Modern Dictionary of Electronics

SIXTH EDITION

REVISED *and* UPDATED

Rudolf F. Graf

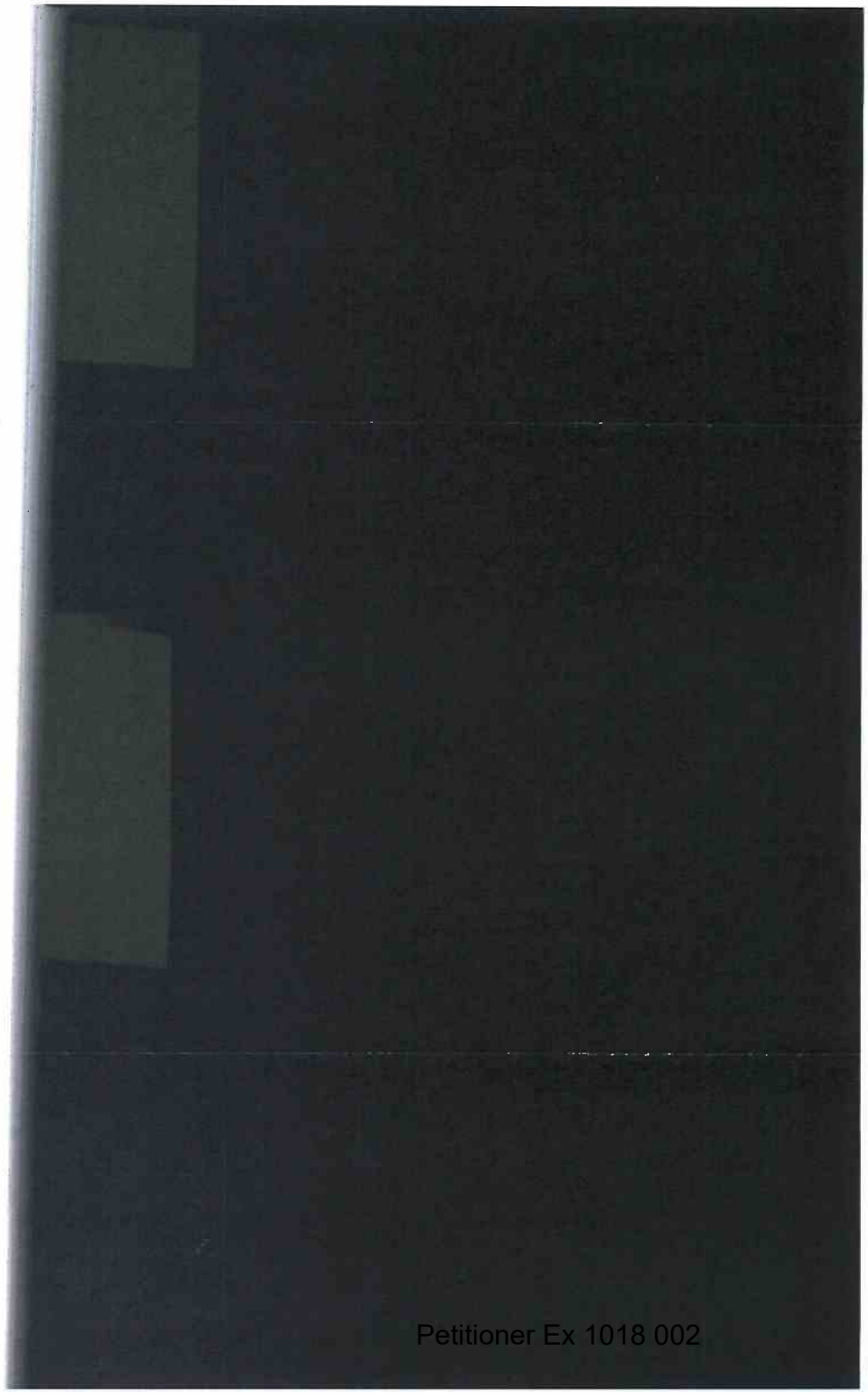
MODERN DICTIONARY of ELECTRONICS

SIXTH EDITION

REVISED AND UPDATED

Rudolf F. Graf

Newnes
Boston Oxford Johannesburg Melbourne New Delhi Singapore



Newnes is an imprint of Butterworth-Heinemann

A member of the Reed Elsevier group

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

Library of Congress Cataloging-in-Publication Data
Graf, Rudolf F.
Modern dictionary of electronics / by Rudolf F. Graf. — 6th ed.
p. cm.
Reprint. Originally published: Indianapolis, Ind. : H.W. Sams, © 1984.
ISBN 0-7506-9870-5
1. Electronics—Dictionaries.
TK7804.G67 1996 96-25894
621.381'03—dc 20 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
313 Washington Street
Newton, MA 02158–1626
Tel: 617-928-2500
Fax: 617-928-2620

For information on all Newnes electronics publications available, contact our World Wide Web home page at: http://www.bh.com/bh

Edited by: *Charlie Buffington* and *Jack Davis*
Illustrated by: *T.R. Emrick*

Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

level. Selectivity measurements usually refer to signals on the alternate channel (400 kHz from the desired channels in fm and 20 kHz in am); selectivity measured on the adjacent channel (200 kHz for fm, 10 kHz for am) is usually lower. The higher the selectivity, the less interference there will be from signals on nearby channels, which is most important in crowded metropolitan areas. 4. The characteristic which determines the extent to which the desired frequency can be differentiated from other frequencies.

selectivity control — The control for making a receiver more selective.

select lines—In a core memory array, the wires which pass through magnetic cores and carry the selecting coincident currents.

selector—1. On a punch-card machine, a mechanism which reports a condition and accordingly causes a card or an operation to be selected. 2. In a telephone system, the switch of relay-group switching systems that select the path the call is to take through the system. It operates under the control of the dial at the calling station. 3. A sequential switch, usually multicontact or motor driven.

selector pulse—A pulse used to identify one event of a series.

selector relay—A relay capable of automatically selecting one or more circuits.

selector switch—A multiposition switch that permits one or more conductors to be connected to any of several other conductors.

selectron — A computer-memory tube capable of storing 256 binary digits and permitting very rapid selection and access.

selenium — A chemical element with marked photosensitive properties and a resistance that varies inversely with illumination. It is used as a rectifier layer in metallic rectifiers.

selenium cell — A photoconductive cell consisting of a layer of selenium on a substrate whose electrical resistance varies with the illumination falling on the cell. (Selenium cells have been largely replaced by photocells of one kind or another.)

selenium rectifier—A metallic rectifier in which a thin layer of selenium is deposited on one side of an aluminum plate and a highly conductive metal is coated over it. Electrons flow more freely from the coating to the selenium than in the opposite direction, thereby providing rectification.

self-adapting—Pertaining to the ability of a system to change its performance characteristics in response to its environment.

self-adaptive system—A system which can exhibit the qualities of reorganization and/or learning.

self-adjusting communication — *See* Adaptive Communication.

self-aligned thick oxide—A term used to describe a proprietary low-voltage, self-aligned gate process.

self-aligning-gate MOS — Abbreviated SAG MOS. 1. MOS device where a polycrystalline silicon layer is substituted for the usual aluminum metal gate. The key feature is a different processing technology in which the gate is automatically aligned. 2. A process in which materials like polycrystalline silicon or refractory metals are used in place of aluminum at the gate. These materials act as a mask and result in the gate being automatically aligned between source and drain regions.

self and systems testing and checkout — Logical and numerical processing for the purpose of exercising and monitoring responses of the system and the functioning of the computer itself.

self-balancing recorder — A recording device operating on the servomechanism principle.

self-bias—The voltage developed by the flow of vacuum-tube current through a resistor in a grid or cathode lead. Also called automatic bias.

self-capacitance — *See* Distributed Capacitance.

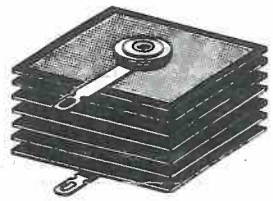
self-checking code — In computers, a code in which errors produce forbidden combinations. A single error-detecting code produces a forbidden combination if a digit gains or loses a single bit. A double error-detecting code produces a forbidden combination if a digit gains or loses either one or two bits, and so forth.

self-cleaning contact — *See* Wiping Contact.

self-complementing code—A machine language in which the code of the complement of a digit is the complement of the code of the digit.

self-contained instrument—An instrument that has all the necessary equipment built into the case or made a corporate part thereof.

self-demagnetization—The process by which a magnetized sample of magnetic material tends to demagnetize itself by virtue of the opposing fields created



Selenium rectifier.

stop and lock on when a signal is found or to continually plot band occupancy.

sweep jammer — An electric jammer which sweeps a narrow band of electronic energy over a broad bandwidth.

sweep linearity—The maximum displacement error of the independent variable between specified points on the display area in an oscilloscope.

sweep lockout—A means for preventing multiple sweeps when operating an oscilloscope in a single-sweep mode.

sweep magnifier — Also called sweep expander. A circuit or control for expanding part of the sweep display of an oscilloscope.

sweep oscillator—An oscillator used to develop a sawtooth voltage which can be amplified to deflect the electron beam of a cathode-ray tube. (*See also* Sweep Generator.)

sweep switching—The alternate display of two or more time bases or other sweeps using a single-beam crt. Comparable to dual- or multiple-trace operation of a deflection amplifier.

sweep test—Pertaining to cable, checking the frequency response by generating an rf voltage, the frequency of which is varied back and forth through a given frequency range at a rapid constant rate while observing the results on an oscilloscope.

sweep-through—A jamming transmitter that sweeps through a radio-frequency band and jams each frequency briefly, producing a sound like that of an aircraft engine.

sweep voltage — The voltage used for deflecting an electron beam. It may be applied to either the magnetic deflecting coils or the electrostatic plates.

swell manual—Also called solo manual. In an organ, the upper manual normally used to play the melody. (*See also* Manual, 2.)

swept resistance — The portion of the total resistance of a potentiometric transducer over which the slider travels when the device is operated through its total range.

swim — The phenomenon in which the constructs on a crt screen appear to move about their normal position. It can be observed when the refresh rate is slow and is not some multiple or submultiple of line frequency. In some cases, swim is a result of instability in the digital-to-analog converters in the display controller

swimming — Lateral shifting of a thick-film conductor pattern on molten glass crossover patterns.

swing — 1. The variation in frequency or amplitude of an electrical quantity. 2. The total variation of voltage, current, or frequency. 3. The arc traversed by the needle of a meter.

swingback permeability — *See* Reversible Permeability.

swinger — 1. A swinging short. 2. *See* Swing Short.

swinging—1.Momentary variations in frequency of a received wave. 2. Existing only for short periods.

swinging arm — A type of mounting and feed used to move the cutting head at a uniform rate across the recording disc in some recorders. All phonograph pickups are of the swinging-arm type.

swinging choke—1. A filter inductor designed with an air gap in its magnetic circuit so its inductance decreases as the current through it increases. When used in a power-supply filter, a swinging choke can maintain approximately critical inductance over wide variation in load current 2. An audio-frequency choke whose core is operated saturated with flux. It is used at the input of a power-supply filter for improved voltage regulation. Its inductance is at a maximum for small currents, and charges (swings) to a minimum for large currents.

swing short — A come-and-go (intermittent) short produced by a pair of wires swinging together in the wind. Also called swinger.

"swiss-cheese" packaging—Also called imitation 2-D. A high-density packaging technique in which passive and active components are inserted into holes punched in printed-circuit-board substrates and attached by soldering or thermocompression bonding or by means of conductive epoxy adhesive.

switch — 1. A mechanical or electrical device that completes or breaks the path of the current or sends it over a different path. 2. In a computer, a device or programming technique by means of which selections are made. 3. A device that connects, disconnects, or transfers one or more circuits and is not designated as a controller, relay or control valve. The term is also applied to the functions performed by switches. 4. A mechanical component for opening or closing (interrupting or completing) one or more electrical circuits. In electronics, as opposed to the electrical industry, switches tend to be low-voltage, low-current units scaled to the size of the equipment in which they function. Switch suitable for opening and closing 120- and 240-volt ac line current and various dc and signal-level voltages under 100 volts dc predominate. 5. A mechanical or electronic device designed for conveniently interrupting, completing, or changing connections in electrical circuits whenever desired or necessary. Mechanical types may control more than one circuit, by incorporating multiple-contact elements which are controlzed by the same actuator. Electronic switches

ordinarily control only a single electrical circuit. 6. A device for making, breaking, or changing the connections in an electrical circuit.

switchboard — 1. A manually operated apparatus at a telephone exchange. The various circuits from subscribers and other exchanges terminate here, so that operators can establish communications between two subscribers on the same exchange, or on different exchanges. 2. A single large panel or an assembly or panels on which are mounted the switches, circuit breakers, meters, fuses, and terminals essential to the operation of electrical equipment. 3. An attended console where telephone subscribers' lines appear for answering and calling. An operator interconnects lines and trunks, and supervises the connections.

switching center—*See* Switching Office.

switch detector — A detector which extracts information from the input waveform only at instants determined by a selector pulse.

switched network — 1. The network by which switched telephone service is provided to the public. Also called public switched network and switched message network. 2. A multipoint network with circuit switching capabilities. The telephone network is a switched network, as are Telex and TWX.

switch-fader — A control that permits each of two or more cameras to be selectively fed into the distribution system. The "fader" permits gradual transition from one camera to another.

switcher—1. A catchall term for a power source that employs switching techniques to achieve higher-efficiency regulation. Can include line switchers and conventional transformer/rectifier ac-operated power sources employing switching regulator techniques. 2. A device that allows the pictures from a number of cameras to be viewed on one monitor. 3. *See* Switching Power Supply.

switch gear — A general term covering switching, interrupting, control, metering, protective, and regulating devices; also assemblies of these devices and associated interconnections, accessories, and supporting structures, used primarily in connection with the generation, transmission, and distribution of electric power.

switch hook — A switch associated with the structure on a telephone set that supports the receiver or handset. The switch is operated when the receiver or handset is removed from or replaced on the support.

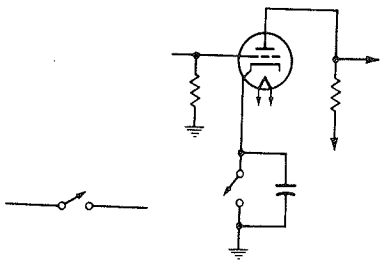
switching — 1. Making, breaking, or changing the connections in an electrical circuit. 2. The action of turning a device on and off.

switching amplifier—1. One whose output stage rapidly switches output power between transistor saturation and cutoff. Average output current is varied by controlling switching frequency, pulse amplitude, duty cycle, or any combination of these factors. Usually, however, switching amplifiers control power by modulating either pulse width or pulse frequency. Switching rates can be varied up to about 100 kHz. Since a switching amplifier controls output power by varying on-off time ratio of the output pulses, amplifier heat dissipation varies little from a nominal rating and is much less than that of amplifiers that consume unused power. However, switching amplifiers generate transients that can upset the operation of nearby electronic circuits. 2. *See* Class-D Amplifier.

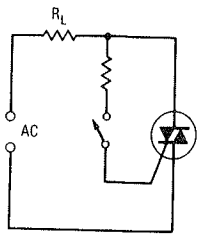
switching center—1. A location at which data from an incoming circuit are routed to the proper outgoing circuit. 2. A group of equipment within a relay station for automatically or semiautomatically relaying communications traffic. 3. A location where an incoming call/message is automatically or manually directed to one or more outgoing circuits.

switching characteristics — An indication of how a device responds to an input pulse under specified driving conditions.

switching circuit—A circuit which performs a switching function. In computers, this is performed automatically by the presence of a certain signal (usually a pulse signal). When combined, switching circuits can perform a logical operation.



Simple switch. Vacuum tube.



Triac.

Switching circuits.

switching coefficient—The derivative of applied magnetizing force with respect to the reciprocal of the resultant switching time. It is usually determined as the reciprocal of the slope of a curve of reciprocals of switching times versus the values of applied magnetizing forces, which are applied as step functions.

switching control—An installation in a wire system where telephone or teletypewriter switchboards are installed to interconnect circuits.

switching current—The current through a device at the switching voltage point.

switching device—Any device or mechanism, either electrical or mechanical, which can place another device or circuit in an operating or nonoperating state.

switching differential—The difference between the operate and release points of a switch, caused by hysteresis. It can be in units of amperes, volts, inches, gausses, etc. *See* Hysteresis *and* Switching.

switching diode—A diode that has a high resistance (corresponding to an open switch) below a specified applied voltage but changes suddenly to a low resistance (closed switch) above that voltage.

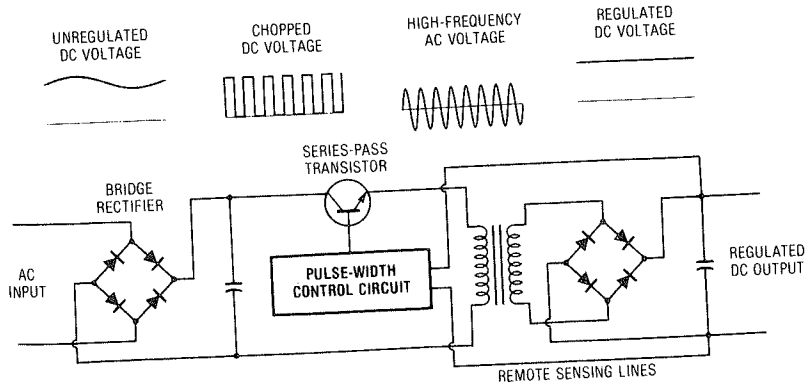
switching hysteresis—The principle associated with sensors, such that, the operate point is not at the same level as the release point. In solid-state sensors it is accomplished with negative-resistance devices, and in mechanical switches it results from the storing of potential energy before the transition occurs.

switching mode—A way of utilizing a vacuum tube or transistor so that (except for negligibly small transition times) it is either in cutoff or saturation. A transistor operated in this mode can switch large currents with little power dissipation.

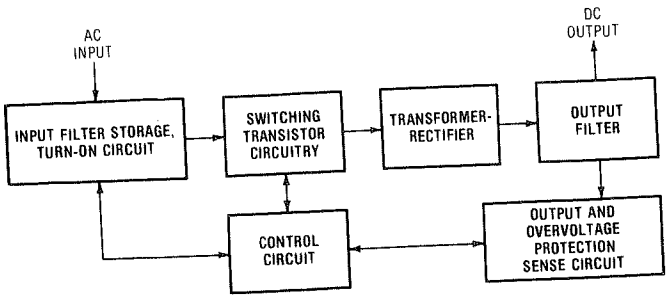
switching office—A location where either toll or local telephone traffic is switched or connected from one line or circuit to another. Also called switching center.

switching pad—A transmission-loss pad automatically inserted into or removed from a toll circuit for different desired operating conditions.

switching power supply—A power supply (usually dc output) which achieves its output regulation by means of one or more active power handling devices which are alternately placed in the off and on states. Distinguished from linear or dissipative power supplies, in which regu-



Schematic.



Block diagram.

Switching power supply.

lation is achieved by power handling devices whose conduction is varied continuously over a wide range which seldom (if ever) includes the full off or full on condition. Also called switcher.

switching regulator — A power supply design that achieves efficient regulation by commuting the input voltage into a filter circuit.

switching time—1. The interval between the reference time and the last instant at which the instantaneous-voltage response of a magnetic cell reaches a stated fraction of its peak value. 2. The interval between the reference time and the first instant at which the instantaneous integrated-voltage response reaches a stated fraction of its peak value. 3. The time for a multiplexer to change from one channel to the next with the new output signal remaining within a specified percentage of its final value. Expressed for a maximum voltage transition.

switching transients—Transient voltage spikes that appear at a multiplexer's output when the multiplexer is switched from one channel to another and one of the switches is turned off. Such spikes may cause inaccurate measurements if output is sampled, digitized, or integrated during this time.

switching transistor — A three-terminal device with one terminal controlling the electrical impedance between the other two. Typical transistor switching circuits include inverters, converters, switching voltage regulators, and relay and solenoid drivers.

switching trunk — A trunk that runs between a long-distance office and a local exchange office and is used for completing a long-distance call.

switching voltage — The maximum forward voltage a device can sustain without breaking over into full conduction.

switchplate—A small plate attached to a wall to cover a push-button or other type of switch.

switch register — A physical register made up of a number of manual switches, typically equal to the number of bits in the computer, and generally located on the computer control panel. The switch register is used to manually enter addresses and data into the computer's memory and to manually intervene in program execution. The function performed by a physical switch register can also be implemented by software, with switches being set through a terminal device or a memory location.

switch room — That part of a telephone central office building that houses switching mechanism and associated apparatus.

switchtail ring counter—A type of ring counter in which the output of one stage is inverted before being applied as an input to the next stage. An even number of states equal to $2n$ (where n is the number of flip-flops) normally is produced. For example, a modulo-10 counter can be made from five flip-flops. Each flip-flop changes states on every fifth count. Decoding of all ten states is accomplished conveniently with 10 two-input gates. A switchtail ring counter will contain the complement of the information it contained initially after n clock pulses, and will contain the initial information again after $2n$ clock pulses.

switch train — A sequence of switches through which connection must be made when a circuit between a calling telephone azd a called telephone is established.

SWL—Shortwave listener; one who tunes the shortwave bands as a hobby.

swr — Abbreviation for standing-wave ratio.

swr bridge — *See* Standing-Wave-Ratio Bridge.

swr meter — An external or built-in circuit which measures the standing-wave ratio at the transceiver end of the antenna transmission line.

SWTL — Abbreviation for surface-wave transmission line.

syllabic companding — Companding in which the effective gain variations are made at speeds allowing response to the syllables of speech but not to individual cycles of the signal wave.

syllable articulation — Also called percent of syllabic articulation. The percent of articulation obtained when the speech units considered are syllables (usually meaningless and usually of the consonant-vowel-consonant type).

symbol—1. A simplified design representing a part in a schematic circuit diagram. 2. A letter representing a particular quantity in formulas.

symbolic — 1. Having to do with the representation of something by a conventional sign. 2. Represented by the usual alphanumeric symbols.

symbolic address—Also called a floating address. In digital-computer programming, a label chosen in a routine to identify a particular word, function, or other information independent of the location of the information within the routine.

symbolic code — A code by which programs are expressed in source language; that is, storage locations and machine operations are referred to by symbolic names and addresses that do not depend on their hardware-determined names and addresses. Also called pseudocode. Contrasted with computer code.

symbolic coding — In digital computer programming, any coding system using symbolic rather than actual computer