

SEVENTH EDITION

MODERN  
DICTIONARY  
*of*  
ELECTRONICS

RUDOLF F. GRAF



MODERN  
DICTIONARY  
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**ELECTRONICS**

SEVENTH EDITION  
REVISED AND UPDATED

**Rudolf F. Graf**



**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.



Boston Oxford Auckland Johannesburg Melbourne New Delhi

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#### Library of Congress Cataloging-in-Publication Data

Graf, Rudolf F.

Modern dictionary of electronics / Rudolf F. Graf. — 7th ed.,  
revised and updated.

p. cm.

ISBN 0-7506-9866-7 (alk. paper)

1. Electronics — Dictionaries. I. Title

TK7804.G67 1999

621.381'03 — dc21

99-17889

CIP

#### British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

The publisher offers special discounts on bulk orders of this book.

For information, please contact:

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225 Wildwood Avenue

Woburn, MA 01801-2041

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10 9 8 7 6 5 4 3 2 1

Typeset by Laser Words, Madras, India

Printed in the United States of America

has advanced, as measured from an arbitrary origin. 6. A particular stage, or point of advancement, in an electrical cycle. The fractional part of the period through which the time has advanced, measured from some arbitrary point, usually expressed in electrical degrees, where  $360^\circ$  represents one cycle. 7. The difference between the zero crossing or starting reference point between a standard waveform and the measured waveform. Phase is usually measured in degrees.

**phase advancer**—A phase modifier that supplies leading reactive volt-amperes to the system to which it is connected. Phase advancers may be either synchronous or nonsynchronous.

**phase angle**—1. Of a periodic function, the angle obtained by multiplying the phase by  $2\pi$  if the angle is to be expressed in radians, or 360 for degrees. 2. The angle between the vectors representing two periodic functions that have the same frequency. 3. The phase difference, in degrees, between corresponding stages of progress of two cyclic operations. 4. The angle between two vectors that represent two simple periodic quantities that vary sinusoidally and that have the same frequency. 5. A notation for phase position when the period is denoted as 360.

**phase-angle correction factor**—That factor by which the reading of a wattmeter or watthour meter operated from the secondary of a current or potential transformer, or both, must be multiplied to correct for the effective phase displacement of current and voltage due to the measuring apparatus.

**phase-angle measuring relay**—Also called out-of-step protective relay. A device that functions at a predetermined phase angle between two voltages or currents, or between voltage and current.

**phase-angle meter**—See phase meter.

**phase angle of a current transformer**—The angle between the primary current vector and the secondary current vector reversed. This angle is conveniently considered as positive when the reversed secondary current vector leads the primary current vector.

**phase angle of a potential (voltage) transformer**—The angle between the primary voltage vector and the secondary voltage vector reversed. This angle is conveniently considered as positive when the reversed secondary voltage vector leads the primary voltage vector.

**phase anomaly**—A sudden irregularity in the phase of a low-frequency or very low frequency signal.

**phase balance**—In a chopper, the phase-angle difference between positive and negative halves of the square wave; the difference in degrees between  $180^\circ$  and the measured angle between square-wave midpoints.

**phase-balance current relay**—See reverse-phase current relay.

**phase-balance relay**—A relay that functions by reason of a difference between two quantities associated with different phases of a polyphase circuit.

**phase center (center of radiation)**—Pertaining only to antenna types that have radiation characteristics such that while they are radiating energy, one can observe the antenna from a distance of many wavelengths and see the energy radiating from a point within the antenna array. The position of a point-source radiator that would replace the antenna and produce the same far-field phase contour.

**phase characteristic**—A graph of phase shift versus frequency, assuming sinusoidal input and output.

**phase comparator**—See phase detector.

**phase-comparison tracking system**—A system that provides target-trajectory information by the use of cw phase-comparison techniques.

**phase-compensation network**—A network used to provide closed-loop stability in an operational amplifier. No greater than 12-dB/octave rolloff of the open-loop gain is allowed.

**phase conductors**—Those conductors other than the neutral conductor of a polyphase circuit.

**phase constant**—1. The imaginary component of the propagation constant. For a traveling plane wave at a given frequency, the rate in radians per unit length at which the phase lag of a field component (for the voltage or current) increases linearly in the direction of propagation. 2. With respect to a traveling plane wave at a known frequency, the space rate of decrease of phase of a field component in the direction of propagation, measured in radians per unit length.

**phase control**—Also called horizontal parabola control. 1. One of three controls for adjusting the phase of a voltage or current in a color television receiver employing the magnetic-convergence principle. Each control varies the phases of the sinusoidal voltages applied, at the horizontal-scanning frequency, to the coils of the magnetic-convergence assembly. 2. A technique for proportional control of an output signal by conduction only during certain parts of the cycle of the ac line voltage. 3. A method of regulating a supply of alternating current by use of a switching device such as a thyristor, by varying the point in each ac cycle or half-cycle at which the device is switched on.

**phase-controlled rectifier**—A rectifier circuit in which the rectifying element is a thyatron having a variable-phase sine-wave grid bias.

**phase correction**—The process of keeping synchronous telegraph mechanisms in substantially correct phase relationship.

**phase corrector**—1. A network designed to correct for phase distortion. 2. See pc, 2.

**phased array**—1. A group of simple radiating elements arranged over an area called an aperture. A beam (or beams) can be formed by superposition of the radiation from all the elements, and the direction of the beam can be adjusted by varying the relative phase of the signal applied to each element or by varying the frequency of the main oscillator. 2. An antenna consisting of a plurality of individual antennas, called elements, that are arrayed in a grid and interconnected so that a specific phase relationship exists between them, forming a narrow beam pattern for the reception of electromagnetic signals. 3. A technique of improving the gain of an antenna system by combining the outputs of several similar VHF/UHF/FM antennas in an array in such a way that the output signals from each one are exactly in phase with one another.

**phase delay**—1. In the transfer of a single frequency wave from one point to another in a system, the delay of part of the wave identifying its phase. 2. The insertion phase shift (in cycles) divided by the frequency (in cycles per second, or hertz). See also delay distortion, 2.

**phase-delay distortion**—The difference between the phase delay at one frequency and the phase delay at a reference frequency.

**phase detector**—Also called phase discriminator or phase comparator. 1. A TV circuit in which a dc correction voltage is derived to maintain a receiver oscillator in sync with some characteristic of the transmitted signal. 2. A circuit that detects both the magnitude and the sign of the phase angle between two sine-wave voltages or currents. 3. A circuit that creates an output level which is a function of the phase angle between two ac input signals. Most phase detectors are also amplitude sensitive. 4. A circuit that compares the relative phase between two inputs and produces an error voltage dependent on the difference. This error voltage corrects the VCO frequency

SEVENTH EDITION

# 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!"

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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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