

ELECTRONICS READY REFERENCE MANUAL

Edward Pasahow

Electronics Ready Reference Manual

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Preface

The purpose of this manual is to provide a single source of current electronics information for engineers, technicians, students, and hobbyists. Perhaps the best way to characterize the contents is to describe what is not found between these covers. Space is not wasted on page after page of trigonometric and logarithmic tables. Anyone working in electronics will have a pocket calculator that readily provides these functions. Instead of such traditional tables, this manual provides formulas, tables, and diagrams that supply straightforward solutions to electronics circuits and problems. Both calculators and computers can use these solution methods. Related material is gathered into a single topic. Thus all the information you need for a circuit is usually found within just a few adjacent pages.

Coverage begins with the general laws of electronics. Included are Ohm's law, voltage and current measurements, impedance, resonance, time constants, and power equations. Circuit analysis techniques are thoroughly described. Robust network methods such as Kirchhoff's laws, Thevenin's theorem, Norton's theorem, and superposition are fully explained.

The next two sections cover passive and active devices. Parameters and codes for resistors, capacitors, transformers, diodes, transistors, and

optoelectronic equipment are detailed. The linear circuit section supplies operational amplifier (op amp), timer, and trigger characteristics.

Filter designs suitable for active and passive elements show how to construct a number of practical circuits. Power supply configuration, voltage regulation, and rectifier circuit descriptions demonstrate how a variety of applications can be handled. Precise measurement of electronic values using bridges and meters comprises another series of circuit designs.

A major development of both analog and digital methods of communications includes the most needed data for working in this area. Various types of emissions and radio, television, and time standards are tabulated for worldwide stations. Television and radio standards are documented. Important communication codes such as ASCII, EBCDIC, and Teletype are found here also.

Another significant grouping of topics is formed by the digital circuits and computer sections. Number systems, Boolean algebra, gate theory, flip-flops, and TTL circuits are incorporated. Every important 8- and 16-bit microprocessor is fully described. A summary of the popular BASIC and FORTRAN programming languages completes this subject.

Remaining sections provide mathematical tables, symbology, and conversion formulas. Frequently used formulas, relationships, and definitions are found in these sections. Properties of materials and physical constants occupy a succeeding topic. A summary of electrical safety and first aid concludes the manual.

I wish to acknowledge the generous support that manufacturers, trade associations, and other organizations have provided in allowing their materials to be used in this book:

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Without their help, it would have been impossible to compile such a complete set of electronics data. I also want to express my gratitude to Deryl Browning for the many hours she cheerfully spent typing the manuscript. And finally, the indulgence of Rosemarie Pasahow offered the opportunity to write this book—thank you.

EDWARD PASAHOW

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Figure 2-1 (p. 33), Fig. 2-2 (p. 41), Fig. 2-3 (p. 42), Fig. 2-4 (pp. 44–45), Fig. 2-7 (p. 53–54), Fig. 2-8 (p. 55), Fig. 3-8 (pp. 86–87), Fig. 8-12 (p. 199), Figs. 8-17 and 8-18 (p. 219), Fig. 8-19 (p. 220), Fig. 8-20 (p. 221), Figs. 9-1 through 9-18 (pp. 222–244), Table 13-2 (pp. 459–471), Fig. 15-1 and Table 15-1 (pp. 514–519), and Sec. 16 (pp. 539–557) are taken from *Basic Electronics*, Vol. 1, prepared by the U.S. Navy Bureau of Naval Personnel, originally published by the U.S. Navy Publications Center, 1971, designated as Rate Training Manual NAVPERS 10087-C, and reprinted by Dover Publications, New York, 1973.

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Section 8-8 (pp. 146–197) is taken from U.S. Department of Commerce, National Bureau of Standards, *NBS Time and Frequency Dissemination Services*, Sandra L. Howe, (ed.), Special Publication 432, Sept. 1979.

Section 9-2 (pp. 245–263 and 266), Secs. 11-4 and 11-5 (pp. 389–417) and Sec. 11-7 (pp. 418–421), Tables 12-3, 12-4, 12-5, and 12-6 (pp. 426–452) and Table 15-2 (pp. 520–521) are taken from U.S. Department of Commerce, National Bureau of Standards, *Handbook of Mathematical Functions*, Edward M. Abramowitz and Irene A. Stegun (eds.), Applied Mathematics Series 55, June 1964.

ABOUT THE AUTHOR

Edward Pasahow has had twenty years' experience as a design and development engineer of hardware, software, and digital communications systems. He is the author of over a hundred technical papers and 14 books, including *Learning Digital Electronics Through Experiments*, *Microcomputer Interfacing for Electronics Technicians*, and *Microprocessors and Microcomputers for Electronics Technicians* (McGraw-Hill).

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Definitions and Equations

1-1 ELECTRICAL UNITS

Ampere (A). One ampere is the constant current flowing in two parallel conductors one meter apart that would produce a force of 2×10^{-7} newtons per meter of length.

Coulomb (C). One coulomb is the charge that is moved in one second by a current of one ampere.

Farad (F). One farad is the capacitance of a capacitor that produces a potential of one volt between the plates when charged to one coulomb.

Henry (H). One henry is the inductance of a coil that has one volt induced in it when the current varies uniformly at one ampere per second.

Joule (J). One joule is the work done by a force of one newton acting over a distance of one meter.

Ohm (Ω). One ohm is the resistance between two points of a conductor that produces a current of one ampere when one volt is applied between these points.

Siemens (S). One siemens is the conductance between two points of a conductor that produces a current of one ampere when one volt is applied between these points. Reciprocal of the ohm. Formerly mho (Ω).

Volt (V). One volt is the potential difference between two points in a wire carrying one ampere when the power dissipated between these points is one watt.

Watt (W). One watt is the power which produces energy at one joule per second.

Weber (Wb). One weber is the magnetic flux that produces an electromotive force of one volt in a circuit of one turn as the flux changes uniformly from maximum to zero in one second.

1-2 OHM'S LAW IN DIRECT CURRENT CIRCUITS

$$V = IR \quad I = \frac{V}{R} \quad R = \frac{V}{I}$$

where V = voltage, V
 I = current, A
 R = resistance, Ω

Figure 1-1 shows the application of Ohm's law in dc circuits.

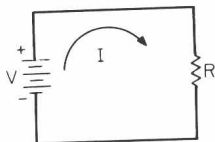


FIG. 1-1 Ohm's law in a dc circuit.