

THEORY AND APPLICATIONS
OF
ELECTRON TUBES

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SECOND EDITION

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THEORY AND APPLICATIONS OF ELECTRON TUBES

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PREFACE TO THE SECOND EDITION

The preparation of the second edition of "Theory and Applications of Electron Tubes" was prompted by two principal considerations. The first, and probably more important, of these was the necessity of bringing the book up to date as regards the principal new developments of the past five years in the field which it covers. Although the press of other work connected with the defense and war efforts has made it impossible for the author to make an exhaustive search of the literature of this period, he believes that the most important subjects have been adequately treated.

The second factor that led to the preparation of the new edition was the desirability of incorporating improvements in presentation that have been suggested or that have suggested themselves during five years of use of the book in college courses. Much of the material has been rearranged, and the chapter on Modulation and Detection and that on Oscillators have been to a considerable extent rewritten. A few changes in symbols or definitions have appeared to be desirable. In response to many requests, problem answers are included in the new edition.

The author of a book in a field that develops as rapidly as that covered by this book is faced with the difficulty of keeping the book up to date without increasing the size unduly. Probably the best judges of what material should be eliminated or added are the instructors in the courses in which the book is used as a text. The author will welcome suggestions and criticisms.

HERBERT J. REICH.

CAMBRIDGE, MASS.,
August, 1944.

PREFACE TO THE FIRST EDITION

Electron tubes, which have made possible the rapid development of radio to its present state of refinement, have been assuming an increasing importance in power control and transmission, in manufacturing, in the home, and in the various branches of engineering and scientific research. The rapidly growing field of application of electronic devices has necessitated the addition of courses in theoretical and applied electronics to engineering and scientific curriculums. The need for a single book to assemble and coordinate our present knowledge of the theory and application of electron tubes led to the writing of this book.

The book is intended to give the student a sufficiently thorough grounding in the fundamental principles of electron tubes and associated circuits to enable him to apply electron tubes to the solution of new problems. The author has not attempted to discuss all applications of tubes to special problems but rather to cover basic principles and typical applications. Since it was not his purpose to write a treatise on the subject of applications of electron tubes, Class C amplification and the design of radio transmitters and receivers, which are adequately treated in books on radio engineering, have not been taken up. The basic principles that are presented, however, are applicable to radio engineering problems, as well as to industrial electronics, power control, electrical measurements, and other fields of use of tubes. Although written primarily as a text for college students, it is hoped that it will also prove to be of value to practicing engineers as a reference book.

The book is based upon mimeographed notes that have been used in the author's courses on electron tubes during the past five years. These notes have been kept up to date and have been revised as use in the classroom has indicated where improvement could be made.

A problem encountered in the preparation of the manuscript was the choice of symbols. In the main, the symbols used are those which have been standardized by the Standards Committee of the Institute of Radio Engineers. Although the use of the symbols e and E for the voltage of tube electrodes is in agreement with the practice of most writers on the subject of electron tubes in the United States during the past twenty-five years, it is not in agreement with the symbols standardized by the American Institute of Electrical Engineers nor with those used in England. Since the basic symbols that are used in this book have already been standardized by the Institute of Radio Engineers, the author

feels that it would be a mistake to set up new symbols now. Because of the very large number of symbols that must be used in the analysis of tubes, difficulties are invariably encountered, regardless of the system of nomenclature that is adopted.

The series expansion for electrode currents has been made the basis of the analysis of the operation of high-vacuum tubes and associated circuits. In order to justify the use of the series expansion and several other very useful equations, the outlines of their derivations are included. The student will not be seriously handicapped by the omission of these derivations. Because the author believes that a thorough understanding of the principles of detection and modulation is of great value in the study of distortion in amplifiers, the chapter on detection and modulation precedes those on amplification. The arrangement of subject matter is such, however, that little difficulty will be experienced by the student if this chapter is studied after those on amplifiers. Equivalent-circuit and graphical methods of analysis are stressed throughout the book.

H. J. REICH.

URBANA, ILL.,
November, 1938.

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