

SEVENTH EDITION

**M O D E R N**  
**DICTIONARY**  
*of*  
**ELECTRONICS**

**RUDOLF F. GRAF**



**MODERN  
DICTIONARY  
of  
ELECTRONICS**

**SEVENTH EDITION**

**REVISED AND UPDATED**



**Rudolf F. Graf** is an author whose name is well-known to engineers, technicians, and hobbyists around the world. He graduated as an electronics engineer from Brooklyn Polytechnic Institute and did his graduate work New York University. Mr. Graf has been active in the electronics industry for more than fifty years in capacities ranging from design and consulting engineer, chief engineer, chief instructor at electronics and television schools, and consulting editor. He also held various sales and marketing positions. Mr. Graf is the author or co-author of more than 150 technical articles published by major magazines. He has written about 50 books on electricity and electronics, with more than 2 million copies in print, including the best-selling *Video Scrambling & Descrambling for Satellite & Cable TV, Second Edition* and the *Circuits* series of books, both published by Newnes. A number of his books have been translated into several European languages as well as Chinese, Japanese, and Russian.

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Boston Oxford Auckland Johannesburg Melbourne New Delhi

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*It gives me great pleasure to dedicate this edition to  
Allison, Sheryl, Daniel, David, Russell and Scott,  
the loveliest children this side of heaven.*

# Preface

When the first edition of this dictionary was published in 1961, today's everyday items like color TVs, VCRs, CD players, computers, FAX machines, ATMs, cordless and cell phones, pagers, tape recorders, digital watches, pocket calculators, lasers, and many others too numerous to mention, were non-existent or mere laboratory curiosities. Since then, electronics has undergone significant changes based primarily on the meteoric expansion of integrated circuits and their apparently limitless applications. Vacuum tubes were replaced by semiconductors, and numerous technologies like ferrite core or bubble memories were relegated to the electronics graveyard. No other industry has ever grown so much and matured so fast, paced by technological advances that occur at a feverish pace. The first edition of this dictionary contained about 10,000 definitions of then current terms. And now, a scant 38 years later, this seventh edition contains approximately 25,000 terms—a clear indication of the phenomenal growth of our industry.

As technologies evolve and fresh products and concepts are introduced, suitable terminology must be developed to be able to communicate. The originators of the new words give them their initial meaning, but their exact definitions change with technological advances and through actual use by others. The contents of this dictionary is thus an analysis of words and their meanings as determined by common usage, written in a modern and popular style to provide clear and concise explanations of each entry. Continual updating of a work such as this is vital, so that those involved in the world of electronics have the power to communicate with those about them and to grasp new concepts as they emerge.

All entries are allowed as much space as is necessary for complete and meaningful definitions. Terms are explained clearly and precisely without excessive technical jargon. Original entries from the previous edition have been reviewed and many were revised to keep pace with current usage. Where more than one definition exists for a term, they are arranged numerically. This method, however, does not necessarily imply a preferred order of meanings. Important words from formative technologies that are no longer in use are retained in this edition for their historical interest.

My thanks go out to Ms. Tara Troxler Thomas and to Charles Thomas whose dedication to this project and skill at the word processor made it possible to deliver the manuscript for this work to the publisher in a timely fashion.

Industry and technical sources—notably the IEEE and the ASA—generously aided in defining many terms during the preparation of earlier editions of this work.

While this volume is as up-to-date as possible at the time of writing, the field of electronics is expanding so rapidly that new terms are constantly being developed and older terms take on broader or more specialized meanings. It is the intention of the publisher to periodically issue revised editions of this dictionary; thus suggestions for new terms and definitions are always welcome.

Rudolf F. Graf  
February 1999

character or set of characters. 3. Within a code set, a character intended to initiate, modify, or stop a control function.

**control characteristic**—1. A plot of the load current of a magnetic amplifier as a function of the control ampere turns for various loads and at the rated supply voltage and frequency. 2. The relationship between the critical grid voltage and the anode voltage of a tube.

**control circuit**—See control.

**control circuits**—In a digital computer, the circuits that carry out the instruction in proper sequence, interpret each instruction, and apply the proper commands to the arithmetic element and other circuits in accordance with the interpretation.

**control-circuit transformer**—A voltage transformer utilized to supply a voltage suitable for the operation of control devices.

**control-circuit voltage**—The voltage provided for the operation of shunt-coil magnetic devices.

**control compartment**—A space within the base, frame, or column of a machine used for mounting the control panel.

**control counter**—In a computer, a device that records the storage location of the instruction word to be operated on following the instruction word in current use.

**control current**—Current that occurs in the control circuit when control voltage is applied.

**control data**—In a computer, one or more items of data used to control the identification, selection, execution, or modification of another routine, record file, operation, data value, etc.

**CONTROL DATA or Control Data**—A trademark and service mark of Control Data Corporation in respect to data processing equipment and related services.

**control electrode**—An electrode on which a voltage is impressed to vary the current flowing between other electrodes.

**control field**—In a sequence of similar items of computer information, a constant location where control information is placed.

**control-flow machine**—A parallel-processing architecture with a single central sequence of instruction, carried out by many processors.

**control grid**—The electrode of a vacuum tube, other than a diode, upon which a signal voltage is impressed to regulate the plate current.

**control-grid bias**—The average direct-current voltage between the control grid and cathode of a vacuum tube.

**control-grid plate transconductance**—The ratio of the amplification factor of a vacuum tube to its plate resistance, combining the effect of both into one term.

**controlled avalanche**—A predictable, nondestructive avalanche characteristic designed into a semiconductor device as protection against reverse transients that exceed its ratings.

**controlled-avalanche device**—A semiconductor device that has very specific maximum and minimum avalanche-voltage characteristics and is also able to operate and absorb momentary power surges in this avalanche region indefinitely without damage.

**controlled-avalanche silicon rectifier**—A silicon diode manufactured with characteristics such that, when operating, it is not damaged by transient voltage peaks.

**controlled-carrier modulation**—Also called variable-carrier or floating-carrier modulation. A modulation system in which the carrier is amplitude modulated by the signal frequencies, and also in accordance with the

envelope signal, so that the modulation factor remains constant regardless of the amplitude of the signal.

**controlled-impedance cable**—Package of two or more insulated conductors in which impedance measurements between respective conductors are kept essentially constant throughout the entire length.

**controlled rectifier**—1. A rectifier employing grid-controlled devices such as thyatrons or ignitrons to regulate its own output current. 2. Also called an SCR (silicon-controlled rectifier). A four-layer pnpn semiconductor that functions like a grid-controlled thyatron.

**controller**—1. An instrument that holds a process or condition at a desired level or status as determined by comparison of the actual value with the desired value. 2. A device or group of devices that serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected. 3. A hardware interface that accepts instructions from a computer and reformats them to program an instrument or peripheral.

**controller function**—Regulation, acceleration, deceleration, starting, stopping, reversing, or protection of devices connected to an electric controller.

**control-line timing**—Clock signals between a modem and a communication-line controller unit.

**control link**—Apparatus for effecting remote control between a control point and a remotely controlled station.

**control locus**—A curve that shows the critical value of grid bias for a thyatron.

**control operator**—An amateur radio operator designated by the licensee of an amateur radio station to also be responsible for the emissions from that station.

**control panel**—A panel having a systematic arrangement of terminals used with removable wires to direct the operation of a computer or punched-card equipment.

**control point**—1. A point that may serve as a reference for all incremental commands. 2. The operating position of an amateur radio station where the control operator's function is performed.

**control-power disconnecting device**—A disconnective device, such as a knife switch, circuit breaker, or pullout fuse block, used for the purpose of connecting and disconnecting the source of control power to and from the control bus or equipment.

**control program**—A computer program that places another program and its environment in core memory in proper sequence and retains them there until it has finished operating.

**control ratio**—1. The ratio of the change in anode voltage to the corresponding change in critical grid voltage of a gas tube, with all other operating conditions maintained constant. 2. Also called programming coefficient. The required range in control resistance of a regulated power supply to produce a 1-volt change in output voltage. Expressed in ohms per volt.

**control read-only memory**—Abbreviated CROM. A major component in the control block of some microprocessors. It is a ROM that has been microprogrammed to decode control logic.

**control rectifier**—A silicon rectifier capable of switching or regulating the flow of a relatively large amount of power through the use of a very small electrical signal. These solid-state devices can take the place of mechanical and vacuum tube switches, relays, rheostats, variable transformers, and other devices used for switching or regulating electric power.

**control register**—Also called instruction register. In a digital computer, the register that stores the current instruction governing the operation of the computer for a cycle.

**control section**—See control unit.

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# MODERN DICTIONARY *of* ELECTRONICS

## RUDOLF F. GRAF

"How do you improve on a classic? Rudy Graf has done just that in the fully updated seventh edition of his **Modern Dictionary of Electronics**. In his elegantly practical style he defines over 28,000 terms drawn from a broad range of fields. In a world where electronics technology is growing so rapidly, this authoritative book belongs on everyone's reference shelf!"

— **Larry Steckler**, Editor-in-Chief of *Electronics Now and Popular Electronics*

With over a million copies in print, the **Modern Dictionary of Electronics** is the bible of technology reference for readers around the world. Now fully updated by the original author, this essential, comprehensive reference book should be in the library of every engineer, technician, technical writer, hobbyist, and student.

Included in this fully revised classic are well over 28,000 terms, phrases, acronyms, and abbreviations from the ever-expanding worlds of

consumer electronics, optics, microelectronics, computers, communications, and medical electronics. From the basic elements of theory to the most cutting-edge circuit technology, this book explains it all in both words and pictures.

For easy reference, the author has provided definitions for standard abbreviations and equations as well as tables of SI (International System of Units) units, measurements, and schematic symbols.

**Rudolf F. Graf** is an author whose name is familiar to electronics professionals and hobbyists alike. Mr. Graf graduated from Brooklyn Polytechnic Institute as an electronics engineer, and did his graduate work at New York University. He has been active in the electronics industry for more than fifty years in capacities ranging from design and consulting engineer to chief instructor at electronics and television schools, as well as in sales and marketing. He currently lives in New York. His many books offer a practical and enjoyable approach to often complex material. Other Newnes titles by Mr. Graf include **Video Scrambling and Descrambling, Second Edition**, and his full five-book series on electronics circuits.

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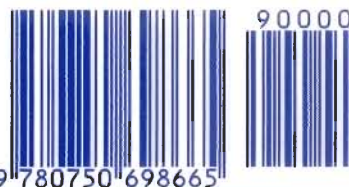


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