ELECTRON-TUBE CIRCUITS

BY

SAMUEL SEELY, PH.D.
Professor of Electrical Engineering
Syracuse University

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PREFACE

This book is the outgrowth of several courses that were organized by the author on electron-tube circuits and applications and that covered many of the important circuits in widespread use during the Second World War. It seeks to achieve the following: (1) to develop in the student a clear analytical method in the study of electron-tube circuits; (2) to present and study the various classes of circuits which find widespread application; (3) to indicate with examples how one proceeds to combine circuits of various types to achieve either one or a multiplicity of operations. It is not intended to include either a comprehensive discussion of all aspects of any given field or all possible circuits or methods for achieving a given result. It is hoped that representative circuits have been included and studied and that the reader may find some suggestions that will be of assistance to him in a particular development.

The choice of material to be included and the detail of coverage were the subject of much thought. The principle adopted was to present a coordinated account of each broad field of application, with the main emphasis on the operation of many of the significant circuits. No claim is made to completeness of coverage, nor are the fine points of any given field discussed in detail. Where general practice has favored a given type of circuit, the major emphasis is on these.

Approximately one-half the content is of a radio-engineering character, the remaining material being extensively used in radar, television, pulse communication, and general electronic control. Sufficient material is contained for a course in radio-engineering circuits and for one in non-radio electronic circuits. Sufficient diversity exists for the instructor to choose topics to satisfy almost any course requirements. It has been assumed that the student has completed his basic studies in a-c circuit theory and in basic electronics before undertaking a study of the text.

The order of presentation of the material has been dictated by the character of the analysis rather than by the application. Because of this, circuits of diverse application may be found in a given chapter. However, the book divides itself quite naturally into a number of major sections. The first part of the volume is devoted to a review of the fundamental properties of electron tubes and their basic circuit applications. The next part of the volume includes a discussion of a variety of amplifiers of the untuned variety. This includes circuits in which the

tube is operated as a linear device and other circuits in which the nonlinear capabilities of the tube are employed. The former include simple voltage amplifiers, video amplifiers, power amplifiers, and electronic computing circuits. The latter include circuits which utilize the tube as a switch. The third part of the book contains a discussion of circuits of the tuned variety and discusses such topics as tuned voltage amplifiers, tuned power amplifiers, and oscillators. A comprehensive treatment of power rectifiers, filters, and regulators is followed by a discussion of amplitude modulation and demodulation and frequency modulation and detection. The latter part of the text includes a treatment of circuits that have been largely extended by developments in radar applications during the course of the war. This discussion is considerably more detailed and more extensive than has heretofore appeared in any general text.

An effort has been made to include sufficient analysis of the operation of the circuits to indicate clearly the operation and the various factors on which the operation depends. This has a twofold purpose, one of which is to indicate the procedure that must be adopted in effecting an analysis and the second of which is to indicate the factors on which the operation depends. This is considered to be very important, since in some instances the tube plays a direct part in the operation of the circuit, whereas in others it may serve simply in the capacity of a switch. However, the mathematical developments are only a part of the analysis, since the discussion attempts to introduce the physical aspects of the problem and then to incorporate the mathematical results into the complete analysis.

A rather regrettable situation will be found to exist in the matter of notation. This arises from the author's desire to conform to the Institute of Radio Engineers standards on vacuum-tube notation. However, such single-subscript notation in electron-tube circuits is often inadequate, and double-subscript notation is employed, except for those particular cases where no confusion is likely to arise. The result is a mixed single-subscript and double-subscript system of notation, the single-subscript terms generally conforming to the IRE notation.

A controversial matter is also to be noted. Throughout the text the symbols a-c and d-c are used as adjectives. Purists might object that the word *current* in *a-c current* is redundant and that the phrase *a-c voltage* is fundamentally meaningless. However, the use of the symbols a-c and d-c as descriptive adjectives is becoming increasingly widespread and does provide a clear and convenient abbreviation.

A number of problems have been included at the end of each chapter. These have been formulated in a way that requires an understanding of the subject matter. As a result, all text assignments may be supple-

mented by problem assignments. Problems which entail nothing more difficult than the substitution of numbers into equations have been kept to a minimum. Wherever possible, the problems are based on practical data in order to familiarize the student with such practical details.

To provide proper acknowledgment of the source of much of this material proves to be an impossible task. Much of the material that is principally of a radio-engineering character has appeared in one form or another in a wide variety of sources over many years, and the significant original sources seem to have been generally neglected. The principal source of many of the circuits which were extended for use in radar applications was the M.I.T. Radiation Laboratory, of which the author was a staff member during the war. However, it is known that many of these circuits were adapted from existing circuits of diverse origin, whereas some were developed at other laboratories, including British laboratories. In only a few cases is the identity of the groups who did some of this work known.

Special mention must be made of the freedom with which the author drew on his earlier text, "Electronics" (by J. Millman and S. Seely, McGraw-Hill Book Company, Inc., New York, 1941). Certain of the material closely parallels that in the earlier book.

The author wishes to acknowledge many helpful discussions with a number of his colleagues. He is particularly indebted to Professors David K. Cheng and Glenn M. Glasford, both for such discussions and for their assistance in proofreading portions of the text. Thanks are also due to the General Electric Co. and the RCA Manufacturing Co. for freely supplying many photographs and tube characteristics.

SAMUEL SEELY

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Electron Tubes are utility items added by Forestry. They are used to configure Multifarms and to change the operational characteristics of Electrical Engines and other Forestry machines. Electron Tubes are created in the Thermionic Fabricator. They must be inserted into a Circuit Board before use. 444444444444. Thermionic Fabricator. A Thermionic Fabricator must be placed and powered. Sand or Glass should be placed in the top-left slot. As the Thermionic Fabricator heats up, the sand will be melted The Electron Tube Division of Hamamatsu Photonics supports progress in the most advanced photonics technologies involving low-light-level and ultra-fast measurements. The various light-related de-vices we develop and produce are widely used in spectropho-tometry, semiconductors, biotechnology and experimental sci-entific research as well as in medical applications such as blood analysis and diagnostic imaging. in an electron tube circuit using cathode biasing, the cathode is made positive in relation to the grid. this is done by a voltage dropped across what circuit element. Rk. the cathode bias voltage level applied to the cathode is maintained at a constant level by what circuit component. Ck. which of the following undesirable characteristics is associated with cathode biasing. current must flow in the circuit continuously. grid-leak biasing develops a biasing voltage from what portion of the input signal and by what type of action. course in electronics, electron tubes, and associated circuits Truman S. Gray. Electronic Devices and Circuits. 523 PagesÂ·2010Â·17.11 MBÂ·40,887 Downloads. Electronic Devices and Circuits. Dr. K. Lal Kishore. Ph.D, mieee, fiete, miste, mishm. Registrar Electronics - Circuits and Systems, Fourth Edition. 381 PagesÂ·2012Â·7.05 MBÂ·40,248 Downloads. Website ix Part 1 Circuits 1 1. Diodes 5 2. Transistor Switches 11 Electronics - Circuits and Syst Electronics Fundamentals.