Supply	317
Graybar Electric Company	317
Home Automated Living.....	317
WESCO International.....	318

Appendix B: What Mr. Ohm Wanted You to Know319

Using the Basic Ohm's Law Formula	319
Measuring current in amps	320
Measuring electromotive force in volts.....	321
Calculating Electrical Values.....	321
Calculating power in watts.....	322
Calculating energy use in watt-hours.....	322
Measuring power in AC circuits	322
Using the NFPA Wire Properties Table	324
Selecting Conductors.....	327
Limitations for using small conductors.....	329
Bundling conductors together.....	329

Using non-metallic cable (NMC)331
Converting between Celsius and Fahrenheit331
Ethernet Length Limits332

Appendix C: About the CD335

System Requirements335
Using the CD with Microsoft Windows336
What You'll Find337
If You've Got Problems (Of the CD Kind)337

***Index*339**

Introduction



Thousands of years ago, a home was little more than a sheltered place in which to sleep. Later, indoor fireplaces and ovens allowed people to cook inside their homes. In recent centuries, homes sprouted washrooms and sinks, thanks to indoor plumbing, and in the last 100 years, electrical and telephone systems have become standard features.

Homes have come a long way since their humble beginnings as crude shelters. In the 21st century, digital lifestyles will influence home design as never before. The modern home is a place for high-fidelity entertainment, advanced communications, and automated convenience. This book shows you how to bring your home into the new millennium. We show you how to install whole-home remote controls, cable TV systems, computer networks, public address systems, multi-room sound, backup power, and the latest phone systems.

Wiring Your Digital Home For Dummies offers illustrations, diagrams, and job-site photographs to help you better understand the sometimes complex wiring topics. We've packed this book with practical advice on what to include in new-home designs and techniques that work whether you're building a new home or updating an existing one. Even if you're not a do-it-yourselfer, this book helps you better understand digital systems, allowing you to make more informed decisions as you work with your architect or builder.

About This Book

If you've ever started a sentence with, "I wish my home were wired for (insert fantasy here)," then *Wiring Your Digital Home For Dummies* is for you! This book is organized into parts and chapters, creating the framework that builds and binds the book together. You needn't approach the book in one single way — we expect that you will jump from section to section based upon your needs and plans.

We wrote this book both with the construction trade professional and the novice in mind. For the do-it-yourselfer, we've packed in lessons learned from a combined 80-plus years of working as electricians, technicians, and computer and networking geeks. We hope you can relate to these lessons as you complete your projects.

If you're a professional, *Wiring Your Digital Home For Dummies* provides a heads-up on features you may want to include in the next home you wire, and it gives some insights about what your residential customers will ask you to do in the days and years to come. For builders, architects, engineers, designers, and electricians, this book is not only a reference but also a marketing checklist. As a builder, use it to work with the buyer the next time you're asked to quote a price for a new home. Electrical contractors will want to use this book when working with the builder to offer options in the wiring contract.

Conventions Used in This Book

When we refer to or paraphrase some section of *the code*, we mean the National Electrical Code (NEC) sponsored by the National Fire Protection Association (NFPA). Often we use the word *must* without referring specifically to the code. This usually means either the code requires it or the circuit won't work correctly any other way. *Wiring to code* means meeting a minimum standard. Most of the time this minimum standard is sufficient.

In some cases, we refer you to helpful resources on the Internet. Web addresses are printed this way: www.wiley.com.

What You Don't Have to Read

It's perfectly okay to skip items you already know or don't care about. For example, if you already know the code inside and out, then you can probably skip stuff that is marked with the Code Stuff icon (although we think that a quick refresher is always a good idea).

In some cases we include sidebars, which provide nice-to-know information. Sidebars don't contain critical information, so you can safely skip them if they don't meet your current need.

And finally, it's a good idea to read all paragraphs marked with Warning icons. The information in those paragraphs is critical and will prevent mistakes that could cost you — or hurt you.

Foolish Assumptions

Whether you know nothing about wiring, everything about wiring, or you're somewhere in between, all we assume about you is that you want to better

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