Phase-Locked Loops
Principles and Practice

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Phase-Locked Loops

Principles and Practice

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For my parents and
for my wife, Francine

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Preface

This book is intended as a concise guide to the theory and design of phase-locked loop (PLL) circuits. It is written from an engineering point of view, including numerous block diagrams, example circuits and experimental results, whilst making use of 'engineering' analytical methods such as signal flow graphs and Laplace transforms to retain a firm grip on the theoretical basis. Competent PLL design and analysis requires a considerable degree of theoretical understanding and yet it is a subject which is seldom formally taught to any depth. For this reason the book has a strong theoretical foundation, with most results derived from first principles, although mathematics is included for reasons of practical relevance rather than academic interest. This, hopefully, has resulted in a substantially self-contained text which should prove useful to both those new to and to those more familiar with the subject.

The initial motivation for the work came from a lecture course which I have been giving on PLLs since 1990 in the Department of Electronic and Electrical Engineering at University College London. This may explain the tutorial nature of parts of the book (such as the examples and worked solutions) which is slightly unusual in a PLL book and which should appeal to third/fourth year undergraduate and postgraduate students.

Although the book is relatively brief, a number of quite advanced analyses and sophisticated techniques are included, such as fractional- N synthesis. I have endeavoured to treat the subject in a straightforward yet comprehensive fashion with the overall aim of providing a coherent, consistent reference which avoids cutting too many corners. A spin-off of this approach is that there are one or two techniques and treatments which I believe to be original to this text.

I would like to thank Brian Oughton for first introducing me to PLLs in 1984 and those who have since given me the opportunity of continuing my interest in this fascinating, elegant and very useful area of electronic circuits.

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