

**MODERN
DICTIONARY
of
ELECTRONICS**

SEVENTH EDITION

REVISED AND UPDATED

Rudolf F. Graf



Luxottica et al. v. Solos
IPR2026-00412
Petitioners' Ex. 1014

Boston Oxford Auckland Johannesburg Melbourne New Delhi

Newnes is an imprint of Butterworth-Heinemann.

Copyright © 1999 by Rudolf F. Graf

 A member of the Reed Elsevier Group.

All rights reserved.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher.



Recognizing the importance of preserving what has been written, Butterworth-Heinemann prints its books on acid-free paper whenever possible.



Butterworth-Heinemann supports the efforts of American Forests and the Global ReLeaf program in its campaign for the betterment of trees, forests, and our environment.

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:

Manager of Special Sales

Butterworth-Heinemann

225 Wildwood Avenue

Woburn, MA 01801-2041

Tel: 781-904-2500

Fax: 781-904-2620

For information on all Butterworth-Heinemann publications available, contact
our World Wide Web home page at: <http://www.bh.com>

10 9 8 7 6 5 4 3 2 1

Typeset by Laser Words, Madras, India

Printed in the United States of America

air-spaced coax—A coaxial cable in which air is basically the dielectric material. The conductor may be centered by means of a spirally wound synthetic filament, by beads, or by braided filaments. This construction is also referred to as an air dielectric.

air surveillance—Systematic observation of airspace by electronic, visual, or other means, primarily to identify and determine the movements of aircraft and missiles, friendly and enemy, in the airspace under observation.

airtime—Time spent on a cellular phone, which is usually billed to the subscriber on a per-minute basis.

air-to-ground communication—Transmission of radio signals from an aircraft to stations or other locations on the earth's surface, as differentiated from ground-to-air, air-to-air, or ground-to-ground communications.

air-to-ground radio frequency—The frequency or band of frequencies agreed upon for transmission from an aircraft to an aeronautical ground station.

air-to-surface missile—A missile designed to be dropped from an aircraft. An internal homing device or the aircraft's radio guides it to a surface target.

airwaves—Slang expression for radio waves used in radio and television broadcasting.

alacritized switch—1. A mercury switch treated to yield a low adhesive force between the rolling surface and mercury pool, resulting in a decreased differential angle. 2. A mercury switch in which the tendency of the mercury to stick to the mating parts has been reduced.

alarm—A device that signals the existence of an abnormal condition by means of an audible or visible discrete change, or both, intended to attract attention. An alarm circuit produces or transmits an alarm signal.

alarm condition—A threatening condition, such as an intrusion, fire, or holdup, sensed by a detector.

alarm device—A device that signals a warning in response to an alarm condition, such as a bell, siren, or annunciator.

alarm discrimination—The ability of an alarm system to distinguish between those stimuli caused by an intrusion and those which are a part of the environment.

alarm hold—A means of holding an alarm once sensed. The typical magnetic trap does not hold or latch, and thus the reclosing of a trapped door resets the typical magnetic trap. A hold circuit applied to such a device indicates that the door has been opened and continues to so indicate until reset.

alarm line—A wired electrical circuit used for the transmission of alarm signals from the protected premises to a monitoring station.

alarm relay—A relay, other than an annunciator, used to operate, or to operate in connection with, a visual or audible alarm.

alarm state—The condition of a detector that causes a control unit in the secure mode to transmit an alarm signal.

alarm system—An assembly of equipment and devices designated and arranged to signal the presence of an alarm condition requiring urgent attention, such as unauthorized entry, fire, temperature rise, etc. The system may sound a local warning or alert the police, a central station, or a proprietary service.

albedo—The reflecting ability of an object. It is the ratio of the amount of light reflected compared with the amount received.

ALC—Abbreviation for automatic level (volume) control. 1. A special compressor circuit included in some tape recorders for automatically maintaining the recording volume within the required limits regardless of changes in the volume of the sound. 2. A circuit that automatically maintains recording levels within permissible limits, so that, no matter how loud or soft the sound being recorded,

the signal on the tape will not get strong enough to over-modulate and distort or soft enough to be lost in noise. Also known as automatic volume control (AVC).

Alexanderson alternator—An early mechanical generator used as a source of low-frequency power for transmission or induction heating. It is capable of generating frequencies as high as 200,000 hertz.

Alexanderson antenna—A vlf antenna consisting of a horizontal wire connected to ground at equally spaced points by vertical wires with base-loading coils; the transmitter is coupled to an end coil.

Alford antenna—A square loop antenna comprising four linear sides with their ends bent inward so that capacitive loading is provided to equalize the current around the loop.

algebraic adder—In a computer, an adder that provides the algebraic rather than arithmetic sum of the entered quantities.

algebraic logic—A calculator mode that permits all calculations to be done in the order in which they are written.

algebraic sum—The sum of two or more quantities combined according to their signs. (Compare with *arithmetic sum*.)

ALGOL—1. An international problem language designed for the concise, efficient expression of arithmetic and logical processes and the control (iterative, etc.) of these processes. From *algorithmic language*. 2. A high-level language that has a context-free structure.

algorithm—1. A set of rules or processes for solving a problem in a finite number of steps (for example, a full statement of an arithmetic procedure for finding the value of $\sin x$ with a stated precision). *See also* procedure. 2. A series of equations, some of which may state inequalities, that cause decisions to be made and the computational process to be altered based on these decisions. 3. A set of rules or directions for getting a specific output from a specific input. The distinguishing feature of an algorithm is that all vagueness must be eliminated; the rules must describe operations that are so simple and well defined they can be executed by a machine. Furthermore, an algorithm must always terminate after a finite number of steps. 4. An ordered sequence of mathematical steps that always produces the correct answer to a problem, though the solution may be more lengthy than necessary. 5. A set of well-defined procedures for the solution of a problem in a limited number of steps. Algorithms are implemented in a computer by a programmed sequence of instructions.

algorithmically generated pattern—An array of digital data automatically generated by a predetermined software routine or program.

algorithmic language—An arithmetic language by which a numerical procedure may be presented to a computer precisely and in a standard form.

algorithmic pattern generation—Real-time generation of input test patterns during test execution according to specified procedures, formulas, or algorithms. Also refers to procedures or algorithms used in automatic-test-generation software for specific fault sets.

alias—An alternate label. For instance, a label and one or more aliases may be used to identify the same data element or point in a computer program.

aliasing—1. The introduction of error into the Fourier analysis of a discrete sampling of continuous data when components with frequencies too great to be analyzed with the sampling interval being used contribute to the amplitudes of lower-frequency components. 2. A phenomenon arising as a result of the sampling process in which high-frequency components of the original analog signal (whether information or noise) appear as lower frequencies in the sampled signal. Aliasing occurs when the

sampling rate is less than twice the highest frequency existing in the original analog signal. 3. Undesirable distortion component that can arise in digital audio equipment when the input signal's frequency exceeds one-half of the digital circuitry's sampling rate. 4. The mistaking of some object or situation for another, especially because of the way data is examined. Examples: movies of propellers and wagon wheels that seem to turn backward, musical notes that are wrongly analyzed by sequential measurement (for instance, thought to be an octave too low), and, especially, "jaggies." 5. Undesirable stair-step distortions in computer-generated images caused by improper sampling techniques. The most common effect is a jagged edge along object boundaries.

aliasing noise—A distortion component that will be created if a sampled signal bandwidth is effectively greater than one-half the sampling rate.

align—1. To adjust the tuned circuits of a receiver or transmitter for maximum signal response. 2. To put into proper relative position, agreement, or coordination when placing parts of a photomask together or placing a photomask over an etched pattern in the oxide on a semiconductor wafer. 3. To adjust the tuning of a multistage device so that all stages are adjusted to the same frequency or so that they work together properly.

aligned bundle—See coherent bundle.

aligned-grid tube—A multigrid vacuum tube in which at least two of the grids are aligned one behind the other to give such effects as beam formation and noise suppression.

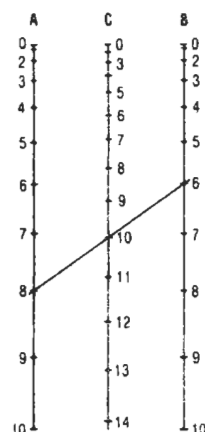
alignment—1. The process of adjusting components of a system for proper interrelationship. The term is applied especially to (a) the adjustment of tuned circuits in a receiver to obtain the desired frequency response and (b) the synchronization of components in a system. 2. In a tape recorder, the physical positioning of a tape head relative to the tape itself. Alignment in all respects must conform to rigid requirements in order for a recorder to function properly. 3. The accuracy or proper relative position of an image on a photomask with respect to an existing image on a substrate, as in a photoresist coating, or etched in the oxide of an oxidized silicon wafer. 4. A technique in the fabrication process of semiconductors by which a series of six to eight masks are successively registered to build up the various layers of a monolithic device. Each mask pattern must be accurately referenced to or aligned to all preceding mask patterns. 5. The accuracy of coordination or relative position of images on a semiconductor oxide coating and on the photomask, or any other images placed in relation to those.

alignment chart—Also called nomograph, nomogram, or abac. Chart or diagram consisting of two or more lines on which equations can be solved graphically. This is done by laying a straightedge on the two known values and reading the answer at the point where the straightedge intersects the scale for the value sought.

alignment pin—1. A pin in the center of the base of a tube. A projecting rib on the pin ensures that the tube is correctly inserted into its socket. 2. Any pin or device that will ensure the correct mating of two components designed to be connected.

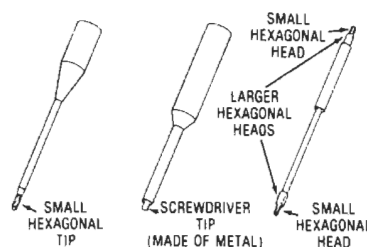
alignment protractor—An instrument that indicates error in a pickup's lateral alignment. It fits on the center spindle of the turntable, and the pickup stylus fits into a small hole on the device. The correct indication is shown when the angle of lateral movement of the pickup head is at 90° to the tangent of the groove at any point, although minimal tracking error is expected with most pickup arms.

alignment tool—A special screwdriver or socket wrench used for adjusting trimmer or padder capacitors



Alignment chart.

or cores in tuning inductances. It is usually constructed partly or entirely of nonmagnetic material. See also neutralizing tool.



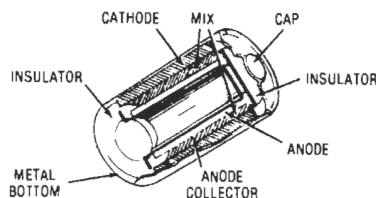
Alignment tools.

alive—1. Electrically connected to a source of potential difference, or electrically charged to have a potential different from that of the earth. 2. Energized. 3. Reverberant, as a room in which sound reflects and echoes.

alive circuit—A circuit that is energized.

alkali—A compound that forms hydroxyl ions when in aqueous solution. Also called a base.

alkaline cell—1. A primary cell, similar to the zinc-carbon cell, in which the negative electrode is granular zinc mixed with a potassium hydroxide (alkaline) electrolyte; the positive electrode is a polarizer in electrical contact with the outer metal can of the cell. A porous separator divides the electrodes. This type of cell delivers a terminal potential of 1.5 volts and has a 50 percent to 100 percent higher capacity than does a 1.5-volt zinc-carbon cell. Also called an alkaline-manganese cell. 2. A primary dry cell that has a very low internal resistance and high



Alkaline cell.

shielded building — In modern practice, a building in which shielding was incorporated in the basic architectural design. Shielded buildings often employ structural steel members as an integral part of RFJ shielding.

shielded cable — 1. A single- or multiple-conductor cable surrounded by a separate conductor (the shield) intended to minimize the effects of adjacent electrical circuits. 2. A cable in which each insulated conductor is enclosed in a conducting envelope so constructed that substantially every point of the surface of the insulation is at ground potential with respect to ground under normal operating conditions.

shielded-conductor cable — A cable in which the insulated conductor or conductors are enclosed in a conducting envelope or envelopes, almost every point on the surface of which is at ground potential with respect to ground.

shielded enclosure — A room, hangar, or box that is shielded or screened so as to provide a controlled electromagnetic environment.

shielded joint — A cable joint having its insulation so enveloped by a conducting shield that substantially every point on the surface of the insulation is at ground potential, or at some predetermined potential with respect to the ground.

shielded line — A transmission line whose elements confine propagated radio waves to an essentially finite space inside a tubular conducting surface called the sheath, thus preventing the line from radiating radio waves.

shielded pair — A two-wire transmission line surrounded by a metallic sheath to isolate the pair from electrical interference.

shielded room — An enclosed area made free from electrical interference that would affect the sensitivity of electrical equipment.

shielded transmission line — A transmission line whose elements confine the propagated electrical energy inside a conducting sheath.

shielded wire — An insulated wire covered with a metal shield — usually of tinned, braided copper wire.

shielded X-ray tube — An X-ray tube enclosed in a grounded metal container, except for a small opening through which the X-rays emerge.

shield effectiveness — The relative ability of a shield to screen out undesirable radiation.

shield factor — Ratio between the noise (or induced current or voltage) in a telephone circuit when a source of shielding is present and when it is not.

shield grid — In a glass tube, a structure that shields the control electrode from the anode or cathode, or both. It prevents the radiation of heat from them and the depositing of thermionic activating material on them. It also reduces the electrostatic influence of the anode, and may be used as a control electrode in some applications.

shield-grid thyatron — A thyatron that contains a shield grid, usually operated at the same potential as the cathode.

shielding — 1. The practice of confining the dielectric field of an electric cable to the inside of the cable insulation or insulated conductor assembly by surrounding the insulation or assembly with a grounded conducting medium called a shield. 2. Metal covering used on a cable; also a metal can, case partition, or plates enclosing an electronic circuit or component. Shielding is used to prevent undesirable radiation, pickup of signals, magnetic induction, stray current, ac hum, or radiation of an electrical signal. 3. A physical barrier, usually electrically conductive, designed to reduce the interaction of electric or magnetic fields on devices, circuits, or portions of circuits.

shielding effectiveness — The relative reduction of radiated electromagnetic energy levels occasioned by the use of an enclosure either to contain or exclude the energy.

shield percentage — Also called shield coverage. The physical area of a circuit or cable actually covered by shielding material, expressed in percent.

shield wire — A wire employed for reducing the effects of extraneous electromagnetic fields on electric supply or communication circuits.

shift — 1. Displacement of an ordered set of computer characters one or more places to the left or right. If the characters are the digits of a numerical expression, a shift is equivalent to multiplying a power of the base. 2. The process of moving information from one place to another in a computer; generally, a number of bits are moved at once. A word can be shifted sequentially (generally referred to as shifting left or right), or all bits of a word can be shifted at the same time (called parallel load or parallel shift). 3. In a computer, an operation whereby a number is moved one or more places to the left or right. The number 110, for instance, becomes 1100 if shifted one place left or 11 if shifted one place right. The operation is of considerable use in digital computer operations. 4. The difference between the mark and space frequencies. For example, if the mark frequency is 2125 Hz and the space frequency is 2295 Hz, the difference of 170 Hz is referred to as the shift. The 170-Hz and 850-Hz shifts have become two widely used standards.

shift counter — 1. A shift register in which the first stage, through logic feedback, produces a pattern of 1s or 0s as a function of the state of other stages in the register. The pattern of 1s and 0s so produced is termed a ring code. 2. See ring counter, 2.

shift-frequency modulation — A form of frequency modulation in which the modulating wave shifts the output frequency between predetermined values and the output wave is coherent, with no phase discontinuity.

shift-in character — In a computer, a code extension character that can be used by itself to bring about a return to the character set in effect before substitution of another set was caused by a shift-out character.

shift out — In a computer, to move information within a register toward one end so that, as the information leaves this one end, 0s are entered into the other end.

shift-out character — In a computer, a code extension character that can be used by itself to cause substitution of some other character set for the standard set, usually to access additional graphic characters.

shift pulse — A drive pulse that initiates the shifting of characters in a register.

shift register — 1. A digital storage circuit in which information is shifted from one flip-flop of a chain to the adjacent flip-flop on application of each clock pulse. Data may be shifted several places to the right or left, depending on additional gating and the number of clock pulses applied to the register. Depending on the number of positions shifted, the rightmost characters are lost in a right shift, and the leftmost characters are lost in a left shift. See dynamic shift register; static shift register. 2. A program, entered by the user into the memory of a programmable controller, in which the information data (usually single bits) is shifted one or more positions on a continual basis. There are two types of shift registers: asynchronous and synchronous. 3. A register in which binary data bits are moved as a contiguous group a prescribed number of positions to the right or to the left. 4. A memory in which data words are entered serially and shifted to successive storage locations. The data word can be read when it has been sequentially shifted to the output. 5. A digital circuit consisting of flip-flops, which is used

to convert parallel data (where several binary digits arrive at once) to serial (where the same digits travel one after another), or vice versa.

ship error—A radio direction-finder error that occurs when radio waves are reradiated by the metal structure of a ship.

ship-heading marker—On a PPI scope, an electronic radial sweep line indicating the heading of the ship on which the equipment is installed.

ship's emergency transmitter—A ship's transmitter to be used exclusively on a distress frequency for distress, urgency, or safety purposes.

ship station—A radio station operated in the maritime mobile service and located on board a vessel that is not permanently moored.

ship-to-shore communication—Communication by radio between a ship at sea and a shore station.

shock—1. An abrupt impact applied to a stationary object. It is usually expressed in gravities (g). 2. An acceleration transient of short duration and nonrepetitive occurrence. 3. Sudden stimulation of the nerves and convulsive contraction of the muscles caused by a discharge of electricity through the body.

shock absorber—A device for dissipating vibratory energy, to modify the response of a mechanical system to an applied shock.

shock excitation—See impulse excitation.

shock-excited oscillations—See free oscillations.

shock hazard—A hazardous condition that exists at a part of a ground-fault circuit interrupter if (a) there would be current of 5 milliamperes or more in a resistance of 500 ohms connected between the part in question and the grounded supply conductor, and (b) the device would not operate to open the circuit to the 500-ohm resistor within a specified time.

shock isolator—Also called a shock mount. A resilient support that tends to isolate a system from applied mechanical shock.

Shockley diode—A four-layer controlled semiconductor rectifier diode without a base connection, used as a trigger or switching diode.

shock motion—In a mechanical system, transient motion characterized by suddenness and by significant relative displacements.

shock mount—See shock isolator.

shockover capacitor—A capacitor connected between the grid and cathode of a thyatron to prevent premature firing.

shock pulse—Usually a single disturbance that is characterized by an increase and a decrease of acceleration in a relatively short period.

shock test (mechanical)—A test to determine the ability of a device to withstand suddenly applied forces of specified magnitude and duration.

shodop—Acronym for short-range Doppler.

shoran—Acronym for short-range air navigation. A precision distance-measuring system employing the pulse timing principle to measure the distance from an aircraft to one or more fixed responder ground stations. Fundamentally, the system consists of a mobile transmitter-receiver-indicator unit and a fixed receiver-transmitter unit (transponder). Pulses are sent from the mobile transmitter and returned to the originating point by the transmitter. The indicator measures the time interval required for the travel of a pulse between stations and converts this information into distance to the nearest thousandth of a mile.

shore effect—The bending of radio waves toward the shore line when traveling over water, due presumably

to the slightly greater velocity of radio waves over water than over land. This effect causes errors in radio direction-finder indications.

shore-to-ship communication—Communication by radio between a shore station and a ship at sea.

short—See short circuit.

short base-line system—A system that uses continuous waves and that has a base-line length that is short in comparison to the target distance.

short check—See flash test.

short circuit—Also called a short. 1. An abnormal connection of relatively low resistance between two points of a circuit. The result is excess (often damaging) current between these points. 2. An accidental or intentional near-zero resistance connection between two sides of a circuit. 3. An abnormal connection of relatively low impedance, whether made accidentally or intentionally, between two points of different potential. 4. A low-resistance path in a system that allows the current to flow outside of the proper circuit in an appliance, junction box, or in the wires. Due to a failure in insulation or improper hookup, the current takes the short low-resistance path rather than flowing through the entire circuit. 5. An abnormal condition that occurs when there is an unwanted electrical connection between two wires. It results in a flow of excess current.

short-circuit current—1. The current a power supply delivers when its output terminals are short-circuited. 2. An electronic regulator's output current with the output terminal shorted to the negative supply. Short-circuited current and maximum regulator output current depend on the pass circuitry. The maximum output current is also limited by the maximum allowable package power dissipation and, hence, by quiescent current.

short-circuit driving-point admittance—The driving-point admittance between the j terminal of an n -terminal network and the reference terminal when all other terminals have zero alternating components of voltage with respect to the reference point.

short-circuit feedback admittance (of an electron-device transducer)—The short-circuit transfer admittance from the output terminals to the input terminals of a specified socket, the associated filters, and the electron device.

short-circuit forward admittance (of an electron-device transducer)—The short-circuit transfer admittance from the input terminals to the output terminals of a specified socket, the associated filters, and the electron device.

short-circuit impedance—1. The driving-point impedance of a line or four-terminal network when its far end is short-circuited. 2. The input impedance to a line or four-terminal network when the far end or output terminals are shorted.

short-circuiting or grounding device—A power or stored-energy operated device that functions to short-circuit or ground a circuit in response to automatic or manual means.

short-circuit output admittance (of an electron-device transducer)—The short-circuit driving-point admittance at the output terminals of a specified socket, the associated filters, and the electron device.

short-circuit output capacitance (of an n -terminal electron device)—The effective capacitance determined from the short-circuit output admittance.

short-circuit parameters—In an equivalent circuit of a transistor, the resultant parameters when independent variables are selected for the input and output voltages.

short-circuit protection (automatic)—A current-limiting system that enables a power supply to continue