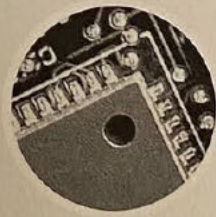
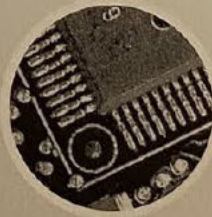


11

WILEY ELECTRICAL



ELECTRONICS ENGINEERING DICTIONARY



STEVEN M. KAPLAN

WILEY ELECTRICAL AND ELECTRONICS ENGINEERING DICTIONARY

Steven M. Kaplan
Lexicographer



IEEE PRESS



A JOHN WILEY & SONS, INC., PUBLICATION

WILEY ELECTRICAL AND ELECTRONICS ENGINEERING DICTIONARY

Copyright © 2004 by John Wiley & Sons, Inc. All rights reserved.

Published by John Wiley & Sons, Inc., Hoboken, New Jersey.
Published simultaneously in Canada.

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, scanning or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400, fax 978-646-8600, or on the web at www.copyright.com. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008.

Limit of Liability/Disclaimer of Warranty: While the publisher and author have used their best efforts in preparing this book, they make no representation or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives or written sales materials. The advice and strategies contained herein may not be suitable for your situation. You should consult with a professional where appropriate. Neither the publisher nor author shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages.

For general information on our other products and services please contact our Customer Care Department within the U.S. at 877-762-2974, outside the U.S. at 317-572-3993 or fax 317-572-4002.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print, however, may not be available in electronic format.

Library of Congress Cataloging-in-Publication Data is available.

Kaplan, Steven M.

Wiley Electrical and Electronics Engineering Dictionary

ISBN 0-471-40224-9

Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

ance, low output impedance, and a wide frequency-response with little phase distortion. Also known as **grounded-anode amplifier**, **cathode follower**, or **common-anode amplifier**.

grounded receptacle Same as **grounded outlet**.

grounded socket Same as **grounded outlet**.

grounded-source amplifier A field-effect transistor amplifier in which the source electrode, which is usually grounded, is common to both the input and output circuits. Also called **common-source amplifier**.

grounded-source circuit Same as **grounded-source connection**.

grounded-source connection For a field-effect transistor, a mode of operation in which the source electrode, which is usually grounded, is common to both the input and output circuits. Also called **grounded-source circuit**, or **common-source connection**.

grounded system A network or system of conductors within which at least one is intentionally grounded. Any grounded conductor may have one or more grounding points.

grounding Also called **earthing**. 1. The connection to a ground, or to a conductor connected to a ground. The term grounding refers to an intentional path to ground, while **ground fault** describes an unintentional path to ground. 2. The process of connecting to a ground, or to a conductor connected to a ground.

grounding bus Same as **ground bus**.

grounding cable Same as **ground cable**.

grounding circuit Same as **ground circuit**.

grounding clamp Same as **ground clamp**.

grounding conductor Same as **ground conductor**.

grounding connection Same as **ground connection**.

grounding electrode Same as **ground electrode**.

grounding lug Same as **ground lug**.

grounding mat Same as **ground mat**.

grounding outlet Same as **grounded outlet**.

grounding plate Same as **ground plate**.

grounding receptacle Same as **grounded outlet**.

grounding rod Same as **ground rod**.

grounding socket Same as **grounded outlet**.

grounding wire Same as **ground wire**.

group 1. A collection of things. Such a collection is usually located together, and/or regarded as a unit. For example, a family of chemical elements with similar properties arranged vertically within a periodic table. 2. In communications, a number of channels treated as a unit. For instance, a collection of associated voice channels in frequency-division multiplexing. 3. In computers, a collection of elements regarded as a unit. For example, a set of records in a database.

Group 3 facsimile Same as **Group 3 fax**.

Group 3 fax A fax that is compatible with the **Group 3 protocol**. It is the abbreviation of **Group 3 facsimile**. Its own abbreviation is **G3 fax**.

Group 3 protocol An international protocol for sending faxes over regular telephone lines. It supports data compression, and resolutions of up to 203 x 392 dpi.

Group 4 facsimile Same as **Group 4 fax**.

Group 4 fax A fax that is compatible with the **Group 4 protocol**. It is the abbreviation of **Group 4 facsimile**. Its own abbreviation is **G4 fax**.

group busy signal Same as **group busy tone**.

group busy tone An audible signal indicating that there are no idle trunks in a group. Also called **group busy signal**, or **trunk busy signal**.

group delay The time interval required for the envelope of a wave to pass from one point to another in a transmission system. It is due to different frequencies traveling at slightly different speeds. Often refers to the envelope of a modulated signal. Also called **envelope delay** (1).

group mark A symbol or code which indicates the beginning or end of data treated as a unit.

group velocity The velocity at which a wave group travels. It is the velocity of information propagation, and is not necessarily the same as that of energy propagation.

grouped records A set of records, such as that in a database, treated as a unit.

grouping 1. The formation of a **group**. 2. In a fax system, a periodic error in the spacing between recorded lines.

grouping factor The number of records in a disk block. It may be calculated by dividing the block length by the average length of the contained blocks. Also called **blocking factor**.

groupware Software designed to facilitate groups of people, often in different locations, to work together on one more projects. Such software includes emailing, scheduling, file transferring, application sharing, conferencing, the use of a whiteboard, and so on. Also called **workgroup software**, or **teamware**.

GroupWise A popular groupware offering.

Grove cell A primary cell consisting of a platinum electrode in nitric acid, and a zinc electrode in sulfuric acid, with a porous partition separating the electrolytes. It has a voltage of approximately 1.91.

growler 1. A device or instrument utilized to locate short-circuits, and which emits an audible signal upon finding any. Used especially to locate short-circuited coils in an electric generator or motor armature. 2. A device or instrument, utilized for testing or detection, which emits an audible signal.

grown-diffused junction A junction formed by diffusing impurities into the semiconductor material after a **grown junction** has been formed.

grown-diffused transistor A transistor with a **grown-diffused junction**.

grown junction A pn junction formed while a semiconductor crystal is being grown from a melt.

grown-junction transistor A transistor with **grown junctions**.

Gs Symbol for gauss.

GSE Abbreviation of **ground support equipment**.

GSM A digital cellular network technology which usually utilizes time-division multiple access. It is used in Europe and in many other parts of the world, and may operate in the 900 MHz, 1800 MHz, or 1900 MHz frequency bands. Aside from telephony, it supports voice mail, fax, caller ID, email, Internet access, and error-correction, among others. It is the abbreviation of **Global System for Mobile Communications**.

GSM 1800 A GSM network operating in the 1800 MHz band.

GSM 1900 A GSM network operating in the 1900 MHz band.

GSM 900 A GSM network operating in the 900 MHz band.

GSR Abbreviation of **galvanic skin response**.

gTLD Abbreviation of **generic top-level domain**.

guard band A narrow interval of frequencies between channels, left vacant to help prevent adjacent-channel interference.

projector

a rear-projection TV the projector and any viewers are on opposite sides of the screen.

projector 1. A device which transmits a beam of light, especially that conveying images, onto a surface, such as a translucent screen. An overhead projector is an example. 2. A device or object, such as a horn, which serves to direct and intensify sound.

Prolog Acronym for **programming logic**. A high-level programming language which is frequently used for artificial intelligence applications, such as expert systems.

PROM Acronym for **programmable read-only memory**. A chip which may be programmed once, usually by a customer. This contrasts with **EEPROM** chips, which can be reprogrammed, and with **ROM** chips, which are programmed when manufactured. Also called **PROM chip**.

PROM burner A device utilized to program **PROMs**. To write code or data onto a **PROM** chip is referred to as burning, as connections are melted when programming. Also called **PROM programmer**.

PROM chip Same as **PROM**.

PROM programmer Same as **PROM burner**.

promethium A radioactive metallic chemical element whose atomic number is 61. It has about 30 known isotopes, all unstable, and is used in nuclear-powered batteries, semiconductors, and as an x-ray source. Its chemical symbol is **Pm**.

promiscuous mode 1. In a communications network, a mode of operation in which all data packets can be received by all nodes. This can lead to security problems, such as the interception of passwords, email, account names, and so on. 2. In a communications network, a node engaged in packet sniffing.

prompt A symbol or message which is displayed on a monitor, especially that of a computer, indicating that input is awaited, and when provided will be entered there.

prong Same as **pin**.

propagate 1. To spread or extend from a smaller to a larger area. 2. For a wave move through a medium, such as the atmosphere, a vacuum, or a transmission line. For example, an electromagnetic wave traveling via a transmission line, or an acoustic wave traveling through water. 3. To move through a medium.

propagation 1. The process of spreading or extending from a smaller to a larger area. 2. The movement of a wave through a medium, such as the atmosphere, a vacuum, or a transmission line. For example, an electromagnetic wave traveling via a transmission line, or an acoustic wave traveling through water. Also, the process by which this occurs. Also called **wave propagation**, or **wave motion**. 3. Movement through a medium.

propagation coefficient Same as **propagation constant**.

propagation constant A complex quantity whose real number component is the **attenuation constant**, and whose imaginary number component is the **phase constant**. It describes the effect a transmission medium or line has on a wave traveling through or along it. Also called **propagation coefficient**.

propagation delay Also called **propagation time**, or **propagation time delay**. 1. The time interval required for a signal to move from one point to another. 2. The time interval required for a signal to move through a component, circuit, stage, unit, device, system, or medium.

propagation direction In a homogeneous isotropic medium, the direction of energy flow at any given point. For instance, the direction of propagation in a uniform waveguide is considered to be along its axis. Also called **direction of propagation**.

another. Such losses may be due to absorption, scattering, dispersion, or the like. 2. **Propagation loss** (1) occurring in a signal traveling from a transmitting antenna to a receiving antenna.

propagation losses Same as **propagation loss**.

propagation medium Also called **medium of propagation**. 1. The medium through which a wave or other phenomenon propagates. This can be the atmosphere, a vacuum, a waveguide, a crystal, water, and so on. 2. The **propagation medium** (1) through which an electromagnetic wave travels.

propagation mode For a guided electromagnetic wave, one of the possible manners of propagation. Such waves can propagate in one of three principal modes, which are transverse electric waves, transverse magnetic waves, or transverse electromagnetic waves. Also called **waveguide mode**.

propagation path The path, such as that between a transmitter and a receiver, a wave follows.

propagation speed The speed at which a wave propagates through a given medium. It is the speed at which given points within it, such as crests and troughs, travel. In a vacuum it is equal to the product of the frequency and wavelength. In a dispersive medium the propagation speed of electromagnetic waves varies as a function of the frequency, while in a non-dispersive medium the propagation speed is independent of the frequency. Also called **wave speed**, **wave celerity**, or **celerity**.

propagation time Same as **propagation delay**.

propagation time delay Same as **propagation delay**.

propagation velocity The **propagation speed** in a given direction. Also called **wave velocity**.

property 1. An attribute or characteristic that helps describe, distinguish, and define a component, circuit, device, system, material, and so on. 2. A **property** (1) which is possessed by all members of a given class.

proportional 1. Having, establishing, or maintaining a relationship with one or more entities or values. For instance, the force between two charged particles is directly proportional to the product of their magnitudes, and inversely proportional to the square of their distance. 2. A relationship between two or more quantities, in which the variation in one causes a change in the other. For example, a transducer whose input is a DC, and whose output is a proportional AC.

proportional action An action, such as a corrective action in a control system, which is proportional to a given process, state, or variable.

proportional band A frequency band whose values are equally distributed along the stated interval of frequencies. For example, the first 10% of such a band comprises the same interval of hertz as any other equally-sized segment, such as the middle or last 10%.

proportional control Control in which the corrective action is proportional to a given process, state, or variable.

proportional counter 1. A radiation counter which incorporates a **proportional counter tube**. 2. Same as **proportional counter tube** (1).

proportional counter tube 1. A counter tube whose output is proportional to the number of detected ionized particles. Also called **proportional counter** (2). 2. A counter tube whose output is proportional to the number of detected pulses or events.

proprietary Private, only used by a single or few groups, exclusively owned, or otherwise not utilizing a common or standardized format, composition, mechanism, or the like. For instance, **proprietary software** or a **proprietary file format**.

ated capacitance A rated or named value, stating the capacitance of a capacitor when used in a given manner. The actual value, or interval of values, may not coincide with this number. Also called **nominal capacitance**.

ated capacity A value or quantity establishing the maximum amount that can be contained, accommodated, or handled. For instance, the charge that can be withdrawn from a fully charged battery under specified conditions, the maximum current that can be handled by an electric circuit, or the largest number of communication channels that a communications circuit can handle simultaneously. Also called **maximum capacity**, or **full-rated capacity** (1).

ated conditions For a given component, circuit, device, piece of equipment, or system, the operating conditions, such as voltage, current, temperature, and/or humidity, required for a given rating.

ated current 1. A rated or named value, stating the current that a component, circuit, device, piece of equipment, system consumes, produces, or safely tolerates, when used in a given manner. For example, it may be a rating of the current drawn expressed in RMS amperes after a device is turned on and warmed up. The actual value, or interval of values, may not coincide with this number. Also called **nominal current**. 2. The maximum current that can be applied continuously under specified conditions without harming a component, circuit, device, piece of equipment, or system. Also called **maximum current** (2).

ated frequency A rated or named value, stating the center frequency of a crystal or crystal unit, such as that of quartz. The actual value, or interval of values, may not coincide with this number. Also called **nominal frequency**.

ated impedance A rated or named value, stating the impedance of a circuit or device when used in a given manner. The actual value, or interval of values, may not coincide with this number. For instance, the nominal impedance of a speaker may be 8 ohms, but depending on the frequency reproduced may dip below 3, or exceed 50 ohms. Also called **nominal impedance**.

ated load The maximum power that is consumed by a component, circuit, device, piece of equipment, or system that is connected to a source of electricity, while safely performing its functions.

ated output Also called **maximum output**. 1. The peak output value, such as that of a current or voltage, of a component, circuit, device, piece of equipment, or system. 2. The **rated output** (1) for a given period of time. 3. The **rated output** (1) that can be handled safely.

ated power 1. A rated or named value stating the power that a component, circuit, device, piece of equipment, or system can produce, consume, dissipate, or otherwise safely handle, when used in a given manner. For instance, the nominal power of a speaker may indicate the RMS power that can be delivered to a dynamic speaker for extended periods, without harming the voice coil or other components. The actual value, or interval of values, may not coincide with this number. Also called **nominal power**, or **nominal power rating**. 2. The maximum power a component, circuit, device, piece of equipment, or system can handle safely.

ated power output The highest power output level a component, circuit, device, piece of equipment, or system can handle safely. Also called **maximum power output** (3).

ated resistance A rated or named value, stating the resistance of a resistor when used in a given manner. The actual value, or interval of values, may not coincide with this number. Also called **nominal resistance**.

ated voltage 1. A rated or named value, stating the available, input, or output voltage of a component, circuit, device,

may be 115/230, where the lower number is primarily for lighting and small appliances, and the larger number is for heating and large appliances. The actual values, or interval of values, may not coincide with these numbers. Also called **nominal voltage**, or **nominal voltage rating**. 2. The maximum voltage that can be applied continuously under specified conditions without harming a component, circuit, device, piece of equipment, or system.

ated wattage The **rated power** expressed in watts.

rating 1. A rated or named value, or interval of values, describing a property or the behavior of a component, circuit, device, piece of equipment, or system operated under given conditions. For instance, a rated frequency. The actual observed value, or interval of values, may not coincide with these numbers. For instance, the voltage supplied by an AC power line in a given country. Also called **nominal value**, or **nominal rating**. 2. A rated or named value, or interval of values, describing the operational limits of a component, circuit, device, piece of equipment, or system operated under given conditions. For instance, a power rating.

ratio A relationship between two quantities consisting of one being divided by the other. For example, a signal-to-noise ratio, a charge-mass ratio, an aspect ratio, a cell loss ratio, a compression ratio, or gain expressed as a ratio of an output to an input.

ratio arms In a bridge, such as a Wheatstone bridge, two adjacent arms which serve to indicate ratios of resistance.

ratio control The maintaining of two variables at a given ratio, as seen, for instance, in a ratio control system.

ratio control system A control system in which one variable is kept at a preset ratio with another. Used, for instance, when mixing two component materials.

ratio detector An FM detector that utilizes two diodes, and which converts frequency variations in the input signal voltage into proportional variations in output current. Such a detector demodulates signals without limiter stages.

ratio meter An instrument or device which measures and indicates the ratio of two quantities.

ratio of transformation For a given transformer, the ratio of the primary turns to the secondary turns. Also called **transformer ratio**, **transformation ratio**, or **turns ratio**.

rational number Any real number which can be expressed in the form of a/b , where a is an integer, and b is a non-zero integer.

RAW Abbreviation for read-after-write.

raw capacity Also called **native capacity**. 1. In a disk, disc, or tape, the storage capacity prior to formatting. Data, such as control information, reduces this capacity. Also called **unformatted capacity**. 2. In a disk, disc, or tape, the storage capacity prior to compression. Compression frequently increases this amount 50% or more.

raw data 1. Data which has not been processed, or that has not been processed to the full extent intended. 2. Data which is not in any given proprietary format. 3. Data which has been gathered but not analyzed or otherwise acted upon.

rawin The use of radar to determine wind speed and direction, usually by tracking a specially-equipped balloon. It is an acronym for **radar wind**, or **radio wind**.

rawinsonde A **radiosonde** which is tracked by a radar, or other device which utilizes radio waves, so as to better monitor wind characteristics.

ray 1. A line of radiant energy, such as light, whose cross section is very small. Also, a representation of such a line. For example, the path of a single photon. 2. A particle or beam of particles emitted or radiated from a source. For in-

ter (1). 2. A circuit, device, or system which converts audio, video, or other content into radio waves which are emitted. AM, FM, and AM/FM transmitters are examples. Also called **transmitter (2)**, **radio transmitter**, or **radio sender**.

sensation level For a given individual, the level, expressed in dB, of a sound relative to the individual's hearing threshold for that sound. For example, a noise bandwidth presented at 30 dB sensation level. Its abbreviation is SL. Also called **level above threshold**.

sense 1. The ability of a component, device, piece of equipment, system, or entity, to detect or otherwise perceive a given phenomenon, state, or condition. Also, the action of such perception. For example, to detect a direction or polarity, or to be aware of the state of a relay. 2. In computers, to read data. Also, a read operation.

sense amp Abbreviation of **sense amplifier**.

sense amplifier Its abbreviation is **sense amp**. 1. A circuit or device that detects and amplifies very low voltages. 2. A **sense amplifier (1)** whose output is a fixed voltage.

sense antenna An antenna which indicates the direction from which a radio signal arrives. Used, for instance, in a direction finder. Also called **sensing antenna**.

sense circuit Same as **sensing circuit**.

sense resistor A resistor utilized as a **sensor**. Used, for instance, to detect a current or a voltage in a circuit. Also called **sensing resistor**.

sensing antenna Same as **sense antenna**.

sensing circuit A circuit that serves as a **sensor**. For example, a circuit in a pacemaker which detects electrical activity in the heart. Also called **sense circuit**.

sensing element A probe or other part or section of a **sensor (1)**, which samples or otherwise detects. Also called **sensor (2)**.

sensing resistor Same as **sense resistor**.

sensitive 1. Able to detect or sense phenomena or stimulation. Also, able to change or otherwise respond to a given phenomenon, action, or circumstance. For example, that which is photosensitive. 2. Able to detect and respond to very small or subtle changes. Said, for instance, of an instrument. 3. Able to distinguish between two or more levels, settings, states, or the like. For example, case sensitive. 4. Harmed or otherwise adversely affected by a given phenomenon, condition, level, or the like. For instance, electrostatic discharge sensitive.

sensitive device 1. A device which responds to a given stimulus or signal. For example, a photosensitive device, or a passband filter. 2. A **sensitive device (1)** that responds to very slight stimuli or signals.

sensitivity 1. The ability to detect or otherwise perceive a given phenomenon, state, condition, or level. Also, the degree of such sensitivity. 2. The magnitude of the response of a component, circuit, device, instrument, piece of equipment, system, or material, to a given stimulus, level, or other input signal. For instance, the ohms-per-volt rating of a voltmeter, or the magnitude of the deflection of an indicating needle in response to a given change in a detected variable. 3. The minimum input signal that produces a given output signal. For example, the minimum input signal level that a specific radio receiver needs to produce a stated output level. 4. The proportion of the audio-frequency electrical power input to a loudspeaker which is converted into acoustic energy. Efficiency may be measured, for instance, by driving a loudspeaker with a power input of 1 watt, and measuring its output, in decibels, at a distance of 1 meter. Also called **speaker efficiency**, **loudspeaker efficiency**, or **efficiency (3)**.

sensitivity control A control, such as that in a receiver, which adjusts sensitivity.

sensitivity-time control An automatic control circuit which modifies the gain of a receiver at set intervals, so as to maintain the output signal levels within a desired amplitude, in response to varying input signals. To do so, it reduces sensitivity to strong signals, while increasing it for weak ones. Such modifications are usually anticipated, as when a loran receiver adjusts its gain between successive pulses from fixed transmitters. Its abbreviation is STC. Also called **sensitivity-time control circuit**, **differential gain control**, **gain-time control**, or **gain-sensitivity control**.

sensitivity-time control circuit Same as **sensitivity-time control**.

sensitometer An instrument which measures and indicates the photosensitivity of materials.

sensitometry The measurement and techniques involved in the use of **sensitometers**.

sensor 1. A component, circuit, device, instrument, piece of equipment, system, material, or mechanism which serves to **sense (1)**, and respond. A sensor may, for instance, detect a given value, or any change in values. There are many examples, including acoustic, pressure, contact, force, motion, proximity, position, light, optical, radiation, infrared, ultraviolet, radio-frequency, magnetic, photoelectric, and time sensors. Most sensors convert a non-electrical phenomenon into a proportional electrical equivalent, and nearly all transducers are sensors of some kind. A sensor may provide an analog or digital output, the latter being used, for instance, for computer applications. Contact sensors detect objects and phenomena through physical contact with an object or medium, while non-contact sensors have no such contact. 2. Same as **sensing element**.

sentry robot Same as **security robot**.

separation 1. The act of dividing something. For instance, a disk partitioning, the removal of a gas from a solid it was trapped in, or the separation of individual pulses within a train. 2. The location or area where a **separation (1)** occurs. 3. Any space or interval resulting from a **separation (1)**. 4. In a stereo audio component, the extent to which the information from one channel is absent from the other. Usually expressed in decibels. Also called **stereo separation**, or **channel separation (2)**.

separation circuit A circuit which serves to separate signals or components of signals. For example, a circuit separating the chrominance and luminance signals within a video signal.

separation energy The energy required to remove a particle, such as a proton, from a nucleus.

separator That which serves to divide, cut, sort, isolate, or the like. For example, an electrostatic separator, a frequency separator, an amplitude separator, an information separator, or the dielectric material which isolates the conductors of a capacitor.

septa The plural form of **septum**.

septagon A closed geometric figure bounded by seven straight lines.

septillion A number equal to 10^{24} .

septum A partition or membrane which divides two cavities. For instance, that which partitions a waveguide. Its plural form is **septa**.

sequence 1. An arrangement of two or more things, entities, or events, in a given order. 2. An arrangement of two or more things, entities, or events, in a successive order. 3. That which is ordered by a **sequence (1)** or **sequence (2)**. 4. To arrange in a **sequence (1)** or **sequence (2)**.