
***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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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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