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Dedication

This book is dedicated to
God, who is my teacher;
Mary, my inspiration and friend; and
Bryant, Shawn, and Kial, who are everything that a father could want.

Preface

The name of this book is *Power Quality,* but the title could very well be *The Power Quality Do-It-Yourself Book*. When I set out to write this book, I wanted it to be user friendly, easy to understand, and easy to apply in solving electrical power system problems that engineers and technicians confront on a daily basis. As an electrical engineer dealing with power system quality concerns, many of the books I consulted lacked direct and precise information and required a very thorough search to find what I needed. Very often, I would spend several hours pondering a case just so the theory I read and the practical findings would come together and make sense. This book is the product of my thought processes over many years. I have tried to combine the theory behind power quality with actual power quality cases which I have been involved with in order to create a book that I believe will be very useful and demystify the term *power quality.*

What is power quality? Power quality, as defined in this book, is "a set of electrical boundaries that allows equipment to function in its intended manner without significant loss of performance or life expectancy." Conditions that provide satisfactory performance at the expense of life expectancy or vice versa are not acceptable.

Why should power quality be a concern to facility designers, operators, and occupants? When the quality of electrical power supplied to equipment is deficient, performance degradation results. This is true no matter if the equipment is a computer in a business environment, an ultrasonic imaging machine in a hospital, or a process controller in a manufacturing plant. Also, good power quality for one piece of equipment may be unacceptable for another piece of equipment sitting right next to it and operating from the same power lines, and two identical pieces of equipment can react differently to the same power quality due to production or component tolerances. Some machines even create their own power quality problems. Given such hostile conditions, it is important for an engineer entrusted with the design or operation of an office building, hospital, or a manufacturing plant to be knowledgeable about the basics of power quality.

This book is based on 30 years of personal experience in designing, testing, and troubleshooting electrical power systems and components, the last 9 of which have been spent exclusively studying and solving power quality problems for a wide spectrum of power users. This book is not an assemblage of unexplained equations and statements. The majority of the information contained here is based on my experiences in the power system and power quality fields. Mathematical expressions are used where needed because these are essential to explaining power quality and its effects. Throughout the book, several case examples are provided, the steps used to solve power quality problems are described in depth, and photographs, illustrations, and graphs are used to explain the various power quality issues. The examples show that many power quality problems that have resulted in loss of productivity, loss of

equipment, injury to personnel, and in some cases, loss of life could easily have been avoided. All that is needed to prevent such consequences is a clear understanding of electrical power quality and its effects on power system performance.

I hope the reader will enjoy reading this book as much as I enjoyed writing it. Also, I hope the reader will find the book useful, as it is based on the experiences of an electrical engineer who has walked through the minefields of electrical power system quality and for the most part survived.

C. Sankaran

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