ELECTRONIC COUNTERS

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*‘Counting is
the oldest art
of science’*

Preface

During the last decade the number of books on switching has rapidly increased. These books cover for an important portion of their contents the theory and design of logical circuits, thereby using complicated methods which are not required for many applications. In this type of book the design of counter circuits is hardly treated, even though counting is an operation of major importance in nearly any digital automatic circuit and system.

There is hardly any design problem in binary counters running through all possible state combinations of their memory elements. The problem starts with decade counters using a subset of 10-out-of-16 4-bit binary code combinations. A number of these subsets have been used in decade counters. In all of these counters there is the problem of the jump from one code combination to another which is not the following in the binary sequence. Many examples of bad design have been published in literature even after the correct solution of this problem was known.

Some new components are introduced in this text, such as the *A-S* flip-flop and the accumulator. With the *A-S* flip-flop as building stone the construction of some counter circuits is simplified, and with the accumulator nearly all single-chip counter circuits become superfluous because all these different types of counters can be designed using the accumulator as starting point.

The text of this book is limited in that no counter circuits are discussed for very high-speed work as are required in atomic research. The text covers the counters which can be designed with standard digital integrated circuits, and those counters which are commercially available as single-chip integrated circuits. There are already so many different counting ideas in this field that this text has taken on the character of a handbook on electronic counters.

In the design of many digital automatic circuits and systems only those counters are used which are commercially available as single-chip integrated circuits. Without having a book on electronic counters, many circuit designers might think that the switching methods found in these electronic counters are the only practical counting methods. The synchronous binary rate multiplier is a striking example of the contrary.

The text of this book is especially written to give the circuit designer a comprehensive survey of electronic counters. This is the first complete book on this topic.

This book can also be used in the educational field, in switching laboratories of universities and technical institutes for example, to provide them with problems for practical exercises in digital switching. Many of the ideas given in the following chapters have been tested on the switching equipment for the practical exercises in my laboratory, or by means of a program on the PDP 9L computer in my laboratory.

The diagrams in the text have been checked by T. van Onzen and W. G. van den Berg. A. Snijders, F. L. Muller and A. P. Thijssen have contributed to this text with new ideas. I want to express my thanks to them for their assistance and suggestions and I want to extend this to all who have cooperated with me in one or other way in the preparation of this manuscript.

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