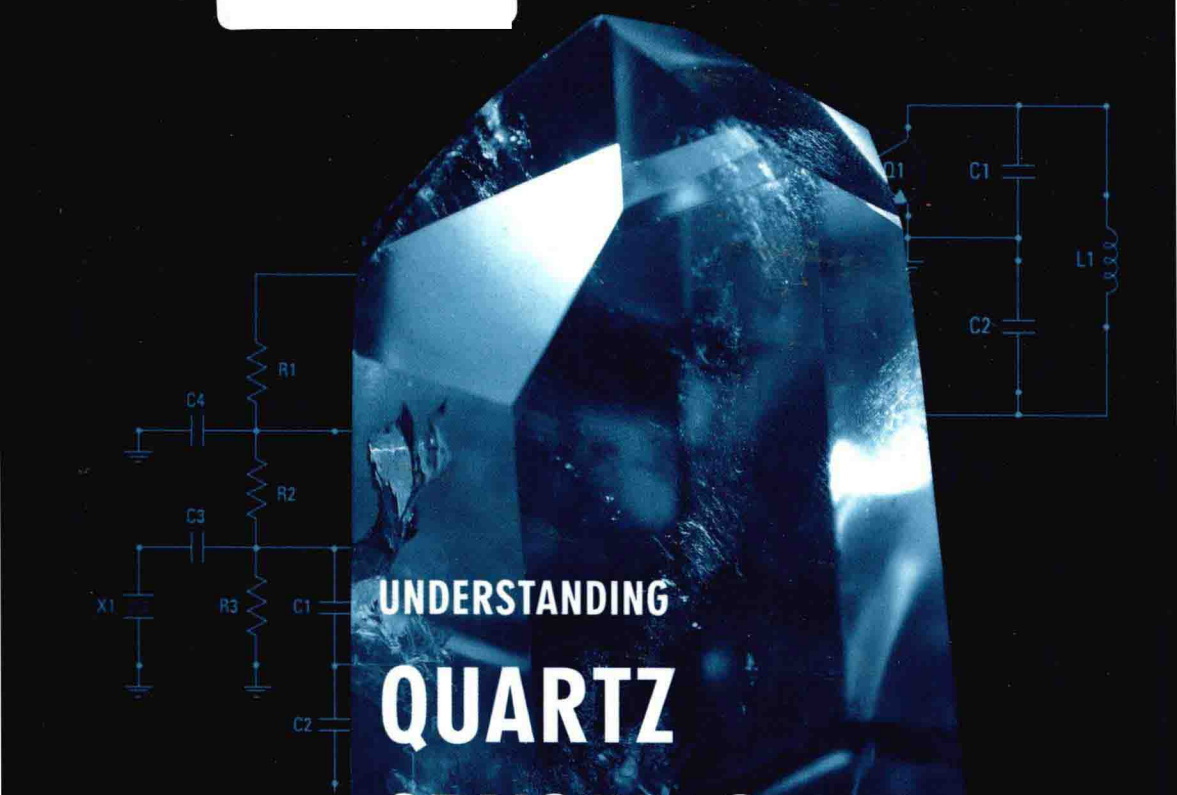
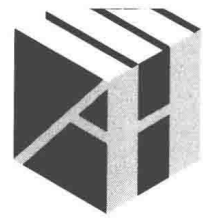
RAMÓN M. CERDA



UNDERSTANDING QUARTZ CRYSTALS AND OSCILLATORS

Understanding Quartz Crystals and Oscillators

Ramón M. Cerda



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Understanding Quartz Crystals and Oscillators

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Artech House Microwave Library,
turn to the back of this book.

To my kids, Cynthia, Ricardo, and Christian.

Preface

Practicing and new engineers faced with the task of specifying a quartz crystal or even designing a simple crystal oscillator may be in the dark on how to accomplish the task. Crystal oscillators are considered by some to be black magic, like RF. If you were one of those fortunate engineers who took a course in college on crystal oscillators, it was either so theoretical or so cookbook that it was useless to the practicing engineer. Frustrated with this situation, you try to find textbooks with concise and reliable design information, but can't find any. I also could not find many understandable texts as a practicing engineer. Sure, there are some very good textbooks for the hardcore oscillator design engineer (i.e., Parzen and Bottom), but in contrast to these advanced texts, this book offers a complete introduction to the subject matter. The goal of the author is to present the practicing and new engineer with comprehensible material about quartz crystals and oscillators to demystify the field.

Although this book is an introduction to the frequency control field, it does include advance subjects on the crystal resonator (Chapter 3) and quartz crystal oscillator design (Chapters 9, 10, and 11). Chapter 6 introduces the newcomer to oscillator theory using three different analysis techniques. Specifying the crystal unit in great detail is covered in Chapters 2 and 5. The specifying crystal oscillator is covered in Chapter 8. Phase noise and jitter are introduced in Chapter 7.

Acknowledgments

This humble author would like to personally thank:

- Agilent Technologies for lending me the entire GENESYS software suite (all the schematics and simulations in this book were done using GENESYS.
- PTC for lending me MathCad Prime 2 and MathCad 15.
- John R. Vig for all his work done over the years in the field of frequency control and for his drawings that were used directly or with minor modifications to illustrate many of the subjects covered in this book.
- Wally Galla and Ralph Peduto, who both passed away a few years ago. Wally and Ralph were former colleagues who were great people and excellent crystal oscillator design engineers.
- My present employer, Crystek Crystals Corporation, for the opportunity to create and design my true passion, crystal oscillators.

On the lighter side, I would like to thank all my friends at the Boulevard Tavern and the World Famous Cigar Bar in Fort Myers, Florida, for all their encouragement in this four-year endeavor. Last, but not least, I would like to give a special thank you to Jack Battaglia for all his life advice. Thank you all!

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