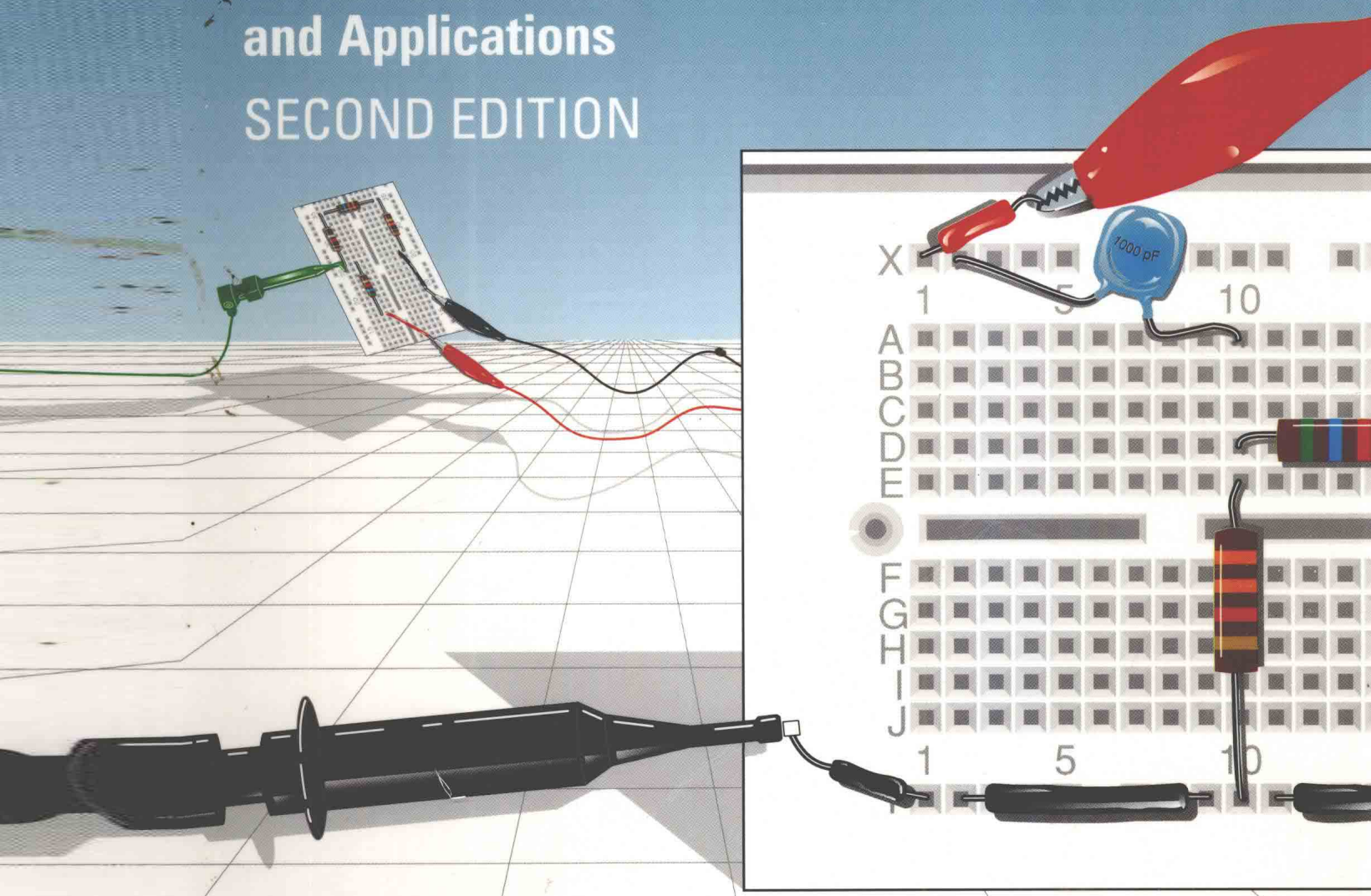
Study Guide to Accompany

ELECTRONICS FUNDAMENTALS

Circuits, Devices, and Applications

SECOND EDITION



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STUDY GUIDE

to accompany

ELECTRONICS FUNDAMENTALS: CIRCUITS, DEVICES AND APPLICATIONS

Second Edition

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PREFACE

TO THE STUDENT:

This study guide can be a valuable learning aid as you explore the fascinating world of electronics. After you read each chapter of the text, you can reinforce your mastery of the subjects by reading the chapter summary in this study guide. Then the chapter quizzes will help define areas where your understanding of the material may be weak. Take the quizzes; if you miss some questions, then reread the related concepts in the text or in this study guide. Once you have gained full mastery of each chapter, you can progress to the next one. May your new career in electronics be interesting and rewarding.

NEW in this edition is an electronic math review, including the use of the calculator. You will find this review in Appendix A. If you need a brief math review and/or help in mastering your new pocket calculator, then this may be of benefit.

TO THE INSTRUCTOR:

This study guide is arranged with many multiple-choice questions at the end of each chapter. These sheets may be torn out and assigned as homework or classroom assignments, or they may be used as quizzes. Many of my students report that the study guide concept is of benefit to them if the instructor uses the material as listed above. I welcome your feedback.

CONTENTS

REVIEW OF KEY POINTS IN CHAPTER 1

INTRODUCTION

HISTORY

- The word ***electricity*** was used by Sir Thomas Browne (1605-82).
- Benjamin Franklin theorized that electricity was a fluid.
- Charles Coulomb proposed the laws of charge in 1785.
- Volt, a unit of potential energy, was named after Alessandro Volta (1745-1827).
- Electromagnetism was discovered in 1820 by Hans Oersted.
- The ampere, a unit of current, was named after André Ampère. He laid the fundamental laws that are basic to electricity.
- Ohm's law, named after Georg Simon Ohm in 1826, forms the basis for relationships among voltage, resistance, and current.
- The electronic age started in 1909, when Robert Millikan measured the charge on an electron.
- The year 1904 saw the invention of the first vacuum tube by John Fleming.
- The first practical amplifier device, an audion, was built in 1907 by Lee de Forest.
- Television picture tubes got their start in the 1920s by Vladimir Zworykin's invention of the kinescope.
- Digital computers got started in 1946 at the University of Pennsylvania.
- The transistor was developed in 1948 at Bell Labs.
- Integrated circuits came into being in the early 1960s.

CAREERS IN ELECTRONICS

- The service shop technician works in an electronic repair facility. He or she could repair any type of electronic equipment.
- The manufacturing technician works in a plant, either testing equipment or maintaining testing equipment.
- The laboratory technician works closely with engineers, breadboarding circuits and making tests for the engineer.
- The field service technician services and repairs electronic equipment at the customer's location.
- The technical writer prepares manuals for the use and service of electronic equipment.
- The technical salesperson is responsible for sales of high-technology products.

CIRCUIT COMPONENTS

- ***Resistors*** resist the flow of electric current in a circuit.
- ***Capacitors*** store electric charge.
- ***Inductors*** are used to store energy in an electromagnetic field.
- ***Transformers*** are used to couple ac voltages between circuits and to increase or decrease ac voltages.
- ***Semiconductor devices*** are diodes, transistors, and integrated circuits.

ELECTRICAL UNITS

- Engineers and scientists must use common terms when communicating with each other. Each electric quantity must have a unique reference name. Some examples are volts for voltage, amperes for current, ohms for resistance, farads for capacitance, and henrys for inductance. There are many more.

SCIENTIFIC NOTATION AND METRIC PREFIXES

- Scientific notation and metric prefixes are convenient ways of expressing both very large and very small numbers. For example, 0.000006 in scientific notation is 6×10^{-6}. Standard metric prefixes are used to make unit expressions even shorter; that is, $6 \times 10^{-6} = 6\mu$.

- Scientific notation and metric prefixes are adaptable to the modern calculator.

TECHNICIAN TIPS

- Upon completion of your electronic education, you will be seeking a good-paying, interesting job. Your future employer will be looking at your technical qualifications and, sometimes of even more importance, your attitude. Are you enthusiastic, outgoing, pleasant? Will you fit into the working place? Your attitude and outlook on life will be of great influence to the selection of you as a new employee.

- Learning the shortcuts to electronic terminology will speed you on your career. This field is filled with these abbreviations. Some of these are F for farad, E or V for voltage, I for current, f for frequency, Hz for cycles per second. The list is long, so be prepared for the new language of electronics.

- The term ***powers of ten*** describes a mathematical notation that you will use to make your understanding of electronic measurements and terms much easier. It is a shortcut to using the large and small numbers used in electronics. Use the powers of ten to communicate with your calculator. This will be indispensable to you as you study the text.

- Metric prefixes will help you to speak and write the language of electronics. As an example, 25,000,000 ohms can be expressed as 25 Megohms. As another example, 0.000000000035 farad can be expressed as 35×10^{-12} or, even simpler, 35 pf since the prefix "p" means 10^{-12}. See how each simplification gets the terms shorter and easier to use.