

SEVENTH EDITION

MODERN
DICTIONARY
of
ELECTRONICS

RUDOLF F. GRAF

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REVISED AND UPDATED**



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Boston Oxford Auckland Johannesburg Melbourne New Delhi

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Manager of Special Sales

Butterworth-Heinemann

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Woburn, MA 01801-2041

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Fax: 781-904-2620

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alpha cutoff frequency—The frequency at which the current gain of a common-base transistor stage has decreased to 0.707 of its low-frequency value. Gives a rough indication of the useful frequency range of the device.

alphanumeric (alphanumeric)—Generic term for alphabetic letters, numerical digits, and special characters that are machine processable.

alphanumeric characters—1. A character set that mixes alphabetic characters, numeric characters, and usually punctuation characters. The alphabetic characters may be uppercase and/or lowercase or even in Japanese or Arabic script. 2. Consisting of letters and numbers. Also called alphanumeric or alphanumeric.

alphanumeric—1. A generic term for alphabetic letters, numerical digits, and special ASCII characters that can be processed by a computer. A character set containing any combination of the above. 2. Consisting of letters and numbers. 3. All letters in the alphabet, the numbers 0 through 9, and special characters—such as -, /, *, \$, %, +, and #—that are machine processable.

alphanumeric code—In computer practice or in communications, a code in which the letters of the alphabet are represented by numbers.

alphanumeric display—Device consisting of a typewriter-style keyboard and a display (CRT) screen on which text is viewed.

alphanumeric keys—Keys on a data entry device that resemble those on a standard keyboard. Usually they are used to manually input or edit text for the display system, although they can also be used in a function key mode.

alphanumeric reader—An instrument that reads alphabetic, numeric, and special characters by means of a photosensor that measures the varying intensity of the characters reflected from a light source.

alphanumeric readout—A type of digital readout that displays both letters and numerals.

alpha particle—A small, electrically charged particle thrown off at very high velocity by many radioactive materials, including uranium and radium. Identical to the nucleus of a helium atom, it is made up of two neutrons and two protons. Its electrical charge is positive and is equal in magnitude to twice that of an electron.

alpha ray—A stream of fast-moving alpha particles that produce intense ionization in gases through which they pass, are easily absorbed by matter, and produce a glow on a fluorescent screen. The lowest-frequency radioactive emissions.

alpha system—A signaling system in which the signaling code to be used is designated by alphabetic characters.

alpha-wave detector—A device that detects and displays alpha-wave segments of brain wave output. Used in biofeedback. Also called alpha-wave meter or sensor.

alpha-wave meter—See alpha-wave detector.

ALS—Abbreviation for advanced low-power Schottky (Texas Instruments). A low-power, high-speed transistor-transistor logic (TTL) family.

alterable memory—A storage medium that may be written into.

alteration switch—A manual switch on a computer console or a program-simulated switch that can be set on or off to control coded machine instructions.

alternate channel—A channel located two channels above or below the reference channel.

alternate-channel interference—Interference caused in one communication channel by a transmitter operating in the channel after an adjacent channel. See also second-channel interference.

alternate facility—A communications-electronics facility that is established for the purpose of replacing or supplementing another facility or facilities under real or simulated emergency conditions.

alternate frequency—The frequency assigned for use at a certain time, or for a certain purpose, to replace or supplement the frequency normally used.

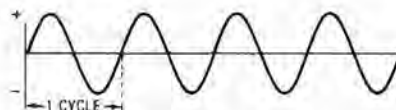
alternate mode—A means of displaying on an oscilloscope the output signals of two or more channels by switching the channels, in sequence, after each sweep.

alternate route or routing—A secondary or backup communications path to be used if the normal (primary) routing is not possible.

alternate voice/data operation—Modem operations coordinated by voice over the same line that accommodates transmission. The modem is patched out of the circuit to allow this. A special switch, called an exclusion key, converts the line from voice to data.

alternating-charge characteristic—The function relating, under steady-state conditions, the instantaneous values of the alternating component of transferred charge to the corresponding instantaneous values of a specified periodic voltage applied to a nonlinear capacitor.

alternating current—Abbreviated ac. 1. A flow of electricity that reaches maximum in one direction, decreases to zero, then reverses itself and reaches maximum in the opposite direction. The cycle is repeated continuously. The number of such cycles per second is the frequency. The average value of voltage during any cycle is zero. 2. Any signal that varies with time. It usually means that the current actually changes polarity with time. The plot of current versus time usually is a sine wave that comprises a succession of instantaneous values, the greatest of which is the amplitude or peak value. The time taken by one complete cyclic repetition is the period, and the number of periods in one second is the frequency.



Alternating current.

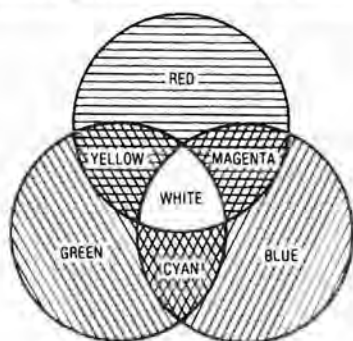
alternating current/direct current—A term applied to electronic equipment indicating it is capable of operation from either an alternating-current or direct-current primary power source.

alternating-current erasing head—An erasing head used in magnetic recording, in which alternating current produces the magnetic field necessary for erasing. Alternating-current erasing is achieved by subjecting the medium to a number of cycles of a magnetic field of a decreasing magnitude. The medium is, therefore, essentially magnetically neutralized.

alternating-current generator—A rotary machine that generates alternating current when its rotor, which may be either the armature or the field, is rotated by an engine or a motor. Also called an alternator.

alternating-current pulse—An alternating-current wave of brief duration.

alternating-current transmission—In television, that form of transmission in which a fixed setting of the controls makes any instantaneous value of signal correspond to the same value of brightness only for a short time.



Chrominance primaries.

the total video signal that contains the color information. Without the chrominance signals, the received TV picture would be in black and white.

chrominance subcarrier—Also called color carrier. An rf signal that has a specific frequency of 3.579545 MHz and that is used as a carrier for the I and Q signals.

chrominance-subcarrier oscillator—In a color TV receiver, a crystal-controlled oscillator that generates the subcarrier signal for use in the chrominance demodulators.

chrominance video signals—Output voltages from the red, green, and blue sections of a color-television camera or receiver matrix.

chromium dioxide—A type of recording-tape coating that produces very good quality at low recording speeds. Because of its magnetic properties, it requires a higher value of bias current in the recorder. The high performance inherent in chromium dioxide tape can only be realized in a tape machine having provision for a CrO₂ bias setting. On a standard recorder, the chromium dioxide tape will appear to have high-frequency emphasis and may likely be difficult to erase. Chromium dioxide has a good dynamic range and a low noise level. Used in the cassette format with a suitable machine equipped with the Dolby system, it can make recordings that meet the best high-fidelity standards.

chronistor—A subminiature elapsed-time indicator that uses electroplating principles to totalize the operating time of equipment up to several thousand hours.

chronograph—An instrument for producing a graphical record of time as shown by a clock or other device.

chronoscope—An instrument for measuring very small intervals of time.

CID—Abbreviation for charge injection device or charge injection imaging device. 1. A memory in which the charge is stored in an X-Y addressable array of potential cells. For image arrays, the charge for each of the cells is generated by an associated photodiode. 2. A solid-state imaging device utilizing an image sensor composed of a two-dimensional array of coupled MOS charge-storage capacitors and designed to convert near infrared energy to electrical signals, providing broad gray shade or tonal rendition. The sensor collects minority carrier charge, generated by photon energy in the substrate near the charge-storage capacitors, and stores it in the surface inversion region. By injecting the stored charge into the substrate, and by monitoring the current, signal readout is achieved.

CIE—Initials of the Commission Internationale de l'Éclairage, or International Commission on Illumination.

CIE source—Standard light source representative of the quality of specified natural or artificial illumination.

CIE standard chromaticity diagram—A chromaticity diagram in which the X and Y chromaticity coordinates are plotted in rectangular coordinates.

CIM—Abbreviation for computer-integrated manufacturing. Applying information technology to production processes and organizational structure to streamline operations. Often focused on integrating systems and processes distributed across a company, such as order entry, scheduling, and production.

cinching—Longitudinal slippage between the layers in a tape pack as a result of acceleration or deceleration of the roll.

cipher—Cryptographic system in which arbitrary symbols or groups of symbols represent units of plain text of regular length, usually single letters, or in which units of plain text are rearranged, or both, according to certain predetermined rules.

cipher machine—Mechanical and/or electrical apparatus for enciphering and deciphering.

cipher telephony—A technique by which mechanical and/or electrical equipment is used for scrambling or unscrambling, or enciphering or decoding, radio or voice messages.

ciphertext or cryptogram—A secret form of a message.

ciphony—See cipher telephony.

circle cutter—A tool consisting of a center drill with an adjustable extension-arm cutter, used to cut holes in panels and chassis.

circle-dot mode—A method of storage of binary digits in a cathode-ray tube in which one kind of digit is represented by a small circle on the screen, and the other kind is represented by a similar circle with a concentric dot.

circle of confusion—The circular image of a point source due to the inherent aberrations in an optical system.

circuitron amplifier—A one-port, nonlinear cross-field high-power microwave amplifier that uses a magnetron as a negative-resistance element, much as a maser uses an active material.

circuit—1. Path through which electrical signals flow. 2. An electronic path between two or more points capable of providing a number of channels. 3. A number of conductors connected together for the purpose of carrying an electrical current. 4. The interconnection of a number of devices in one or more closed paths to perform a desired electrical or electronic function. Examples of simple circuits are high- or low-pass filters, multivibrators, oscillators, and amplifiers. 5. A complete path of electron flow from a negative terminal of voltage source through a conductor and back to the positive terminal. 6. An electrical system using two or more wires in which the current flows from the source to one or more electrical devices and back again to the source of supply. 7. A complete, closed path. Confusion between circuit and network is common. *Circuit* refers to a closed path within a network. 8. An array of elements interconnected to perform functions beyond the range of single-element capability. See channel, 2.

circuit analysis—Careful determination of the nature and behavior of a circuit and its various parts. The analysis may be theoretical, practical, or both.

circuit analyzer—Also called multimeter. Several instruments or instrument circuits combined in a single enclosure and used in measuring two or more electrical quantities in a circuit.

circuit bonding jumper—The connection between portions of a conductor in a circuit to maintain required ampacity of the circuit.

circuit breaker—1. An automatic device that, under abnormal conditions, will open a current-carrying circuit

energy from the circuit. 2. The real part of admittance. 3. Reciprocal of resistance; measured in siemens. It is the ratio of current through a material to the potential difference at its ends. 4. The component of sinusoidal current in phase with the terminal voltage of a circuit, divided by that voltage.

conducted heat—Thermal energy transferred by thermal conduction.

conducted interference—Any unwanted electrical signal conducted on the power lines supplying the equipment under test, or on lines supplying other equipment to which the one under test is connected.

conducted signals—Electromagnetic or acoustic signals propagated along wire lines or other conductors.

conducted spurious transmitter output—A spurious output of a radio transmitter that is conducted over a tangible transmission path such as a power line, control circuit, radio-frequency line, waveguide, etc.

conductimeter—See conductivity meter.

conduction—The transmission of heat or electricity through or by means of a conductor.

conduction band—1. A partially filled energy band in which electrons can move freely, allowing the material to carry an electric current (with electrons as the charge carriers). 2. The band of energy levels occupied by a valence electron when it is liberated from an atom. Electrical conduction in a semiconductor crystal takes place through the transport of electrons in the conduction band.

conduction current—The power flow parallel to the direction of propagation, expressed in siemens per meter.

conduction-current modulation—1. Periodic variations in the conduction current passing a point in a microwave tube. 2. The process of producing such variations.

conduction electrons—The electrons that are free to move under the influence of an electric field in the conduction band of a solid.

conduction error—The error in a temperature transducer due to heat conduction between the sensing element and the mounting to the transducer.

conduction field—Energy that surrounds a conductor when an electric current is passed through the conductor, and that, because of the difference in phase between the electrical field and magnetic field set up in the conductor, cannot be detached from the conductor.

conductive adhesive—An adhesive material that has metal powder added to increase electrical conductivity.

conductive epoxy—An epoxy material (polymer resin) that has been made conductive by the addition of a metal powder, usually gold or silver.

conductive gasket—A special highly resilient gasket used to reduce rf leakage in shielding that has one or more access openings.

conductive level detector—A device with single or multiple probes. A change in level completes an electrical circuit between the container and/or probes.

conductive material—A material in which a relatively large conduction current flows when a potential is applied between any two points on or in a body constructed from the material. Metals and strong electrolytes are examples of conductors.

conductive pattern—1. The arrangement or design of the conductive lines on a printed circuit board. 2. The configuration or design of the conductive material on the base material. Includes conductors, lands, and through connections when these connections are an integral part of the manufacturing process.

conductive pattern-to-board outline—The location of the printed pattern relative to the overall outline dimensions of the printed circuit board.

conductive plastic potentiometer—A potentiometer in which the resistive element consists of a blend of resin (epoxy, polyester, etc.) and processed carbon powder applied to a plastic or ceramic substrate.

conductivity—1. The conductance between opposite faces of a unit cube of material. The volume conductivity of a material is the reciprocal of the volume resistivity. 2. The ability of a material to conduct electric current. It is expressed in terms of the current per unit of applied voltage. It is the reciprocal of resistivity. 3. The ability to conduct or transmit heat or electricity. 4. The ability of a material to allow electrons to flow, measured by the current per unit of voltage applied. It is also the reciprocal of resistivity. 5. Synonym for conductance. 6. The parameter of a material that indicates the extent to which it permits a net electrical current; normally measured in terms of the conductance in reciprocal ohms (siemens) between opposite faces of a cube of the material measuring 1 centimeter on each side. The conductivity of a material is the reciprocal of its resistivity. 6. Property of a material to allow electrical current to flow with very little loss. For natural surfaces, conductivity in general is increased with increased moisture content.

conductivity meter—Also called conductimeter. An instrument that measures and/or records electrical conductivity.

conductivity modulation—1. The change in conductivity of a semiconductor as the charge-carrier density is varied. 2. The process whereby the effective electrical conductivity of a semiconductor region is modified by the injection of excess carriers. Thus, excess majority carriers injected into a lightly doped region can cause the effective conductivity to be increased simply by providing further carriers for current conduction. Conversely, excess minority carriers injected into a heavily doped region can cause the effective conductivity to be reduced by increasing the incidence of recombination and, hence, reducing the number of carriers available for conduction.

conductivity-modulation transistor—A transistor in which the active properties are derived from minority-carrier modulation of the bulk of resistivity of the semiconductor.

conductor—1. A bare or insulated wire or combination of wires not insulated from one another, suitable for carrying an electric current. 2. A body of conductive material so constructed that it will serve as a carrier of electric current. 3. A material (usually a metal) that conducts electricity through the transfer of orbital electrons. 4. A material, such as copper or aluminum, that offers low resistance or opposition to the flow of electric current. 5. A medium for transmitting electrical current. A conductor usually consists of copper, aluminum, steel, silver, or other material. 6. A solid, liquid, or gas that offers little opposition to the continuous flow of electric current. 7. Any material whose valence energy band is only partially filled with electrons, so that empty levels are immediately available for a net electron movement. Such materials conduct electricity readily, even at extremely low temperatures. 8. A substance or body that allows a current of electricity to pass continuously and easily through it. A member of a class of materials that conduct electricity easily, i.e., have a low resistivity (10^{-4} ohm/cm). 9. A single conductive path in a conductive pattern.

conductor side—The side of a single-sided printed board containing the conductive pattern.

conductor spacing—The distance between adjacent edges (not centerline to centerline) of isolated conductive patterns in a conductor layer of a printed circuit.

current—1. The movement of electrons through a conductor. Current is measured in amperes, milliamperes, microamperes, nanoamperes, or picoamperes. 2. A movement of electrons, positive ions, negative ions, or holes. 3. The rate of transfer of electricity from one point to another.

current amplification—1. The ratio of the current produced in the output circuit of an amplifier to the current supplied to the input circuit. 2. In photomultipliers, the ratio of the signal output current to the photoelectric signal current from the photocathode.

current amplifier—1. A device designed to deliver a greater output current than its input current. 2. An amplifier that has a low output impedance and is capable of delivering a heavy current.

current antinode—Also called current loop. The point at which current is a maximum along a transmission line, antenna, or other circuit element having standing waves.

current attenuation—The ratio of the magnitude of the current in the input circuit of a transducer to the magnitude of the current in a specified load impedance connected to the transducer.

current-balance relay—A relay in which operation occurs when the magnitude of one current exceeds the magnitude of another current by a predetermined ratio.

current-carrying capacity—1. The maximum current a conductor (or braid) can carry without heating beyond a safe limit. 2. The maximum current that can be continuously carried without causing permanent change in the electrical or mechanical properties of a device or conductor. (As applied to phone jacks, it refers to carrying current without interrupting the circuit.) 3. The maximum current an insulated conductor can safely carry without exceeding its insulation and jacket temperature limitations. 4. The maximum current that can be carried continuously without damage to a device, conductor, or machine. It is mainly determined by the temperature which the insulation can withstand and by the ambient temperature.

current-carrying rating—The current that can be carried continuously or for stated periodic intervals without impairment of the contact structure or interrupting capability.

current-controlled oscillator—Abbreviated CCO. A circuit that creates an ac output signal whose frequency is a function of the dc input current.

current density—1. The amount of electric current passing through a given cross-sectional area of a conductor in amperes per square inch; i.e., the ratio of the current in amperes to the cross-sectional area of the conductor. 2. The ratio of current to surface area.

current echo—The signal that on a transmission line is reflected as the result of some discontinuity.

current feed—The excitation or feeding of an antenna by connecting the feeder at a point of maximum current, as at the center of a dipole or half-wave antenna.

current flicker—Current surges resulting from momentary shorts that can occur within a solid electrolyte capacitor. Under certain conditions, current flicker can avalanche to cause a short, which under low-impedance circuit conditions results in catastrophic destruction of the capacitor.

current foldback—In a dc power supply, a self-resetting protective method that reduces the output current to less than full-rated output under overload or short-circuit conditions.

current generator—A two-terminal circuit element with a terminal current independent of the voltage between its terminals.

current hogging—1. A condition in which one of several parallel logic circuits takes the largest share of

the available current because it has a lower resistance than the other circuits. 2. A condition that exists when several base-emitter junctions are driven from the same output and the input with the lowest base-emitter junction forward potential severely limits the drive current to the other transistor bases.

current-hogging injection logic—Abbreviated CHIL. A logic form that combines the input flexibility of current-hogging logic with the performance and packing density of injection logic.

current limiter—A device that detects current leakage and prevents potential shock hazard by minimizing or interrupting current flow.

current-limiter relay—A relay that opens its contacts when the current in a circuit exceeds a certain preset value.

current limiting (automatic)—1. An overload-protection mechanism that limits the maximum output current of a power supply to a preset value and automatically restores the output when the overload is removed. 2. In a dc power supply, a self-resetting safeguard that protects the power supply against short-circuit and overload conditions by limiting output current to a predetermined maximum value. See also short-circuit protection.

current-limiting fuse—A protective device that anticipates a dangerous short-circuit current and opens the circuit, precluding the development of the peak available current.

current-limiting reactor—A form of reactor intended for limiting the current that can flow in a circuit under short-circuit conditions.

current-limiting resistor—A resistor inserted into an electric circuit to limit the flow of current to some predetermined value. Usually inserted in series with a fuse or circuit breaker to limit the current flow during a short circuit or other fault, to prevent excessive current from damaging other parts of the circuit.

current-limit sense voltage—The voltage across the current-limit terminals required to cause a regulator to current limit with a short-circuited output. This voltage is used to determine the value of the external current-limit resistor when external booster transistors are used.

current loop—1. Means of communicating data via the presence or absence of current in a two-wire cable. 2. A two-wire transmit/receive interface in which the presence of a 20-mA current level indicates data (a binary 1 or mark) and its absence indicates no data (a 0 or space). Normally used with teletypes, and the only communication method that uses a current signal. See current antinode.

current margin—The difference between the steady-state currents flowing through a telegraph receiving instrument that correspond to the two positions of the telegraph transmitter.

current mirror—A circuit that relies on the collector current matching of two transistors (one strapped as a diode) when connected together base to base and emitter to emitter.

current-mode logic—Abbreviated CML. A non-saturating logic circuit that employs the characteristics of a differential amplifier circuit in its design. Because it is nonsaturating, it is a very fast switching logic design with low logic swings. The gate input element is the base of a transistor, with a separate transistor for each input.

current node—A point at which current is zero along a transmission line, antenna, or any other circuit element that has standing waves.

current noise—Also called excess noise. A low-frequency noise caused by current flowing in a resistor, particularly in film and carbon resistors. The amount of energy varies widely with the type and construction of the

resistor. This low-frequency noise is generally measurable only in the region below 100 kHz; the noise power varies inversely with frequency and is a function of both the current in the resistor and the value of the resistor.

current penetration—The depth a current of a given frequency will penetrate into the surface of a conductor carrying the current.

current probe—A type of transformer, usually having a snap-around configuration, used for measuring the current in a conductor.

current pump—A circuit that drives, through an external load circuit, an adjustable, variable, or constant value of current regardless of the reaction of that load to the current, within rated limits of current, voltage, and load impedance.

current rating—1. The maximum continuous current that can be carried by a conductor without degradation of the conductor or its insulation properties. 2. Maximum current that a device is designed to conduct for a specified time at a specified operating temperature. 3. The maximum continuous electrical current recommended for a given wire in a given situation. Expressed in amperes.

current regulator—1. A device that functions to maintain the output current of a generator or other voltage source at a predetermined value, or varies the voltage according to a predetermined plan. 2. A regulating device that limits generator output and prevents excessive generator output by repeatedly inserting a resistance into the generator field circuit.

current relay—A relay that operates at a predetermined value of current. It can be an overcurrent relay, an undercurrent relay, or a combination of both.

current saturation—The condition in which the plate current of a vacuum tube cannot be further increased by increasing the plate voltage.

current-sensing resistor—A resistor of low value placed in series with a load to develop a voltage proportional to the output current. A regulated dc power supply regulates the current in the load by regulating the voltage across this sensing resistor.

current-sensitivity—The current required to give standard deflection on a galvanometer.

current sink—1. A point toward which conventional current flows (electrons flow away from it). 2. An output type of sensor or analog device in which current flows from the load and into the output of the device at a low voltage when it is turned on.

current-sinking logic—Also called input-coupled logic. A logic form that requires that current flow out of the input of a circuit and back into the output of the preceding stage, which serves as a current sink instead of a source.

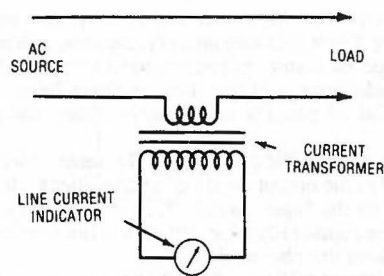
current source—1. A point from which conventional current flows (electrons flow toward it). 2. An output type of switch or analog device in which current flows from it into the load at a high voltage when it is turned on.

current-sourcing logic—Also called collector-coupled logic. A logic form in which current flows from the output of a circuit and is forced into the input of a similar circuit to activate the circuit that drives.

current-stability factor—In a transistor, the ratio of a change in emitter current to a change in reverse-bias current between the collector and base.

current-transfer ratio—The ratio of an optocoupler's output current to input current at a specified bias. See beta.

current transformer—A transformer, intended for measuring or control purposes, designed to have its primary winding connected in series with a circuit carrying the current to be measured or controlled.



Current transformer.

current-type telemeter—A telemeter in which the magnitude of a single current is the translating means.

cursor—1. A mechanically or electronically generated line that moves back and forth over another surface to delineate accurate readings. 2. A mechanical bearing line on a plan position indicator-type display for reading target bearing. 3. A visual movable pointer on a CRT used by the PC programmer to indicate where an instruction is to be added to the PC program. The cursor is also used during editing functions. 4. A small lighted line or square that appears on a video display screen at the point where the next character will appear. 5. A manually movable illuminated or flashing marker on a computer screen used to indicate the location of the next point at which an action will take place. 6. A means for indicating on a CRT screen the point at which data entry or editing will occur. The intensified element may be at constant high intensity or flashing (alternate high intensity and normal intensity). If flashing, additional data may be necessary to complete the instruction. 7. An indicator that marks the current working position on a display. 8. A blinking character that indicates where the next keyboard stroke will appear. 9. A position marker on a video display.

cursor and update—Circuitry that allows a user to add new material into a video terminal's memory and display. The cursor, which locates the current entry location, is generally a blinking underline, although some are overlines or boxes.

curve tracer—An instrument capable of producing a display of one current or voltage as a function of a second voltage or current, with a third voltage or current as a parameter.

customer set—See subscriber set.

cut and paste—To move graphics and/or text from one location to another.

Cutler antenna—A rear feed for a paraboloidal antenna reflector. It consists of a support waveguide with a terminating cavity containing two resonant slots, one on either side of the support waveguide, that face the reflector. Each slot is parallel to the broad faces of the feed waveguide.

Cutler feed—A resonant cavity, at the end of a waveguide, that feeds radio-frequency energy to the reflector of the antenna assembly of some airborne antennas.

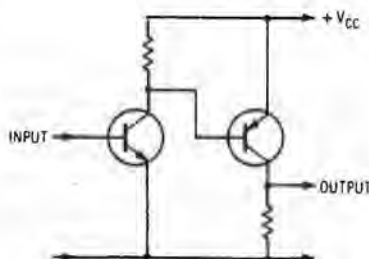
cutoff—1. Minimum value of bias that cuts off, or stops, the flow of plate current in a tube. 2. The frequency above or below which a selective circuit fails to respond. 3. The frequency of transmission at which the loss exceeds by 10 decibels that observed at 1000 hertz. 4. The condition when the emitter-base junction of a transistor has zero bias or is reverse biased and there is no collector current. 4. The frequency at which the modulus of measured parameter has decreased to $1/\sqrt{2}$ of its low-frequency value. (For a transistor, the cutoff

reception dishes to receive its high-power signals, including software and data. 2. A term commonly used to describe Ku-band broadcasts via satellite directly to individual end users. The DBS band ranges from 11.7 to 12.75 GHz.

direct capacitance—1. The capacitance between two conductors, excluding stray capacitance that may exist between the two conductors and other conducting elements. 2. The capacitance measured directly from conductor to conductor through a single insulating layer.

direct-connect modem—A modem that connects directly to a phone line via modular connectors, rather than going through a telephone headset and an acoustic coupler.

direct-coupled amplifier—1. A direct-current amplifier in which the plate of one stage is coupled to the grid of the next stage by a direct connection or a low-value resistor. 2. An amplifier in which the output of one stage is connected to the input of the next stage without the use of intervening coupling components.



Direct-coupled amplifier.

direct-coupled transistor logic—Abbreviated DCTL. A NOR-gate type of bipolar logic in which the output of one gate is coupled directly to the input of the succeeding gate. This form of logic evolved into resistor-transistor logic because of the difficulty in mass producing transistors within the close tolerances necessary for direct coupling.

direct coupling—1. The association of two or more circuits by means of an inductance, a resistance, a wire, or a combination of these so that both direct and alternating currents can be coupled. 2. Interstage coupling or speaker coupling with no intervening transformer or capacitor. To the speaker it ensures that the damping factor remains high at low frequencies (but increasing power supply impedance at low frequencies can influence this), while direct coupling generally minimizes low-frequency phase shift and encourages enhanced bass performance. 3. The connection of two circuits in such a way that both ac and dc currents can flow. Neither a transformer nor a capacitor can be used in series with the signal-carrying wires since these components do not pass dc.

direct current—Abbreviated dc. 1. An essentially constant-value current that flows in only one direction. 2. A flow of continuous electric current in one direction as long as the circuit is closed (as opposed to alternating current). 3. A current that flows in only one direction in an electric circuit. It may be continuous or discontinuous, and may be constant or varying.

direct-current amplifier—Also called dc amplifier. An amplifier capable of boosting dc voltages. Resistive coupling only is generally employed between stages, but sometimes will be combined with other forms.

direct-current erasing head—A head that uses direct current in magnetic recording to produce the magnetic field required for erasure. Direct-current erasing is achieved by subjecting the medium to a unidirectional field. Such a medium is therefore in a different magnetic state from one erased by alternating current.

direct-current generator—1. A rotating machine that changes mechanical into electrical energy in the form of direct current. This is accomplished by commutating bars on the armature. The bars make contact with stationary brushes, from which the direct current is taken. 2. A rotary machine having a commutator that generates direct current when its armature is rotated in a magnetic field by an engine or motor. The commutator reverses the alternating current generated in the armature winding to produce direct current at the machine's output terminals.

direct-current resistance—Abbreviated DCR. The resistance offered by any circuit to direct current.

direct-current restorer—The means by which a direct-current or low-frequency component is reinscribed after transmission. Used in a circuit incapable of transmitting slow variations, but capable of transmitting components of higher frequency.

direct-current transmission—Of television, that form of transmission in which a fixed setting of the controls makes any instantaneous value of signal correspond to the same value of brightness at all times.

direct data entry—The entry of data directly into a computer through machine-readable source documents or through the use of online terminals.

direct digital control—Time-sharing, or multiplexing, of a computer among many controlled loops.

direct distance dialing—Abbreviated DDD. 1. A telephone exchange service that enables the telephone user to call other subscribers outside his or her local area without operator assistance. 2. Direct distance dialing by subscribers over the nationwide intertoll telephone network. *See also* area code.

direct drive—A drive system used to rotate a turntable, in which the platter is driven directly by the motor shaft at the exact speed required. These designs usually include electronic motor control.

direct-drive torque motor—A servomotor that can be directly attached to the load it is to drive. It converts electrical signals directly into sufficient torque to maintain the desired accuracy in a positioning or speed control system.

direct electromotive force—A unidirectional electromotive force in which the changes in values are either zero or so small that they may be neglected.

direct grid bias—The dc component of grid voltage; commonly called grid bias.

direct-insert subroutine—*See* open subroutine.

direct inward dialing—A service allowing outside parties to call directly to extensions on the customer's premises.

direction—The position of one point in space with respect to another.

directional—Having radiative characteristics that vary with direction.

directional antenna—An antenna that radiates radio waves more effectively in some directions than in others. (The term is usually applied to an antenna whose directivity is larger than that of a half-wave dipole.)

directional beam—An electromagnetic wave that is concentrated in a given direction.

directional coupler—1. A junction consisting of two waveguides coupled together in such a manner that a traveling wave in either guide will induce a traveling wave in the same direction in the other guide. 2. A bilateral

HIGH-GROUP TONES				
	1209 Hz	1336 Hz	1477 Hz	1633 Hz
LOW-GROUP TONES	697 Hz	1	2	3
	770 Hz	4	5	6
	852 Hz	7	8	9
	941 Hz	*	0	#
				A B C D

Dual-tone multifrequencies.

dual trace—A mode of operation in which a single beam in a cathode-ray tube is shared by two signal channels. *See also* alternate mode; chopped mode.

dual-track recorder—Normally a monophonic recorder in which the recording head covers slightly less than half the width of a standard quarter-inch tape, making it possible to record one track on the tape in one direction and, after turning the reels over, a second track in the opposite direction. Known also as half-track or two-track recorder.

dual-use line—A communications link that normally is used for more than one mode of transmission (e.g., for voice and data).

dub—Also called rerecording. 1. A copy of a recording. 2. To make a copy of a recording by recording on one machine what another machine is playing.

dubbing—1. In radio broadcasting, the addition of sound to a prerecorded tape or disc. 2. Copying of already recorded material. In tape recording, playing a tape or disc on one machine while recording it on another. The copy is called a dub.

duct—1. An overhead or underground protective tube or pipe used for carrying electrical conductors. 2. In microwave transmission, atmospheric conditions may cause radio waves to follow a narrower path than usual. The narrower path is called a duct. The presence of ducting sometimes causes unusual transmission because the transmission waves do not follow the intended path.

ducting—The trapping of an electromagnetic wave, in a waveguide action, between two layers of the earth's atmosphere, or between a layer of the atmosphere and the earth's surface.

DUF—Abbreviation for diffusion under the epitaxial film. A method for providing a low-resistance path between the active region of an IC transistor and the contact electrode at the surface. A region of high conductance is formed by selective diffusion in the required location prior to deposition of the epitaxial layer.

dumb terminal—1. Conversational slave to a host computer in a communication network. 2. An inexpensive means of interactive computer control that is good for on-line fixed-program applications. All software is in the host computer mainframe. A dumb terminal contains no user programming or memory for data manipulation. 3. The minimum equipment necessary to communicate with a computer. It consists of a monitor and a keyboard and will do little more than send and receive data. 4. A display terminal with no processing capabilities other than that associated with screen formatting. For processing, the terminal is entirely dependent on the main computer with which it communicates.

dummy—1. A device that can be substituted for another, but which has no operating features. 2. A telegraphy network used to simulate a customer's loop for adjustment of a telegraph repeater. The dummy side of the repeater is the side toward the customer. 3. In a computer, an artificial address, instruction, or other unit of information inserted solely for the purpose of fulfilling such prescribed conditions as word length or block length

without affecting operations. 4. A simulating circuit that has no features.

dummy antenna—*See* artificial antenna.

dummying—The process of removing metallic impurities from plating solution with a large-area dummy cathode.

dummy instruction—An artificial instruction or address inserted in a list of instructions to a computer solely to fulfill prescribed conditions (such as word length or block length) without affecting the operation.

dummy load—*See* artificial load.

dummy variable—In a computer program, a symbol inserted at definition time, which will later be replaced by the actual variable.

dump—Also called power dump. 1. To withdraw all power from a computer, either accidentally or intentionally. 2. To transfer all or part of the contents of one section of a digital-computer memory into another section. 3. To transfer information from a register word to a memory position. 4. To transfer all of the information contained in a record into another storage medium. For example, a disc record could be dumped onto tape. 5. Copying contents of memory from one place to another. Same as memory dump.

dump check—Checking a computer by adding all digits as they are dumped (transferred) to verify the sum to make sure no errors exist as the digits are retransferred.

dump circuit—One form of transient suppression circuit, a self-biased snubber. The dump circuit is virtually inactive until the voltage across it exceeds the recent (slow) average value.

dumping resistor—A resistor whose function is to discharge a capacitor or network for safety purposes.

Dunmore cell—*See* lithium chloride sensor.

duodecal socket—A vacuum-tube socket having 12 pins. Used for cathode-ray tubes.

duodecimal—1. Pertaining to a characteristic or property involving a selection, choice, or condition in which there are 12 possibilities. 2. Pertaining to the numbering system with a radix of 12.

duodiode—Also called dual diode. A vacuum tube or semiconductor having two diodes within the same envelope.

duodiode-pentode—An electron tube containing two diodes and a pentode in the same envelope.

duodiode-triode—An electron tube containing two diodes and a triode in the same envelope.

duolateral coil—*See* honeycomb coil.

duopole—An all-pass action with two poles and two zeros.

duotriode—Also called double triode. An electron tube containing two triodes in the same envelope.

duplex—1. The method of operation of a communication circuit in which each end can simultaneously transmit and receive. (Ordinary telephones are duplex. When used on a radio circuit, duplex operation requires two frequencies.) 2. Two-in-one, as two conductors with a common overall insulation or two telegraph transmission channels over one wire. 3. Two conductors twisted together, usually with no outer covering. This term has a double meaning; it is possible to have parallel wires and jacketed parallel wires, and still refer to them as duplex. 4. Two-way data transmission. *Full duplex* describes two data paths that allow simultaneous data transmission in both directions. *Half duplex* describes one data path that allows data transmission in either of two directions, but only one direction at a time.

duplex artificial line—A balancing network simulating the impedance of the real line and distant terminal apparatus; it is employed in a duplex circuit for the

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purpose of making the receiving device unresponsive to outgoing signal currents.

duplex cable—A cable composed of two insulated stranded conductors twisted together. They may or may not have a common insulating covering.

duplex channel—A communication channel providing simultaneous transmission in both directions.

duplexer—1. A radar device that, by using the transmitted pulse, automatically switches the antenna from receive to transmit at the proper time. 2. Highly selectable, tunable filters that allow a transmitter and receiver to use one common antenna.

duplexing assembly (radar)—See transmit-receive switch.

duplex operation—Simultaneous operation of transmitting and receiving apparatus at two locations.

duplex system—A system with two distinct and separate sets of facilities, each of which is capable of assuming the system function while the other assumes a standby status. Usually both sets are identical in nature.

duplex tube—A combination of two vacuum tubes on one envelope.

duplicate—To copy in such a way that the result has the same physical form as the source. For example, to make a new punched card that has the same pattern of holes as an original punched card.

duplication check—A computer check in which the same operation or program is checked twice to make sure the same result is obtained both times.

Duraspark—Conventional (Ford Motor) electronic ignition for use with high-voltage, high-energy spark timing control.

duration control—A control for adjusting the time duration of reduced gain in a sensitivity time control circuit.

duress alarm device—A device that produces either a silent alarm or local alarm under a condition of personnel stress such as holdup, fire, illness, or other panic or emergency. The device is normally manually operated and may be fixed or portable.

duress alarm system—An alarm system that employs a duress alarm device.

during cycle—The interval while a timer is operating for its preset time period.

dust core—A pulverized iron core consisting of extremely fine iron particles mixed with a binding material for use in radio-frequency coils.

dust cover—A device specifically designed to cover the mating end of a connector so as to provide mechanical and/or environmental protection.

DUT—Abbreviation for device under test.

duty cycle—1. Ratio of working time to total time for intermittently operated devices. 2. The ratio of on-time to off-time in a periodic on-off cycle. 3. The ratio of operating time to total elapsed time of a device that operates intermittently, expressed as a percentage. 4. In percent, $100(t_o/T)$, where T is the period between pulses and t_o is the pulse width.

duty cyclometer—A test meter that gives a direct reading of duty cycle.

duty factor—1. In a carrier composed of regularly recurring pulses, the product of their duration and repetition frequency. 2. Ratio of average to peak power. 3. Same as duty cycle except it is expressed as a decimal rather than a percentage. Usually calculated by multiplying pulses per second times pulse width.

duty ratio—In a pulsed system, such as radar, the ratio of average to peak power.

DVD—Abbreviation for the digital versatile disc and digital video disk. A high capacity optical storage medium

with improved capacity and bandwidth over the CD for prerecorded multimedia program material with applications in video playback and PC areas.

dv/dt—The rate of change of voltage with respect to time. Proportional to current in a capacitor.

Dvorak keyboard—A keyboard arrangement designed by August Dvorak for increased speed and comfort. It reduces the rate of errors by placing the most frequently used letters in the center of the keyboard for use by the strongest fingers.

DX—1. Abbreviation for distance. 2. Reception of distant stations. 3. Distant and/or difficult to hear radio stations.

DXer—One who listens to distant or hard-to-hear stations as a hobby.

DX hound—An amateur who specializes in making distant contacts.

DXing—The hobby of listening to distant or otherwise hard-to-hear stations.

dyadic Boolean operator—A Boolean operator that has two operands. The dyadic Boolean operators are AND, exclusive OR, NAND, NOR, and OR.

dyadic operation—An operation on two operands.

dye laser—A laser using a dye solution as its active medium. Its output is a short pulse of broad spectral content, and its achievable gain is high. Dye lasers function at room temperature. Synchronous pumping can be used to produce a continuous train of tunable picosecond pulses for sustained periods.

dynamic—1. Of, concerning, or dependent on conditions or parameters that change, particularly as functions of time. 2. A speaker drive principle using the interaction between the magnetic field surrounding a voice coil carrying a signal current and a fixed magnetic field to move the coil and the cone to which it is attached. 3. A headphone driver using a voice coil in a magnetic field driving a paper or plastic diaphragm, as in a speaker.

dynamic acceleration—Acceleration in a constantly changing magnitude and direction, either simple or complex motion, usually called vibration. Also measured in gravity units.

dynamically balanced arm—A type of tonearm whose masses are balanced about its pivot, with tracking force applied by a spring. This type of arm does not require that the turntable be level for proper tracking.

dynamic analogies—The similarities in form between the differential equations that describe electrical, acoustical, and mechanical systems that allow acoustical and mechanical systems to be reduced to equivalent electrical networks, which are conceptually simpler than the original systems.

dynamic analysis—Execution of an instrumented program to collect information on its behavior and correctness.

dynamic behavior—The way a system or individual unit functions with respect to time.

dynamic braking—1. A system of braking of an electric drive in which the motor is used as a generator, and the kinetic energy of the motor and driven machinery is employed as the actuating means of exerting a retarding force. 2. A type of motor braking caused by current being applied to the windings after the power is shut off. This is accomplished either by self-excitation (dc motors) or by separate excitation (ac motors).

dynamic burn-in—High-temperature test with devices subject to actual or simulated operating conditions.

dynamic cell—A memory cell that stores data as charge (or absence of charge) on a capacitor. A typical cell isolates the capacitor from the data line (bit line) with a transistor switch. Thus, when no read or write operation is desired, there is essentially no power required

governor connected in series with the motor circuit. The governor is usually built into the motor.

electric-heat soldering—Soldering by heating the joint with an electric current.

electric hygrometer—An instrument for indicating humidity by electric means. Its operation depends on the relationship between the electric conductance and moisture content of a film of hygroscopic material.

electric hysteresis—Internal friction in a dielectric field (e.g., the paper or mica dielectric of a capacitor in an ac circuit). The resultant heat generated can eventually break down the dielectric and cause the capacitor to fail.

electrician—A person engaged in designing, making, or repairing electric instruments or machinery. Also, one who sets up an electrical installation.

electric image—The electrical counterpart of an object; i.e., the fictitious distribution of the same amount of electricity that is actually distributed on a nearby object.

electricity—1. The property of certain particles to possess a force field that is neither gravitational nor nuclear. The type of force field associated with electrons is defined as negative and that associated with protons and positrons as positive. The fundamental unit is the charge of an electron: 1.60203×10^{-19} coulomb. Electricity can be further classified as static electricity or dynamic electricity. Static electricity in its strictest sense refers to charges at rest, as opposed to dynamic electricity, or charge in motion. Static electricity is sometimes used as a synonym for triboelectricity or frictional electricity. 2. A basic property of all matter, which consists of negative and positive charges (electrons and protons) that attract each other. 3. The potential energy of electrons at rest. 4. The kinetic energy of electrons in motion. 5. A manifestation of free electrons that can be generated by induction, friction, or chemical action. It is recognized by its magnetic, chemical, and radiant effects.

electric lamp—Any lamp whose emission of radiant energy is dependent on the passage of an electrical current through the emissive medium.

electric light—Light produced by an electric lamp.

electric lines of force—In an electric field, curves whose tangents at any point give the direction of the fields at that point.

electric meter—A device that measures and registers the amount of electricity consumed over a certain period of time.

electric mirror—See dynode.

electric moment—For two charges of equal magnitude but opposite polarities, a vector equal in magnitude to the product of the magnitude of either charge by the distance between the centers of the two charges. The direction of the vector is from the negative to the positive charge.

electric motor—A device that converts electrical energy into rotating mechanical energy.

electric network—A combination of any number of electric elements, having either lumped or distributed impedances, or both.

electric oscillations—The back-and-forth flow of electric charges whenever a circuit containing inductance and capacitance is electrically disturbed.

electric potential—A measure of the work required to bring a unit positive charge from an infinite distance or from one point to another (the difference of potential between two points).

electric precipitation—The collecting of dust or other fine particles floating in the air. This is done by inducing a charge in the particles, which are then attracted to highly oppositely charged collector plates.

electric-heat soldering — electric-wave filter

electric probe—A rod inserted into an electric field during a test to detect dc, audio, or rf energy.

electric reset—A qualifying term indicating that the contacts of a relay must be reset electrically to their original positions following an operation.

electric robot—Programmable machine that is powered by servomotors or stepping motors.

electric service panel—The main cabinet where electricity is brought into a building, then distributed to branch circuits. The panel usually contains the main circuit breaker for shutting down the entire system, and circuit breakers or fuses for shutting down each independent circuit.

electric shield—A housing, usually aluminum or copper, placed around a circuit to provide a low-resistance path to ground for high-frequency radiations and thereby prevent interaction between circuits.

electric strain gage—A device that detects the change in shape of a structural member under load and causes a corresponding change in the flow of current through the device.

electric strength—The maximum electric charge a dielectric material can withstand without rupturing. See also dielectric strength; insulating strength. The value obtained for the electric strength will depend on the thickness of the material and on the method and conditions of test.

electric stroboscope—An instrument for observing or for measuring the speed of rotating or vibrating objects by electrically producing periodic changes in the intensity of light used to illuminate the object.

electric tachometer—A tachometer (rpm indicator) that utilizes voltage or electrical impulses.

electric telemeter—A system consisting of a meter that measures a quantity, a transmitter that sends the information to a distant station, and a receiver that indicates or records the quantity measured.

electric transcription—In broadcasting, a disc recording of a message or a complete program.

electric transducer—A device actuated by electric waves from one system and supplying power, also in the form of electric waves, to a second system.

electric tuning—A system by which a radio receiver is tuned to a station by pushing a button (instead of, say, turning a knob).

electric vector—1. A component of the electromagnetic field associated with electromagnetic radiation. The component is of the nature of an electric field. The electric vector is supposed to coexist with, but act at right angles to, the magnetic vector. 2. The electric field associated with an electromagnetic wave and thus with a light wave. The electric vector specifies the direction and amplitude of this electric field.

electric watch—A timepiece in which a battery replaces the mainspring as the prime energy source of the watch, and in which an electromagnet impels the balance wheel through a mechanical switching-contact arrangement.

electric wave—Another term for the electromagnetic wave produced by the back-and-forth movement of electric charges in a conductor.

electric-wave filter—Also called electric filter. 1. A device that separates electric waves of different frequencies. 2. A frequency-selective device, usually passive, made up of resistance, capacitance, and inductance elements having signal transmission characteristics that are a function of frequency. Basically, filters are used to pass desired signals and reject unwanted or interfering signals. Bandpass filters are used when the desired signals encompass a frequency band that does not contain any unwanted signals.

electroencephalography — 1. Recording and interpretation of the electrical activity of the brain. Voltage (typically 50 microvolts) picked up by electrodes on the scalp is amplified and applied to a strip-chart recorder. 2. Recording of electric currents developed in the brain by means of electrodes applied to the scalp, to the surface of the brain, or placed within the substance of the brain.

electroencephaloscope — An instrument for detecting brain potentials at many different sections of the brain and displaying them on a cathode-ray tube.

electroexplosive device — See EED.

electrofluid dynamics generator — Abbreviated EFD. A generator in which the only moving parts are wind-driven charged particles. Their movement from electrode to electrode is analogous to the spinning of an armature. Ideally suited for use at sea or at the seaside, bladeless windmills could be used anywhere there is a source of moisture. Principal advantages of the concept include efficiency and low cost.

electroforming — Also called electrodeposition and electroplating. 1. Making a metal object by using electrolysis to deposit a metal on an electrode. 2. Creating a pn junction by passing a current through point contacts on a semiconductor. 3. The production or reproduction of articles by electrodeposition on a mandrel or mold that is subsequently separated from the deposit. 4. The process of depositing a substance on an electrode by electrolysis, as in electroplating, electroforming, electrofinishing, or electroforming.

electroforming process — An electrochemical process of metal fabrication using an electrolyte, an anode to supply the metal, and a control of the electrical current and of the deposition of metal on the matrix of a reflector.

electrogalvanizing — Electrodeposition of zinc coatings.

electrogastrogram — The graphic record that results from synchronous recording of the electrical and mechanical activity of the stomach.

electrograph — 1. A plot, graph, or tracing made by means of the action of an electric current on sensitized paper or other material, or by means of an electrically controlled stylus or pen. 2. Equipment for facsimile transmission.

electrographic process — See dielectric process.

electrographic recording — Also called electrostatography. The producing of a visible record by using a gaseous discharge between two or more electrodes to form electrostatically charged patterns on an insulator. See also electrostatic electrography.

electrokinetics — The branch of physics concerned with electricity in motion.

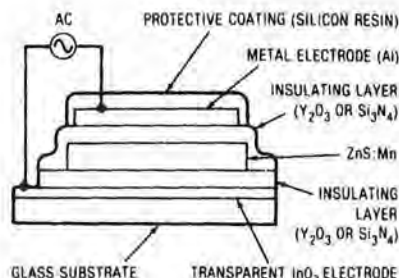
electroless deposition — The deposition of conductive material from an autocatalytic plating solution without application of electrical current.

electroless plating — 1. A method of metal deposition by means of a chemical reducing agent present in the processing solution. The process is further characterized by the catalytic nature of the surface, which enables the metal to be plated to any thickness. 2. A chemical process by which certain metals can be plated without electrical current. Tin may be plated onto copper in this manner. 3. The controlled autocatalytic reduction of a metal ion on certain catalytic surfaces.

electroluminescence — 1. Luminescence resulting from a high-frequency discharge through a gas or from application of an alternating current to a layer of phosphor. 2. Direct conversion of electrical energy into light energy in a liquid or solid; for example, photoemission as a result of electron-hole recombination in a pn junction. This is the mechanism employed by the injection laser. The standard abbreviation for the effect is written

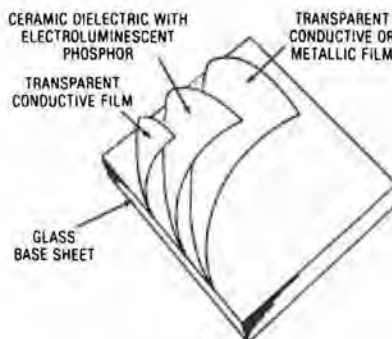
EL. (This process is not to be confused with the ordinary tungsten filament bulb, where there is an intermediate stage of heat, making the process thermoluminescent.) 3. Light produced in a phosphor that is in an alternating electric field. Consists of a phosphor a few mils thick placed between two metal films, one of which is transparent. Alternating current is applied to the plates through a current-limiting resistor.

electroluminescent display — 1. A display, designated EL, whose segments or elements consist of transparent conductive electrodes separated by a dielectric containing a luminescent phosphor. Application of ac voltage to opposing electrodes causes the dielectric between them to glow with a characteristic blue-green light. 2. The utilization of the light produced when electrical energy is directly converted into light within devices used for visual readout displays or as complex logic-circuit elements. The display devices may be flat, giving a wide viewing angle without parallax, and may have low power needs. Can yield blue, green, yellow, and white colors.



Electroluminescent display.

electroluminescent lamp — A lamp in the shape of a panel that is decorative as well as illuminative. It consists primarily of a capacitor having a ceramic dielectric with electroluminescent phosphor. The amount of illumination is determined by the voltage across the layer and by the frequency applied to it.



Electroluminescent lamp.

electroluminescent-photoconductive image intensifier — A panel, made up of electroluminescent and photoconductive (EL-PC) layers, used as either a positive or negative image intensifier, depending on amplitude and phase of its two power supply voltages. The

half-duplex operation—A duplex telegraph system capable of operating in either direction, but not in both simultaneously.

half-duplex repeater—A duplex telegraph repeater provided with interlocking arrangements that restrict the transmission of signals to one direction at a time.

half-hertz transmission—A data transmission and control system in which synchronized sources of 60-Hz power are used at transmitting and receiving ends. Either of two relays at the receiver can be actuated by proper choice of the half-hertz polarity of the transmitter power supply.

half-life—1. The time in which half the atoms in a radioactive substance decay. In the first half-life interval, the amount of radioactive material left unchanged is one-half the original amount; in the next half-life interval, half of the remaining amount, or one-fourth of the original amount, remains. Thus, by determining the remaining radioactivity of a fossil and comparing it with the half-life of the material, scientists can estimate the age of the fossil. The half-life of various materials varies greatly—from millionths of a second to billions of years. 2. Time required for a source to decay to one-half its initial millicurie value. Typical values are Cs-137, 30 years; Co-60, 5.3 years; Sr-90, 28 years; Kr-85, 10.7 years; Am-241, 457 years; and Ra, 1622 years.

half-nut—A feed nut that engages half the circumference or less of a lead screw, so that it can be withdrawn from the lead screw to stop the lateral scanning movement.

half-power frequency—Either a high frequency or a low frequency at which the output of an amplifier, network, transducer, etc., falls to one-half (± 3 dB) of its maximum or nominal response.

half-power point—On an amplitude response characteristic or other curve of the magnitude of a network quantity versus frequency, distance, angle, or other variable, the point that corresponds to half the power of a neighboring point having maximum power.

half-power width of a radiation lobe—In a plane containing the direction of the maximum of the lobe, the full angle between the two directions in that plane in which the radiation intensity is one-half the maximum value of the lobe.

half-shift register—1. A logic circuit that consists of a gated input storage element with or without an inverter. 2. A logic device equivalent of half of a full master-slave flip-flop.

half step—See semitone.

half tap—A bridge that can be placed across conductors without disturbing their continuity.

half-time emitter—A device that produces synchronous pulses midway between the row pulses of a punched card.

half-tone characteristic—In facsimile, the fidelity of the recorded density shadings in comparison with the

original transmitted subject copy. Also used to express the relationship between the facsimile signal and the subject or recorded copy.

half track—See two track.

half-track recorder—See dual-track recorder.

half-track tape—Also called two-track tape. Quarter-inch magnetic tape on which half the width of the tape is used for one sound path. Such a tape provides stereo in one direction of tape travel, or mono sound in both directions.

half-track tape-recording format—A professional tape recording standard format in which independent tracks (channels) are recorded in the same direction. Two tracks on $\frac{1}{4}$ -inch (6.35-mm) wide tape or four tracks on $\frac{1}{2}$ -inch (12.7-mm) wide tape or eight tracks on 1-inch (25.4-mm) wide tape or 16 tracks on 2-inch (50.8-mm) wide tape are used.

half wave—A wave with an electrical length of half a wavelength.

half-wave antenna—An antenna having an electrical length equal to half the wavelength of the signal being transmitted or received.

half-wave dipole—A straight, ungrounded antenna measuring substantially one-half wavelength.

half-wave rectification—1. The production of a pulsating direct current by passing only half the input cycle of an alternating current. The other half is blocked by the rectifier. 2. The process of blocking the negative half cycle of current of an alternating input. This is accomplished by a single diode.

half-wave rectifier—A rectifier utilizing only one-half of each cycle to change alternating current into pulsating direct current.

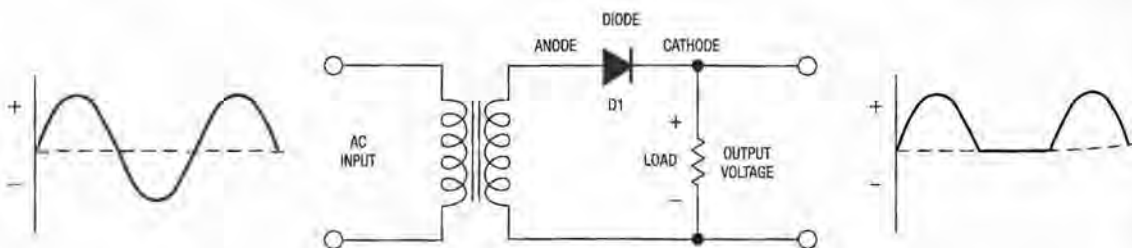
half-wave transmission line—A piece of transmission line having an electrical length equal to half the wavelength of the signal being transmitted or received.

half-wave vibrator—A vibrator used mainly in battery-operated mobile power supplies. It has only one pair of contacts, and supplies an intermittent unidirectional current at its output (usually connected to a half-wave rectifier).

half word—A nonbroken sequence of bits or characters that makes up half a computer word and that can be addressed as a unit.

Hall constant—The constant of a proportionality in the equation for a current-carrying conductor in a magnetic field. The constant is equal to the transverse electric field (Hall field) divided by the product of the current density and the magnetic field strength. The sign of the majority carrier can be inferred from the sign of the Hall constant.

Hall effect—1. In a current-carrying semiconductor bar located in a magnetic field that is perpendicular to the direction of the current, the production of a voltage perpendicular to both the current and the magnetic field. 2. The description given to the following phenomenon:



Half-wave rectifier.

when a conductor, through which a current is flowing, is placed in a magnetic field, a potential difference is generated between the two opposed edges of the conductor in the direction mutually perpendicular to both the field and the conductor.

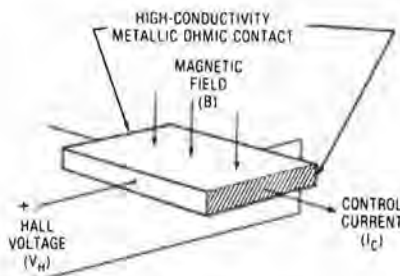
Hall-effect generator—Also called Hall sensor.

1. A magnetic sensor using the Hall effect to give an output voltage proportional to magnetic field strength.
2. A device made of compounds such as indium arsenide, indium antimonide, or silicon that produces a useful Hall-effect potential. Its output is proportional to magnetic induction through the semiconductor.

Hall-effect modulation—Use of a Hall-effect multiplier as a modulator to produce an output voltage proportional to the product of two input voltages or currents.

Hall-effect switch—A keyboard switch that incorporates an IC chip containing a Hall generator, trigger circuit, and amplifier. Depressing the key moves the magnet shunt member across the chip. This increases the magnetic flux through the chip and causes the analog voltage generated by the Hall element to switch the trigger circuit to its on state.

Hall generator—A thin wafer of semiconductor material used for measuring ac power and magnetic field strength. Its output voltage is proportional to the current passing through it times the magnetic field perpendicular to it.



Hall generator.

Hall mobility—The product of conductivity and the Hall constant for a conductor or semiconductor. It is a measure of the mobility of the electrons or holes in a semiconductor.

Hall sensor—See Hall-effect generator.

halo—1. The undesirable ring of light around a spot on the fluorescent screen of a cathode-ray tube. 2. The appearance of a blank border around unusually bright objects in a televised scene.

halogen—A general name applied to four chemical elements, fluorine, chlorine, bromine, and iodine, that have similar chemical properties.

halogen quenching—A method of quenching the discharge in a counter tube by the introduction of a small quantity of one of the halogens.

halt—The state in which a computer stops and does nothing.

ham—Also called amateur. Slang for a licensed radio operator who operates a station as a hobby rather than a business.

Hamming code—1. One of the error correction code systems used in data transmission. 2. A forward error correction technique named for its inventor. It corrects single-bit errors. 3. A seven-bit error-correcting computer code.

hand capacitance—The capacitance introduced when one's hand is brought near a tuning capacitor or other insufficiently shielded part of a tuned circuit.

handheld—An amateur radio transceiver small enough to be carried in one hand (often abbreviated HT). Typically, amateur handhelds are for VHF/UHF use.

Handie-Talkie—Trade name of the Motorola Communications Division for a two-way radio small enough to be carried in one's hand.

handler—Also called device handler. 1. A section of a computer program used to control or communicate with an external device. 2. A software routine that controls the operation of a peripheral.

handoff—The transfer of a cellular phone call to a new cell, designed to be transparent to the cellular phone user. During a cellular conversation, when the user reaches the edge of the service area of a cell, computers in the network assign another tower in the next cell to provide the phone with continuing service.

hand receiver—An earphone held to the ear by hand.

hand reset—A relay in which the contacts must be reset manually to their original positions after normal conditions are resumed.

handset—1. A telephone-type receiver and transmitter mounted on a single frame. 2. That portion of the telephone containing the transmitter and receiver that is hand-held when the telephone is in use. Consists of a receiver and transmitter about 6 inches (15.2 cm) apart at the ends of a common handle, connected by an electrical cord to the handset mounting. Sometimes includes a dial or Touchtone pad.

handset telephone—See hand telephone set.

hands-free telephone—A desk telephone containing a microphone and voice-switched amplifiers with a separate speaker unit, permitting telephone conversation without use of a hand-held handset.

handshake—1. An interface procedure that is based on status/data signals that assure orderly data transfer as opposed to asynchronous exchange. 2. In communications, a preliminary exchange of predetermined signals performed by modems and/or terminals to verify that communication has been established and can proceed.

handshake cycle—The process whereby digital signals effect the transfer of each data byte across the interface by means of an interlocked sequence of status and control signals. "Interlocked" denotes a fixed sequence of events in which one event in the sequence must occur before the next event may occur.

handshaking—1. A process in which predetermined arrangements of characters are exchanged by the receiving and transmitting equipment to establish synchronization. 2. The exchange of predetermined signals between machines connected by a communications channel to assure each that it is connected to the other. May also include the use of passwords and codes by an operator. 3. A colloquial term that describes the method used by a modem to establish contact with another modem at the other end of a telephone line. Often used interchangeably with buffering and interfacing, but with a fine line of difference in which handshaking implies a direct package-to-package connection regardless of functional circuitry. 4. A CPU-terminal interface process that prevents overrun and ignores signaling. The transmitter sends a signal in response to a request from the receiver, which then sends an acknowledgment signal to the transmitter. 5. The exchange of predetermined signals for control purposes during establishment of a connection between two data sets or modems. 6. Refers to the sequence of signals exchanged when a connection is established between two modems or between a DCE

being plated by the substrate. Thickness of the plating is limited to 10 to 50 microinches (0.254 to 1.27 μm). 2. The chemical deposition of a thin metallic coating over certain base metals by a partial displacement of the base metal.

immersion pyrometer—An instrument for determining molten-steel temperature and normally consisting of a platinum-platinum rhodium bimetal thermocouple junction and a recording device for transposing the millivoltage into degrees of temperature.

immittance—A term that denotes both impedance and admittance. It is commonly applied to transmission lines, networks, and certain kinds of measuring instruments.

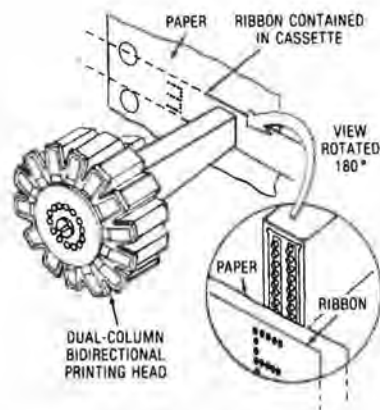
IMOS—See ion-implanted MOS.

impact excitation—The starting of damped oscillations by a sudden surge, such as by a spark discharge.

impact modulator amplifier—A fluidic device in which the impact plane position of two opposed streams is controlled to alter the output.

impact predictor—A device that can determine, in real time, the point on the earth's surface where a ballistic missile will impact if thrust is instantaneously terminated.

impact printer—1. Any type of printer that generates characters by using some form of stamping or inking through a ribbon by some sort of character slug, element, or hammer-needle. (Daisy-wheel printers are impact printers.) 2. Any mechanical imprinting device that forms characters by striking characters against a ribbon onto paper. 3. A mechanical printer operating at relatively low speeds—from 150 lines per minute to 1800 lines per minute. Has multiple copy capability and normally is capable of producing an original plus three copies. Impact printers are identified as letter-quality, dot-matrix, and line-printing types. No longer in common use.



Impact printer (dot-matrix).

impact printing—Printing that is produced by the impact of a key on an inked ribbon, transferring the impression of a character onto the paper located behind the ribbon.

impact resistance—Resistance to fracture under shock force.

IMPATT—Acronym for impact avalanche and transit time.

IMPATT diode—Impact avalanche and transmit time diode. 1. A pn-junction diode operated with heavy back bias so that avalanche breakdown occurs in the active region. To prevent burnout, the device is so

constructed that the active region is very close to a good heat sink. For the same reason, the bias supply must be a constant-current type. 2. A device whose negative resistance characteristic is produced by a combination of impact avalanche breakdown and charge-carrier transit-time effects. Avalanche breakdown occurs when the electric field across the diode is high enough for the charge carriers (holes or electrons) to create electron-hole pairs. With the diode mounted in an appropriate cavity, the field patterns and drift distance permit microwave oscillations or amplification. 3. A semiconductor microwave diode that, when its junction is biased onto avalanche, exhibits a negative resistance over a frequency range determined by the transit time of charge carriers through the depletion region.



IMPATT diode.

IMPATT oscillator—An oscillator in which the active element is an IMPATT diode operating in a negative resistance mode. Dc to rf conversion efficiencies are normally less than 20 percent. Present devices operate above 5 GHz.

impedance—1. The total opposition (i.e., resistance and reactance) a circuit offers to the flow of alternating current at a given frequency; the ratio of the potential difference across a circuit or element of a circuit to the current through the circuit or element. It is measured in ohms, and its reciprocal is called admittance. Symbol: Z . 2. The combination of resistance and reactance. 3. Combined opposition to current resulting from resistance, capacitance, and inductance. 4. The sinusoidal terminal voltage of a circuit divided by the current through it. 5. A speaker's resistance to an alternating current, which varies with frequency. A speaker's rated impedance is usually the value measured at 400 Hz. 6. The opposition to alternating current in a circuit, generally categorized as either high or low, and measured in ohms. 7. The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency. It is a combination of resistance, R , and reactance, X , measured in ohms.

impedance angle—Angle of the impedance vector with respect to the resistance vector. Represents the phase angle between voltage and current.

impedance at the intermediate frequency—In a mixer semiconductor diode, the impedance measured at the output terminals of a mixer circuit when the device is driven by a local oscillator under specified conditions.

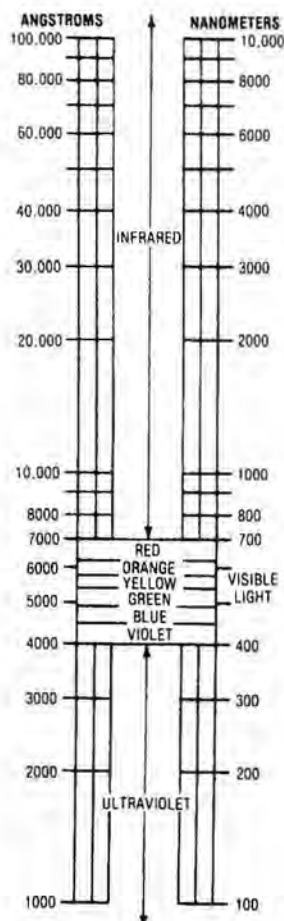
impedance bridge—A device for measuring the combined resistance and reactance of a component part of a circuit.

LIFO—Last in, first out; method of storing and retrieving data in a stack, table, or list. *Compare* FIFO.

lifter—In a tape recorder, a movable rod or guide that draws the tape away from the heads during fast-forward or rewind modes to eliminate needless head wear. Lifters work automatically on most machines in either high-speed mode.

lifting magnet—A powerful electromagnet used on the end of a crane to lift iron and steel objects, which can be dropped instantly by merely cutting off the current.

light—1. Radiant energy within the wavelength limits perceptible by the average human eye (roughly, between 400 and 700 nanometers). Although ultraviolet and infrared emissions will excite some types of photocells, they are usually not considered light. 2. In combination with other terms, a device used as a source of luminous energy (e.g., a pilot light). 3. Radiant energy transmitted by wave motion with wavelengths from about 0.3 μm to 30 μm ; this includes visible wavelengths (0.38 μm to 0.78 μm and those wavelengths such as ultraviolet and infrared, which can be handled by optical techniques used for the visible region. In more restricted usage, radiant energy within the limits of the visual spectrum.



Light, 1 (spectrum).

light-activated silicon-controlled rectifier—*See* LASCR.

light-activated silicon-controlled switch—*See* LASCR.

light-activated switch—A semiconductor diode that is triggered into conduction by light irradiation of a light-sensitive part of the semiconductor pellet.

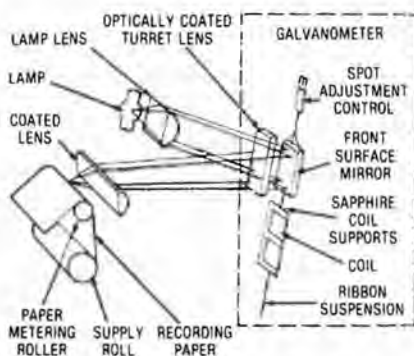
light amplifier—A device that serves to emit light of the same wavelength as the input light, only with an increase in intensity. It may be a solid-state device comprised of photoconductive and luminescent layers contained between two electrodes.

light-beam cathode-ray-tube recorder—Recorder using an electron beam to make multiple traces on a CRT screen. Traces are reflected from a fixed plane mirror onto moving photosensitive paper via an optical system.

light-beam galvanometer—A modified form of the D'Arsonval meter movement in which a small mirror is cemented to a moving coil mounted in the field of a permanent magnet. Current through the coil causes the coil to be deflected angularly, and the mirror reflects a beam of light onto a moving strip of photographic paper. The developed chart shows the waveform of the current through the coil.

light-beam instrument—An instrument in which a beam of light is the indicator.

light-beam oscillograph—Recorder using a mirror on a galvanometer to achieve recording response to 5 kHz.



Light-beam oscillograph.

light-beam pickup—A phonograph pickup utilizing a beam of light as a coupling element of the transducer.

light chopper—A device for interrupting a light beam. It is frequently used to facilitate amplification of the output of a phototube on which the beam strikes.

light current—The current that flows through a photosensitive device, such as a phototransistor or a photodiode, when it is exposed to illumination or irradiance.

light-dimming control—A circuit, often employing a saturable reactor, used to control the brightness of the lights in theaters, auditoriums, etc.

light-emitting diode—Abbreviated LED. A pn junction that emits light when biased in the forward direction. *See* LED.

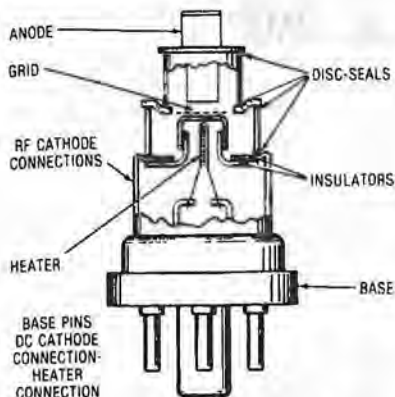
light-emitting diode coupler—Abbreviated LED coupler. A coupling device that enables the coupling of light energy from a light-emitting diode (LED) source to an optical fiber or cable at the transmitting end of an optical fiber data link. The coupler may be an optical fiber pigtail epoxied to the LED.

light flux—See luminous flux, 1.

light guide—1. An assembly of optical fibers and other optical elements mounted and finished in a component that is used to transmit light. 2. A conduit made up of fibers randomly collected or bunched in a group; it conducts light and images.

light gun—A photoelectric cell used by computer operators to take specific actions in assisting and directing computer operation. So called because of its gun-like case.

lighthouse tube—An ultrahigh-frequency electron tube shaped like a lighthouse and having disc-sealed planar elements. See also disc-seal tube.



Lighthouse tube (cutaway view).

lighting outlet—An outlet for direct connection of a lamp holder, lighting fixture, or pendant cord termination in a lamp holder.

light intensity cutoff—In a photoelectric alarm system, the percent reduction of light that initiates an alarm signal at the photoelectric receiver unit.

light level—The amount of (or intensity of) light falling upon a subject.

light load—A fraction of the total load the device is designed to handle.

light meter—An electron device that contains a photosensitive cell and calibrated meter for the measurement of light levels.

light microsecond—The unit for expressing electrical distance. It is the distance over which light travels in free space in 1 microsecond (i.e., about 983 feet, or 300 meters).

light modulation—Variation in the intensity of light, usually at audio frequencies, for communications or motion-picture sound purposes.

light modulator—The device for producing the sound track on a motion-picture film. It consists of a source of light, an appropriate optical system, and a means for varying the resulting light beam (such as a galvanometer or light valve).

light negative—Having a negative photoconductivity when subjected to light.

lightning arrester—A device to prevent damage to electrical equipment by transient overvoltages whether from lightning or switching. Spark gaps that can only be bridged by voltages above those used in the equipment allow the higher voltages to be discharged to ground.

lightning generator—A generator of high-voltage surge (e.g., for testing insulators).

lightning rod—A pointed metal rod carried above the highest point of a pole or building, and connected to earth by a heavy copper conductor, for the purpose of carrying a direct lightning discharge directly to earth without damage to the protected structure.

lightning surge—A transient disturbance in an electric circuit caused by lightning.

lightning switch—A switch for connecting a radio antenna to ground during electrical storms.

light pen—1. A light-sensitive device used with a computer-operated CRT display for selecting a portion of the display for action by the computer. 2. A photosensor placed in the end of a penlike probe. It is used in conjunction with a CRT display for drawing, erasing, or location characters. Operation is by comparison of the time it senses a light pulse to the scanning time of the display. 3. A hand-held data-entry device used only with refresh displays. It consists of an optical lens and photocell, with associated circuitry, mounted in a wand. Most light pens have a switch on the barrel that makes the pen sensitive to light from the screen. An activated light pen, when pointed at a vector or character on the screen, will generate an interrupt. It is then possible to identify the vector or character since the display stopped refreshing when the item was drawn that caused the interrupt. The most common uses of light pens are light-button selection and tracking.

light pencil—A narrow cone of light rays that diverges from a point source or converges to an image point.

light pipe—1. A bundle of transparent fibers that can transmit light around corners with small losses. Each fiber transmits a portion of the images through its length, reflection being caused by the lower refractive index of the surrounding material, usually air. 2. Transparent matter that usually is drawn into a cylindrical or conical shape through which light is channeled from one end to the other by total internal reflections. Optical fibers are examples of light pipes.

light positive—Having positive photoconductivity—i.e., increasing in conductivity when subjected to light.

light-powered telephone—Technology that relies on a highly efficient photodetector that can detect incoming light signals at one frequency and transmit outgoing signals at another, thus permitting the sending and receiving of light signals over one fiber with a single device.

light ray—1. A very thin beam of light. 2. A line, perpendicular to the wavefront of light waves, indicating their direction of travel and representing the light wave itself.

light relay—A photoelectric device that opens or closes a relay when the intensity of a light beam changes.

light-sail—A method of spacecraft propulsion using a giant sail to catch the solar wind, a nonfictional stream of ionized gas particles constantly emitted from the sun at speeds of up to 2 million miles an hour (3.2 million kilometers per hour).

light sensitive—Exhibiting a photoelectric effect when irradiated (e.g., photoelectric emission, photoconductivity, and photovoltaic action).

light-sensitive Darlington amplifier—Two stages of transistor amplification in one light-detector device. Darlington's give much higher gain than single transistors.

light-sensitive tube—A vacuum tube that changes its electrical characteristics with the amount of illumination.

light source—Any object capable of emitting light. (In fiber optics, the light source is normally either an LED or a laser.)

optical coupling—Sometimes called crosstalk. In fiber optics, light leakage from one fiber to another by evanescent boundary wave interaction.

optical cropper—A mechanical or electrical electromagnetic device for passing and then interrupting a beam of light for a known brief interval. Examples include tuning forks, rotation shutters, and the more sophisticated Kerr cells.

optical damping—A damping ratio slightly less than unity in which the overshoot is less than the specified uncertainty of the instrument.

optical data link—A system consisting of a transmitter (i.e., a light source), a fiber-optic cable, and a receiver (i.e., a photodetector), connected together in such a manner that light waves from the source can be received at the receiver. Light from the transmitter is usually modulated by an intelligence-bearing signal.

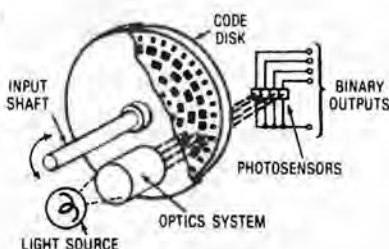
optical density—The negative logarithm of the percent transmittance (or reflectance) of a transparent (or opaque) material.

optical detector—A device used in optical fiber communication systems, such as CATV and data links, for optical fiber measurements, to combine or split optical signals at desired ratios by insertion into a transmission line; for example, a three-port or four-port unit with precise connectors at each port to enable inputs to be coupled together and transmitted via multiple outputs.

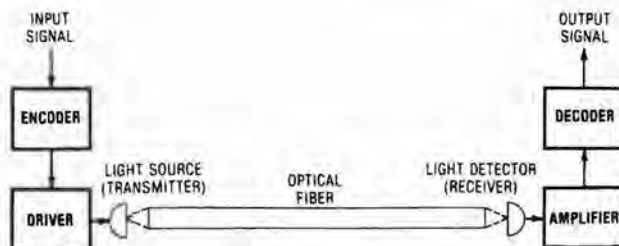
optical disk—A very-high-density information storage medium that uses light to read and write digital information.

optical distortion—An aberration of spherical surface optical systems due to the variation in magnification with distance from the optical axis.

optical encoder—A device designed to accurately measure linear or rotary motion by detection of the movement of markings on a transparent medium past a fixed point of light. The encoder has a moving code plate, a glass disk with positional or angular information on it—generally bit information—and simple geometric optics for readout.



Optical encoder.



Optical fiber link.

optical end-finish—The surface condition at the face of an optical conducting medium.

optical fiber—1. An optical waveguide. 2. A core of transparent material surrounded by a transparent cladding that has a lower refractive index. Both core and cladding are usually made of glass. Because of this arrangement, light rays launched into the fiber are restricted by total internal reflection and are thus confined within the core. 3. A single discrete optical transmission element, usually consisting of a fiber core and a fiber cladding. As a light-guidance system (dielectric waveguide) that is usually cylindrical in shape, it consists either of a cylinder of transparent dielectric material of given refractive index whose walls are in contact with a second dielectric material of a lower refractive index, or of a cylinder whose core has a refractive index that gets progressively lower away from the center. The length of a fiber is usually much greater than its diameter. The fiber relies on internal reflection to transmit light along its axial length. Light enters one end of the fiber and emerges from the opposite end with losses dependent on length, absorption, scattering, and other factors. A bundle of fibers has the ability to transmit a picture from one of its surfaces to another, around curves, and into otherwise inaccessible places with an extremely low loss of definition and light, by the process of total internal reflection. Each fiber transmits only one element of the composite emergent image. As the definition in the output image depends on the smallness of each element composing it, it is desirable to keep the cross section of the individual fibers as small as possible. If the spacing of the fibers increases toward the output end of the bundle, the image is magnified; if spacing is reduced, the image is reduced in size. By crossing the fibers systematically or randomly, the image is scrambled and can be recovered by retransmitting the scrambled image backward through the same or equivalent fiber bundle. 4. A cylinder or core of transparent dielectric material surrounded by a second dielectric. In order to propagate light, the refractive index of the core material is greater than that of the surrounding cladding material. To obtain satisfactory optical isolation of the core, the cladding material has a minimum thickness of one or two wavelengths of the light transmitted.

optical fiber bundle—Many optical fibers in a single protective sheath or jacket. The jacket is usually polyvinyl chloride (PVC). The number of fibers could range from a few to several hundred, depending on the application and the characteristics of the fibers.

optical horizon—The locus of points at which straight lines extended from a given point are tangent to the surface of the earth.

optical isolator—A photon-coupled device in which an electrical signal is converted into light that is projected through an insulating interface and reconverted to an electrical signal. See also optical coupler; optoisolator.

potentiometer circuit—A network arranged so that when two or more electromotive forces (or potential differences) are present in as many branches, the response of a suitable detecting device in any branch can be made zero by adjusting the electrical constants of the network.

potentiometer recorder—A null-balance type of recorder using a servo-operated voltage-balancing device; the sliding contact of a precision measuring potentiometer is adjusted automatically by a servomechanism so that the difference in voltage of the circuit becomes zero. Main feature is high sensitivity.

potentiometric transducer—A transducer in which displacement of a force-summing member is transmitted to the slider in a potentiometer, thus changing the ratio of output resistance to total resistance. Transduction is accomplished by changing the ratios of a voltage divider.

potentiometric transduction—The conversion of the measurand into a change in the position of a contact on a resistance element across which excitation is applied, the output usually being given as a voltage ratio.

pothead—An insulator for making a sealed joint between an underground cable and overhead line.

Potier diagram—A vector diagram showing the voltage and current relationships in an ac generator.

pot life—Also called working life. 1. The period after the addition of a catalyst to a potting compound during which the potting operation must be completed. 2. The time period during which a compound remains suitable for the intended use after compounding ingredients, such as solvents or catalysts, have been added.

potted circuit—A circuit that has been encapsulated in a nonconductive material.

potted line—A pulse-forming network immersed in oil and enclosed in a metal container.

Potter oscillator—A cathode-coupled multivibrator.

potting—1. An embedding process for parts that are assembled in a container or can into which the insulating material is poured, with the container remaining an integral part as the outer surface of the finished unit. 2. Sealing of a component (e.g., the cable end of a multiple-contact connector) with a plastic compound or material to exclude moisture, prevent short circuits, and provide strain relief. 3. A process of embedding a part or assembly by complete immersion in the potting compound. A container, can, or shell used as a mold is retained as an integral part of the finished product. Usually refers to protective encasements of greater than 100 mils (2.54 mm) thickness.

potting compound—A sealing material used to fill the case or enclosure in which a component is contained.

powdered-iron core—A core consisting of fine particles of magnetic material mixed with a suitable bonding material and pressed into shape.

power—1. The energy dissipated in an electrical or electronic circuit or component that is conducting either ac or dc. 2. Electrical energy developed to do work, such as the voltage from an amplifier used to drive a speaker. Also acoustical energy or sound pressure developed in a room by a speaker. 3. Rate of doing work. Some units of power are the foot-pound per second, or (in the cgs system) 1 erg/sec, the watt (joule/second), and the kilowatt.

power amplification—See power gain, 1.

power amplifier—1. An amplifier intended for driving one or more speakers or other transducers. 2. The final stage in a multistage amplifier circuit, designed to give power to the load, rather than to be used mainly as a voltage amplifier. 3. A fluidic device that causes a change in output power following a change of sufficient

magnitude in control power. 4. An amplifier driven by a relatively low voltage, low-power signal (of the order of 0.1 milliwatt or less) that delivers a substantial power output to low-impedance speaker loads. Typical power outputs may range from a few watts to several hundred watts, into impedances in the range of 2 to 16 ohms. The term power amplifier is commonly used to distinguish an amplifier that does not handle source signals directly and does not have volume or tone control functions. 5. A device that causes a change in output power following a change in control power. 6. An amplifier that can deliver a relatively large current and that can often operate from fairly high voltages. Power amplifiers are widely used in audio, but can also be used to drive servomotors and the like.

power amplifier input sensitivity—The input that will drive an amplifier to its maximum rated output power. Usually measured in dBm, dBV, or volts.

power-amplifier stage—1. An audio-frequency amplifier stage capable of handling considerable audio-frequency power without distortion. 2. A radio-frequency amplifier stage used in a transmitter primarily to increase the power of the carrier signal.

power attenuation—See power loss, 1.

power bandwidth—The range of audio frequencies over which an amplifier can produce half its rated power without exceeding its rated distortion. It is determined by using a measurement procedure standardized by the Institute of High Fidelity (IHF). This specification indicates how much power is available at the critical high and low frequencies. The wider the power bandwidth, the better the amplifier.

power (temperature-rise) coefficient—The maximum rise in hot-spot temperature of a resistor above ambient, per watt of dissipation, assuming free-air convection and negligible loss of heat through the leads, after thermal equilibrium has been reached, usually expressed in degrees Celsius per watt.

power conditioning—The process of maintaining uniform voltage on a power line.

power connection—British term used for the constant horsepower connection in a multispeed motor.

power consumption—The maximum wattage used by a device within its operating range during steady-state signal conditions.

power cord—Flexible, insulated cable used in such applications as supplying line power to power tools and electronic equipment.

power density—1. The radiated field strength set up by a radiating source, expressed in microvolts per meter or in dB above 1 μ V/m. 2. Power in a band per hertz, or the total power in a band of frequencies divided by the bandwidth in hertz. 3. The power output of a battery, expressed in watts, per unit weight of the battery.

power derating—Use of computed curves to determine the correct power rating of a device or component to be used above its reference ambient temperature.

power detection—Detection in which the power output of the detector is used for supplying a substantial amount of power directly to a device such as a speaker or recorder.

power detector—A vacuum tube detector operating with such a high plate voltage that strong input signals can be handled without appreciable distortion.

power dissipation—1. The dispersion of the heat generated within a device or component when a current flows through it. This is accomplished by convection to the air, radiation to the surroundings, or conduction. 2. The supply power consumed by a logic circuit operating with a 50-percent duty cycle (equal times in the logical 0 and logical 1 states).

pulse-amplitude modulation — Abbreviated PAM. Modulation in which the modulating wave is caused to amplitude modulate a pulse carrier.

pulse-amplitude modulation/frequency modulation — A system in which a carrier is frequency modulated by pulse-amplitude-modulated subcarriers.

pulse analyzer — 1. Equipment for analyzing pulses to determine their time, amplitude, duration, shape, etc. 2. The instrument used to analyze a pulsed electromagnetic wave to determine its time, amplitude, duration, and shape, and to display this information in some appropriate form, either visually or digitally.

pulse arc welding — A type of welding in which the material to be welded is positioned together, forming one electrode. The other electrode is positioned to form a gap with one of the workpieces. An arc is struck and the current heats the work-pieces to the melting point at their interface. *See also* arc percussive welding.

pulse average time — The duration of a pulse, measured between two points at 50 percent of the maximum amplitude on the leading and trailing edges.

pulse bandwidth — The smallest continuous frequency interval outside of which the amplitude of the spectrum does not exceed a prescribed fraction of the amplitude at a specified frequency.

pulse capacitor — A capacitor for use with pulses of current or voltage.

pulse carrier — A carrier consisting of a series of pulses. Usually employed as a subcarrier.

pulse code — 1. A pulse or series of pulses that, by means of waveform, pulse width, pulse time, pulse numbers, or pulse sequences, may be used to convey information. 2. Loosely, a code consisting of pulses; e.g., Morse, Baudot, binary.

pulse code modulation — Abbreviated PCM. 1. Pulsed modulation in which the signal is sampled periodically and each sample is quantized and transmitted as a digital binary code. 2. A digital technique by which information may be carried from one point to another. The signal is carried as a series of separate pulses or digits. No distortion is introduced and no information is lost from a signal unless a complete pulse disappears or unless a spurious noise pulse is formed that is large enough to be accepted by the equipment as a genuine pulse. Thus, many channels of communication can be made available along a single connecting line. 3. A method of quantizing audio-range analog signals into a digital form for transmission in digital communications systems, or for processing in DSP. Effectively the same as analog-to-digital conversion. 4. A time-division modulation technique in which analog signals are stamped and quantized at periodic intervals into digital signals. The values observed are typically represented by a coded arrangement of 8 bits, of which one may be for parity.

pulse-code modulation/frequency modulation — A system in which pulse-code-modulated subcarriers are used to frequency modulate a second carrier. Binary digits are formed by the absence or presence of a pulse in an assigned position.

pulse coder — A circuit that sets up pulses in an identifiable pattern.

pulse coding and correlation — A general technique concerning a variety of methods used to change the transmitted waveform and then decode upon its reception. Pulse compression is a special form of pulse coding and correlation.

pulse compression — A matched filter technique used to discriminate against signals that do not correspond to the transmitted signal.

pulse counter — A device that gives an indication or record of the total number of pulses that it has received during a given time interval.

pulse counter detector — A device designed to detect frequency-modulated signals by forming a uni-directional pulse from each sine wave. The direct current of the pulse is proportional to the frequency of the frequency-modulation signal.

pulsed Doppler system — A pulsed radar system that utilizes the Doppler effect to obtain information about the target (not including simple resolution from fixed targets).

pulse decay time — The amount of time required for the trailing edge of a pulse to decay from 90 percent to 10 percent of the peak pulse amplitude.

pulse delay time — The time interval between the leading edges of the input and output pulses, measured at 10 percent of their maximum amplitude.

pulse demodulator — Also called a constant delay discriminator. A circuit that responds only to pulse signals with a specified spacing between them.

pulse dialing — Older form of phone dialing, utilizing breaks in dc current to indicate the number being dialed.

pulse digit — A code element comprising the immediately associated train of pulses.

pulse-digit spacing — The time interval between the end of one pulse digit and the start of the next.

pulse discriminator — A device that responds only to pulses having a particular characteristic (e.g., duration, amplitude, period). One that responds to period is also called a time discriminator.

pulse dispersion — In fiber optics, separation or spreading of input optical signals along the length of the optical fiber. Pulse dispersion is expressed in time and distance as nanoseconds and is sometimes called pulse spreading.

pulsed laser — A laser that emits energy in a wave of short bursts or pulses and remains inactive between each burst or pulse. The frequency of the pulses is termed the pulse repetition frequency.

pulsed light — A beam of visible radiant energy of finite duration. The beam rises to a finite amplitude and decays to the same value from which it rose.

pulsed oscillator — 1. An oscillator in which oscillations are sustained by either self-generated or external pulses. 2. An oscillator that generates a carrier-frequency pulse or a train of pulses.

pulsed-oscillator starting time — The interval between the leading-edge times of the pulse at the oscillator control terminals and the related output pulse.

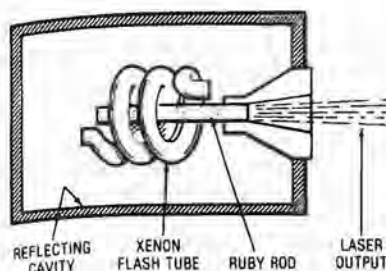
pulsed power supply — A supply that delivers power in pulses, rather than continuously.

pulsed radiance — The integral of the radiance over exposure time.

pulse droop — Distortion characterized by a slanting of the top of an otherwise essentially flat-topped rectangular pulse.

pulsed ruby laser — A laser that uses ruby as the active material. The extremely high pumping power required is obtained by discharging a bank of energy storage capacitors through a special high-intensity flash tube. *See figure on page 599.*

pulse duration — Also called pulse length or pulse width. 1. The time interval between the points at which the instantaneous value on the leading and trailing edges bears a specified relationship to the peak pulse amplitude. 2. The lifetime of a (laser) pulse, generally defined as the time interval between the half-power points on the leading and trailing edges of the pulse.



Pulsed ruby laser.

pulse-duration discriminator—A circuit in which the sense and magnitude of the output is a function of the deviation of the pulse length from a reference.

pulse-duration modulation—Abbreviated PDM. Also called by the less preferred terms pulse-width modulation and pulse-length modulation. 1. Pulse-time modulation in which the duration of a pulse is varied. 2. Pulse-time modulation in which the value of each instantaneous sample of the modulating wave is caused to modulate the duration of a pulse.

pulse-duration modulation/frequency modulation—Also called pulse-width modulation/frequency modulation. A system in which pulse-duration-modulated subcarriers are used to frequency modulate a second carrier.

pulse duty factor—Ratio of the average pulse duration to the average pulse spacing. Equivalent to the average pulse duration times the pulse-repetition rate.

pulse emission—Emission drawn for short periods; it may or may not follow a regular repetition rate.

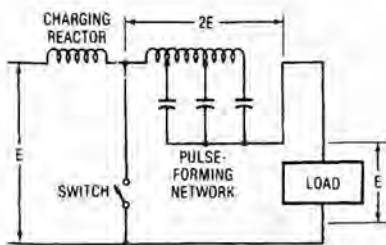
pulse emitter load—The load seen by the collector of an inverter that drives the pulse input to a flip-flop, pulse amplifier, or delay.

pulse equalizer—A circuit that produces output pulses of uniform size and shape when driven by input pulses that vary in size and shape.

pulse fall time—That time during which the trailing edge of a pulse is decreasing from 90 percent to 10 percent of its maximum amplitude.

pulse-forming line—A combination of circuit components used to produce a square pulse of controlled duration.

pulse-forming network—A network that converts either an ac or dc charging source into an approximately rectangular wave output. By means of a high-speed switch, it alternately stores energy from the charging source and releases the energy through the load to which it is connected. This network supplies the accurately shaped pulse required by the magnetron or klystron oscillator of a radar modulator.



Pulse-forming network.

pulse-duration discriminator — pulse mode

pulse-frequency modulation—Abbreviated PFM. More precisely called pulse-repetition-rate modulation. 1. Pulse-time modulation in which the pulse repetition rate is varied. 2. A form of modulation in which the pulse repetition rate is varied as a function of the instantaneous value of the modulating wave.

pulse-frequency spectrum—See pulse spectrum.

pulse generator—1. A device for generating a controlled series of electrical pulses. 2. A device that produces a single pulse or a train of repetitive pulses.

pulse group—See pulse train.

pulse-height analyzer—Also called kicksorter. An instrument that indicates the number or rate of occurrence of pulses within each of one or more specified amplitude ranges.

pulse-height discriminator—Also called a pulse-height selector. A circuit that selects and passes only those pulses that exceed a certain minimum amplitude.

pulse-height selector—See pulse-height discriminator.

pulse-improvement threshold—In a constant-amplitude pulse-modulation system, the condition existing when the peak pulse voltage is at least twice the peak noise voltage after selection and before any nonlinear process such as amplitude clipping and limiting. The ratio of peak to rms noise voltage is ordinarily assumed to be 4 to 1.

pulse-interference eliminator—A device that removes pulse signals that are not precisely on the radar operating frequency.

pulse-interference separator and blanker—A circuit that automatically blanks all video signals that are not synchronous with the radar pulse-repetition frequency.

pulse interleaving—A process in which pulses from two or more time-division multiplexers are systematically combined in time division for transmission over a common path.

pulse interrogation—1. The triggering of a transponder by a pulse or pulse mode. Interrogations by the latter may be employed to trigger one or more transponders. 2. Periodic electrical activation and observation, either synchronous or asynchronous, of the shaft position of an encoder.

pulse interval—See pulse spacing.

pulse-interval jitter—The time or displacement band within which lie all of the transitions in the same direction of a signal through a specified amplitude. This is a dynamic value to be determined at one or more specified speeds. Pulse-interval jitter is expressed as a percentage of one pulse interval at a specified speed.

pulse-interval modulation—Pulse-time modulation in which the pulse spacing is varied. See also pulse-spacing modulation.

pulse jitter—A relatively slight variation of the pulse spacing in a pulse train. It may be random or systematic, depending on its origin, and is generally not coherent with any imposed pulse modulation.

pulse length—See pulse duration.

pulse-length modulation—See pulse-duration modulation.

pulse-link repeater—In a telephone signaling system, equipment that receives pulses from one E and M signaling circuit and transmits corresponding pulses into another E and M signaling circuit.

pulse load—The load presented to a pulse source.

pulse mode—1. A finite sequence of pulses in a prearranged pattern, used for selecting and isolating a communication channel. 2. The prearranged pattern in (1) above.

pulse-mode multiplex—A process or device for selecting channels by means of pulse modes. In this way, two or more channels can use the same carrier frequency.

pulse moder—A device for producing a pulse mode. See also pulse demoder.

pulse-modulated jamming—The use of jamming pulses that have various widths and repetition rates.

pulse-modulated radar—Radar in which the radiation consists of a series of discrete pulses.

pulse-modulated waves—Recurrent wave trains used extensively in radar. In general, their duration is shorter than the interval between them.

pulse modulation—1. The use of a series of pulses modulated to convey information. Modulation may involve changes of pulse amplitude (PAM), position (PPM), or duration (PDM). 2. Modulation of a carrier by a train of pulses; the generation of carrier-frequency pulses. 3. Modulation of a characteristic or characteristics of a pulse carrier; transmission of information on a pulse carrier.

pulse modulator—A device that applies pulses to the element being modulated.

pulse numbers modulation—A type of modulation in which the pulse density per unit time of a carrier is varied in accordance with a modulating wave; omissions of pulses are made systematically without changing the phase or amplitude of the transmitted pulses. For example, the omission of every other pulse could represent zero modulation; the reinsertion of pulses would then represent positive modulation, and the omission of more pulses would represent negative modulation.

pulse operation—The method whereby the energy is delivered in pulses. Usually described in terms of the shape and the frequency of the pulses.

pulse oscillator—An oscillator in which the oscillations are sustained by self-generated or external pulses.

pulse packet—In radar, the volume of space occupied by the pulse energy.

pulse period—Also called impulse period. In telephony, the time required for the dial pulse springs to open and close one time.

pulse-position modulation—Abbreviated PPM. 1. Pulse-time modulation in which the value of each instantaneous sample of the wave modulates the position in time of a pulse. 2. Modulation in which a pulse is delayed from its normal position in time as a function of the modulating wave.

pulse-position modulator—A device that converts analog information to variations in pulse position.

pulser—A generator that produces extremely short, high-voltage pulses at definite recurrence rates for use in radar transmitters and similar pulsed systems.

pulse rate—1. See pulse-repetition rate. 2. The rate at which pulses are fed to a drive of a stepper motor. In most cases, the pulse rate equals the stepping or running rate.

pulse ratio—Ratio of the length of any pulse to its total period.

pulse recovery—The time, usually in microseconds, required for electron flow in a diode to start or stop when voltage is suddenly applied or removed.

pulse-recurrence counting-type frequency meter—A device for measuring frequency. It uses a direct-current ammeter calibrated in pulses per second.

pulse-recurrence time—The time elapsing between the start of one transmitted pulse and the next pulse. The reciprocal of the pulse-recurrence frequency.

pulse regeneration—The restoring of a series of pulses to their original timing, form, and relative magnitude.

pulse repeater—Also called a transponder. A device that receives pulses from one circuit and transmits corresponding pulses at another frequency, waveshape, etc., into another circuit.

pulse-repetition frequency—Abbreviated PRF. The rate (usually given in hertz or pulses per second) at which pulses or pulse groups are transmitted from a radar set.

pulse-repetition period—The reciprocal of the pulse-repetition frequency.

pulse-repetition rate—Abbreviated PRR. Also called pulse rate. The average number of pulses per unit of time.

pulse-repetition-rate modulation—See pulse-frequency modulation.

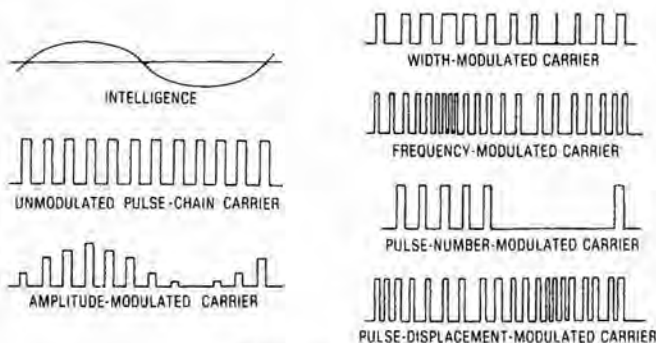
pulse reply—The transmission of a pulse or pulse mode by a transponder as the result of an interrogation.

pulse resolution—The minimum time separation, usually in microseconds or milliseconds, between input pulses that permits proper circuit or component response.

pulse rise time—The interval of time required for the leading edge of a pulse to rise from 10 percent to 90 percent of its peak amplitude, unless some other percentage is stated.

pulse sample-and-hold circuit—A circuit that holds the final amplitude of an integrated pulse until the final amplitude of the succeeding integrated pulse is reached. A less desirable sample-and-hold circuit resets after each hold period to a fixed level before integrating a succeeding pulse.

pulse scaler—A device capable of producing an output signal whenever a prescribed number of input pulses has been received. It frequently includes indicating devices that facilitate interpolation.



Pulse modulation, 3.

pulse selector—A circuit or device that selects the proper pulse from a sequence of (telemetering) pulses.

pulse separation—The interval between the trailing-edge pulse time of a pulse and the leading-edge pulse time of the succeeding pulse.

pulse shaper—Any transducer (including pulse regenerators) used for changing one or more characteristics of a pulse.

pulse shaping—Intentionally changing the shape of a pulse.

pulse soldering—Soldering a connection by melting the solder in the joint area by pulsing current through a high-resistance point applied to the joint area and the solder.

pulse spacing—The time interval from one pulse to the next—i.e., between the corresponding times of two consecutive pulses. (The term *pulse interval* for this concept is ambiguous—it may be taken to mean the duration of a pulse instead of the space or interval between pulses.)

pulse-spacing modulation—Formerly called pulse-interval modulation. A form of pulse-time modulation in which the pulse spacing is varied.

pulse spectrum—Also called pulse-frequency spectrum. The frequency distribution, in relative amplitude and phase, of the sinusoidal components of a pulse.

pulse spike—A relatively short-duration pulse superimposed on the main pulse.

pulse-spike amplitude—The peak amplitude of a pulse spike.

pulse spreading—1. The cumulative effect of material and modal dispersions in an optical fiber. 2. See dispersion, 7.

pulse stepper—A stepper motor that responds directly to a pulse of specified length and amplitude. The positioning of the motor shaft is directly proportionate to the number of pulses applied. Rotational direction is controlled by electrical shading.

pulse-storage time—The time interval from a point at 90 percent of the maximum amplitude on the trailing edge of the input pulse to the same 90-percent point on the trailing edge of the output pulse.

pulse stretcher—1. A circuit designed to extend the duration of a pulse—primarily so that its pulse modulation will be more readily discernible in an audio presentation. 2. In a computer, a circuit that generates a long pulse when triggered by a short pulse. The width of the output pulse is determined by the value of the coupling capacitor. The maximum width of the output pulse cannot exceed 50 percent of the clock rate.

pulse tilt—A distortion characterized in an otherwise essentially flat-topped rectangular pulse by either a decline or a rise of the pulse top.

pulse time—The time interval from a point at 90 percent of the maximum amplitude on the leading edge of a pulse to the 90-percent point on the trailing edge.

pulse-time-modulated radiosonde—Also called time-interval radiosonde. A radiosonde that transmits the indications of the meteorological sensing elements in the form of pulses spaced in time. The meteorological data is evaluated from the intervals between the pulses.

pulse-time modulation—Abbreviated PTM. Modulation (e.g., pulse-duration and pulse-position) in which the values of instantaneous samples of the modulating wave are made to modulate the occurrence time of some characteristic of a pulse carrier.

pulse timer—A timer whose time cycle is started with a continuous input voltage and application or removal of an additional positive input voltage pulse. At the end of the time-delay period, the contacts transfer.

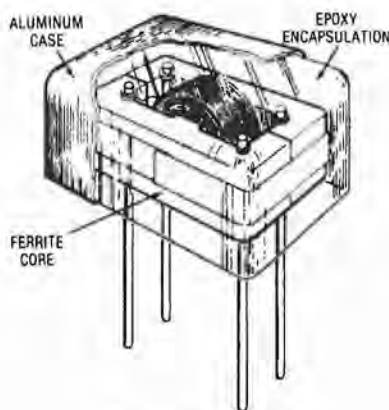
pulse selector — pulsing key

pulse train—Also called pulse group or impulse train. 1. A group or sequence of pulses of similar characteristics. 2. A succession of pulses, usually at equal intervals.

pulse-train frequency spectrum—See pulse-train spectrum.

pulse-train spectrum—Also called pulse-train frequency spectrum. The frequency distribution, in amplitude and in phase angle, of the sinusoidal components of the pulse train.

pulse transformer—1. A special type of transformer designed to pass pulse waveforms as distinguished from sine waves. The major features of a pulse transformer are high-voltage insulation between windings and to ground, low capacitance between windings, and low reactance in the windings. 2. A transformer capable of passing a wide band of frequencies; thus, it can pass a pulse with minimal distortion.



Pulse transformer.

pulse transmitter—1. A pulse-modulated transmitter in which the peak power-output capabilities are usually larger than the average power-output rating. 2. A transmitter used to generate and transmit pulses over a telemetering or pilot-wire circuit to the remote indicating or receiving device.

pulse-triggered binary—A flip-flop in which a change of state results from application of a pulse or waveform of short duration to the input.

pulse valley—See pulse duration.

pulse width—In a pulse, the portion between two specified maxima.

pulse-width discriminator—A device that measures the pulse length of video signals and passes only those whose time duration falls into some predetermined design tolerance.

pulse-width modulation—See pulse-duration modulation.

pulse-width modulation/frequency modulation—See pulse-duration modulation/frequency modulation.

pulse-width modulator amplifier—See class D amplifier.

pulsing key—1. A method of transmitting voice-frequency pulses over a line under control of a key at the original office. It is used with E and M supervision in intertoll dialing. 2. A system of signaling in which numbered keys are used instead of a dial.

put — To insert a single data record into an output file.

PVC — Abbreviation for polyvinyl chloride.

pW — Letter symbol for picowatt.

PWM — Abbreviation for pulse-width modulator. 1. A digital logic circuit that can be programmed to produce pulses having any desired period or duty cycle. A means of controlling variable-speed motors. 2. A form of analog control in which the duration of digital pulses is varied analogously with the signal of interest.

PWM/FM — A system in which a number of pulse-width-modulated subcarriers are used to frequency modulate the carrier.

pylon antenna — A vertical antenna constructed of one or more sheet-metal cylinders with a lengthwise slot. The gain depends on the number of sections.

pyramidal horn — An electromagnetic horn whose sides form a pyramid. The electromagnetic field in such a horn would be expressed basically in a family of spherical coordinates.

pyramid wave — A triangular wave whose sides are approximately equal in length.

pyroelectric effect — Also called pyroelectricity. The redistribution of the charge in a crystal that has been heated. The crystal is left with a net electric dipole moment—i.e., the centers of the positive and negative charges are separated.

pyroelectric infrared detector — A current source with an output proportional to the rate of change of its temperature. Widely used in radiometric systems, from industrial temperature-measuring systems to environmental satellite instruments to the analysis of infrared lasers.

pyroelectricity — See pyroelectric effect.

pyroelectric material — A material that produces electrical output when subjected to a change in temperature.

pyroelectric pulse detector — A current-source thermal detector used to detect and study the pulses obtained from particular lasers.

pyroheliometer — A device for the measurement of infrared radiation.

pyrolysis — The thermal decomposition of a volatile chemical compound into nonvolatile and volatile byproducts. It is generally carried out in an inert carrier gas, and this fact distinguishes it from vapor plating.

pyromagnetic — Pertaining to the effect of heat and magnetism on each other.

pyrometer — 1. An instrument used to measure elevated temperatures (beyond the range of mercury thermometers) by electric means. These include immersion optical, radiation, resistance, and thermoelectric pyrometers. 2. A temperature-measuring instrument incorporating a sensor and a readout device.

pyrone detector — A crystal detector in which rectification occurs between iron pyrites and copper (or other metallic points).

pyrotechnic — Pertaining to explosive-actuated devices, especially those that burn rather than producing a shattering effect.

Pythagorean scale — A musical scale in which the frequency intervals are represented by the ratios of integral powers of 2 and 3.



Side lobes.

record, causing increased wear on the inner groove wall. With low tracking weight, side thrust can cause the stylus to jump the record's groove.

sidetone—1. The reproduction, in a telephone receiver, of sounds received by the transmitter of the same telephone set (e.g., hearing one's own voice in the receiver of a telephone set when speaking into the mouthpiece). 2. That portion of a speaker's voice that is fed back to his or her receiver.

sidetone telephone set—A telephone set with no balancing network for reducing sidetone.

siemens—1. International standard unit of conductance that replaces and is identical with the term *mho*. The reciprocal of resistance in ohms. 2. The unit of electric conductance of a conductor in which a current of 1 ampere is produced by an electric potential difference of 1 volt.

sight check—To verify the sorting or punching of punched cards by looking through the pattern of punched holes.

sign—1. A symbol that distinguishes negative from positive quantities. 2. A binary indicator of the position of the magnitude of a number relative to zero.

signal—1. A visible, audible, or other conveyor of information. 2. The intelligence, message, or effect to be conveyed over a communication system. 3. The physical embodiment of a message or of information. 4. An electrical wave used to convey information. 5. An alerting signal; that is, an acoustic device (such as a bell) or a visual device (such as a lamp) that calls the attention. 6. To transmit an information signal or alerting signal. 7. The event, phenomenon, or electrical quantity that conveys information from one point to another. 8. A current used to convey information, either digital, analog, audio, or video. 9. An electrical impulse of a predetermined voltage, current, polarity, and pulse width. 10. Any electronic visual, audible, or other indication used to convey information. In semiconductors, an electrical quantity (typically voltage, current, or light level) corresponding to some physical quantity. Signals are coded in frequency or amplitude to separate them from unwanted noise.

signal attenuation—The reduction in the strength of electrical signals.

signal averaging—A technique for extracting a signal waveform (generally a time-varying voltage) from a background of unwanted noise. Simple frequency-domain filtering with passive or active circuit elements is the most widely used method for accomplishing this result. But this type of filtering is effective only when the frequency spectrum of the signal and the frequency

spectrum of the noise do not overlap. A signal averager is a special kind of filter, sometimes referred to as a comb filter. It can be used effectively only if the desired signal, with its contaminating noise, can be repeated a number of times. In addition, a synchronization of that pulse must have a fixed time relationship to the desired signal, preferably, but not necessarily, ahead of the signal.

signal-averaging computer—An electronic averager that filters out signals of interest from background noise.

signal bias—A form of teletypewriter signal distortion brought about by the lengthening or shortening of pulses during transmission. When marking pulses are all lengthened, a marking signal bias results; when marking pulses are all shortened, a spacing signal bias results.

signal-carrier FM recording—A method of recording in which the input signal is frequency modulated onto a carrier, and the carrier is recorded on a single track at saturation and without bias.

signal conditioner—A device placed between a signal source and a readout device for the purpose of conditioning the signal. Some examples are damping networks, attenuator networks, preamplifiers, excitation and demodulation circuits, converters for changing one electrical quantity into another (such as voltage to current), instrument transformers, equalizing or matching networks, and filters.

signal conditioning—1. To process the form or mode of a signal so as to make it intelligible to, or compatible with, a given device, including such manipulation as pulse shaping, pulse clipping, digitizing, and linearizing. 2. Any operation that prepares a transducer signal for subsequent display or control functions. Depending on the application, a transducer signal might require any one or a combination of several conditioning operations such as filtering, amplification, isolation, integration, differentiation, and rectification. For extracting low-level signals from electrical noise, an instrumentation amplifier is often the best choice.

signal conductor—An individual conductor used to transmit an impressed signal.

signal converter—A circuit that reduces, filters, and (if necessary) rectifies incoming signals to logic system levels.

signal delay—The transmission time of a signal through a network. The time is always finite, and it may be undesired or purposely introduced.

signal diode—1. A semiconductor diode used for the purpose of extracting or processing information contained in an electrical signal that varies with time and may be either analog or digital in nature. 2. A diode that exhibits an asymmetrical voltage-current characteristic and is used for signal detection.

signal-distortion generator—An instrument furnished and designed to apply distortion to a signal for the purpose of ranging and adjusting teletypewriter equipment or for furnishing a clear signal.

signal dropout—The loss of signal that occurs when the signal becomes too weak to be usable.

signal electrode—The electrode from which the signal output of a camera tube is taken.

signal element—Also called a unit interval. That part of a signal which occupies the shortest interval of the signaling code. It is considered to be of unit duration in building up signal combinations.

signal encoding device—A system component located at the protected premises that will initiate the transmission of an alarm signal, supervisory signal, trouble signal, or other signals the central station is prepared to receive and interpret.

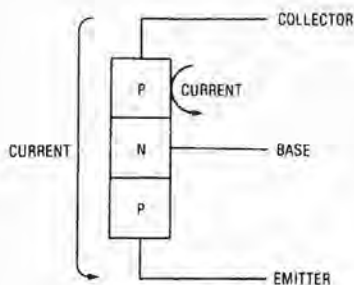
electronic power supply resulting from an abrupt specified change of load, with all conditions held constant. 5. Ability to respond to percussive signals cleanly and instantly. 6. The ability of an amplifier or transducer to handle and faithfully reproduce rapid changes in signal amplitudes. A very short rise time is a measure of this characteristic. 7. The closed-loop step function response of an amplifier under small-signal conditions. 8. The ability of an amplifier, microphone, or speaker to follow sudden changes in signal levels.

transient response time—See transient recovery time.

transient state—The condition in which a variable temporarily behaves in an erratic manner instead of changing smoothly and predictably.

transistance—1. The characteristic of an electrical element that makes possible the control of voltages, currents, or flux so as to produce gain or switching action in a circuit. Examples of the physical realization of transistance occur in transistors, diodes, and saturable reactors. 2. An electronic characteristic exhibited in the form of voltage or current gain or in the ability to control voltages or currents in a precise and nonlinear manner. (Examples of parts showing transistance: transistors, diodes, vacuum tubes.) 3. A function of transistors. An electrical property that causes applied voltage to create amplification or accomplish switching.

transistor—1. An active semiconductor device having three or more electrodes and capable of performing almost all the functions of tubes, including rectification and amplification. Germanium and silicon are the main materials used, with impurities introduced to determine the conductivity type (n-type has an excess of free electrons; p-type, a deficiency). Conduction is by means of electrons (elementary particles having the smallest negative electrical charge that can exist) and holes (mobile electron vacancies equivalent to a positive charge). 2. A tiny chip of crystalline material, usually silicon, that amplifies or switches electric current. It is a three-terminal semiconductor device. A small current (base current) applied to one terminal can control a larger current (collector current) between the other two terminals. For elementary purposes, a transistor can be looked at as a resistor whose value can be changed from a high to a low value by applying a current to the base lead. 3. A three-terminal active semiconductor device that provides current amplification. A bipolar transistor is comprised of base, emitter, and collector and is a current-controlled device with a low input impedance. A field-effect transistor has gate, source, and drain electrodes and is a high-impedance, voltage-controlled device. The first transistor was invented at Bell Laboratories in 1947 by Nobel-Prize physicists John Bardeen, William Shockley, and Walter Brattain.



Transistor (typical).

transient response time — transistor-resistor logic

transistor action—The physical mechanism of amplification in a junction transistor.

transistor amplifier—An amplifier in which the required amplification is produced by one or more transistors.

transistor base—The region between an emitter and a collector of a transistor, into which minority carriers are injected.

transistor chip—An unencapsulated transistor element of very small size used in microcircuits.

transistor dissipation—The power dissipated in the form of heat by the collector. The difference between the power supplied to the collector and the power delivered by the transistor to the load.

transistorized—Pertaining to equipment or a design in which transistors instead of vacuum tubes are used.

transistor oscillator—An oscillator that uses a transistor in place of an electron tube.

transistor-outline metal-can package—Abbreviated TO can. A type of package that resembles a transistor can, but generally is larger and has more leads. The pins are arranged in a circular pattern in the base. This type of package is often used for MSI, LSI, and MOS ICs.

transistor parameters—The performance characteristics of a transistor or class of transistors.

transistor pentode—A transistor designed for mixing, modulating, or switching and containing the equivalent of three emitters, a base, and a collector.

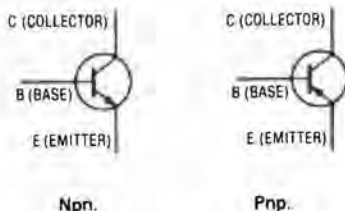
transistor radio—A radio receiver that uses transistors in place of electron tubes.

transistor region—The region around a pn junction in which the majority carriers from each side of the junction diffuse across it to recombine with their respective counterparts.

transistor-resistor logic—Abbreviated TRL. An early form of logic-circuit design that was employed prior to the advent of monolithic circuits. The input elements are resistors; however, unlike RTL there is only one active output transistor. In discrete circuit designs, this logic form was the least expensive since it required a minimum number (one) of active devices.

transistor seconds—Also called fallouts. Those transistors that remain after the firsts (units meeting rigid specifications for a specific application) have been removed from the production line.

transistor symbols—Symbols used to represent transistors on schematic diagrams.



Transistor symbols.

transistor testers—Equipment and instruments that detect or measure leakage current, breakdown voltage, gain, or saturation voltage. Some testers are computer operated.

transistor-transistor logic—Abbreviated TTL or T²L. Also called multiemitter transistor logic. 1. A logic-circuit design similar to DTL, with the diode inputs

volatile—1. A computer storage medium in which information cannot be retained without continuous power dissipation. 2. Capable of evaporating.

volatile memory—1. In computers, any memory that can return information only as long as energizing power is applied. The opposite of nonvolatile memory. 2. A read/write memory whose content is irretrievably lost when operating power is removed. Virtually all types of read/write semiconductor memories are volatile. *See also* nonvolatile memory.

volatile storage—1. A computer storage device in which the stored information is lost when the power is removed. 2. A storage medium in which data cannot be retained without continuous power dissipation (e.g., acoustic delay lines, electrostatics, capacitors).

volatile store—A storage device in which stored data is lost when the applied power is removed (e.g., an acoustic delay line).

volatility—With respect to memory, an inability to retain stored data in the absence of external power.

Voldicon—The trade name of Adage, Inc., for a family of high-speed, all-semiconductor, current-balancing devices that use digital logic and readout for high-speed precision measurement of analog signals.

volt—Letter symbol: V. 1. The unit of measurement of electromotive force. It is the difference of potential required to make a current of 1 ampere flow through a resistance of 1 ohm. 2. The difference of electric potential between two points of a conductor carrying a constant current of 1 ampere when the power dissipated between these points is equal to 1 watt.

Volta effect—*See* contact potential.

voltage—1. Electrical pressure; i.e., the force that causes current through an electrical conductor. 2. Symbolized by E . The greatest effective difference of potential between any two conductors of a circuit. 3. The term most often used in place of electromotive force, potential, potential difference, or voltage drop, to designate electric pressure that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points. 4. Standard unit of magnitude of an electrical signal, named after Count A. Volta, inventor of the battery about 1800.

voltage amplification—Also called voltage gain. 1. Ratio of the voltage across a specified load impedance connected to a transducer to the voltage across the input of the transducer. 2. The ratio of the voltage at the input of a device to the voltage at the output from the device, expressed in decibels.

voltage amplifier—An amplifier used specifically to increase a voltage. It is usually capable of delivering only a small current.

voltage-amplifier tube—A tube that is designed primarily as a voltage amplifier. It has high gain, but delivers very little output power.

voltage and power directional relay—A device that permits or causes the connection of two circuits when the voltage difference between them exceeds a given value in a predetermined direction, and causes these two circuits to be disconnected from each other when the power flowing between them exceeds a given value in the opposite direction.

voltage attenuation—Ratio of the voltage across the input of a transducer to the voltage delivered to a specified load impedance connected to the transducer.

voltage balance relay—A device that operates on a given difference in voltage between two circuits.

voltage breakdown—1. The voltage necessary to cause insulation failure. 2. A rapid increase of current flow, from a relatively low value to a relatively high value, upon the application of a voltage to a pn junction or dielectric.

voltage-breakdown test—A test whereby a specified voltage is applied between given points in a device to ascertain that no breakdown will occur at that specified voltage.

voltage calibrator—Test equipment that supplies accurate ac voltages for comparison on a scope screen with other waveforms to determine their voltage level.

voltage coefficient of capacitance—Also called voltage sensitivity. The quotient of the derivative with respect to voltage of a capacitance characteristic at a point divided by the capacitance at that point.

voltage coefficient of resistivity—The maximum change in nominal resistance value due to the application of a voltage across a resistor, after correcting for self-heating effects; usually expressed in percent or per-unit (ppm) change in nominal resistance per volt applied.

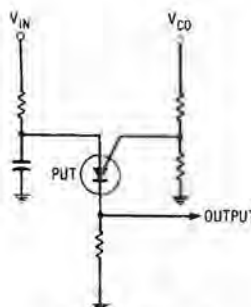
voltage comparator—1. An amplifying device with a differential input that will provide an output polarity reversal when one input signal exceeds the other. When operating with open loop and without phase compensation, operational amplifiers make fast and accurate voltage comparators. 2. A circuit that compares two analog voltages and develops a logic output when the voltages being compared are equal or one is greater or less than the reference level.

voltage control—A method of varying the magnitude of voltage in a circuit by means of amplitude control, phase control, or both.

voltage-controlled capacitor—*See* varactor.

voltage-controlled crystal oscillator—A crystal oscillator whose operating frequency can be changed by applying a controlling voltage to introduce a phase shift in the oscillator circuit.

voltage-controlled oscillator—Abbreviated VCO. 1. Any oscillator for which a change in tuning voltage results in a predetermined change in output frequency. Frequency tuning is accomplished by either changing the bias voltage on a varactor diode in the frequency-determining resonant network or the bias voltage to the active device. The former approach, although more complex than the latter method of tuning, is capable of multioctave bandwidth. 2. A circuit that creates an ac output signal whose frequency is a function of the dc input voltage. 3. An oscillator whose frequency can be changed by means of an external control voltage. It is commonly found in synthesizers.



Voltage-controlled oscillator.

watthour meter—1. An electricity meter that measures and registers the integral, usually in kilowatthours, of the active power of the circuit into which the meter is connected. This power integral is the energy delivered to the circuit during the integration interval. 2. A totalizing meter that registers the total electrical energy used, usually in kilowatthours.

wattless component—A reactive component.

wattless power—See reactive power.

watt loss—See power loss, 2.

wattmeter—An instrument for measuring the magnitude of the active power in an electric circuit. Its scale is usually graduated in watts. If graduated in kilowatts or megawatts, the instrument is usually designated as a kilowattmeter or megawattmeter.

wattsecond—The amount of energy corresponding to 1 watt acting for 1 second. It is equal to 1 joule.

wattsecond constant of a meter—The registration, in wattseconds, corresponding to one revolution of the rotor.

wave—1. A physical activity that rises and falls, or advances and retreats, periodically as it travels through a medium. 2. Propagated disturbance, usually periodic, such as a radio wave or sound wave. If the periodic motion is regular and recurring, it is said to be aperiodic or damped.

wave amplitude—The maximum change from zero of the characteristic of a wave.

wave analyzer—An electric instrument for measuring the amplitude and frequency of the various components of a complex current or voltage wave.

wave angle—The angle at which a wave is propagated from one point to another.

wave antenna—Also called a Beverage antenna. A directional antenna composed of a parallel horizontal conductor one-half to several wavelengths long, and terminated to ground in its characteristic impedance at the far end.

wave band—1. A band of frequencies, such as that assigned to a particular type of communication service. 2. The band of frequencies comprising an electrical wave.

wave-band switch—A multiposition switch for changing the frequency band tuned by a receiver or transmitter.

wave clutter—Clutter caused on a radar screen by echoes from sea waves.

wave converter—A device for changing a wave from one pattern to another (e.g., baffle-plate, grating, and sheath-resaping converters for waveguides).

wave duct—1. A tubular waveguide capable of concentrating the propagation of waves within it. 2. A natural duct formed in air by atmospheric conditions. Waves of certain frequencies travel through it with more than average efficiency.

wave equation—An equation that gives a mathematical specification of a wave process or describes the performance of a medium through which a wave is passing.

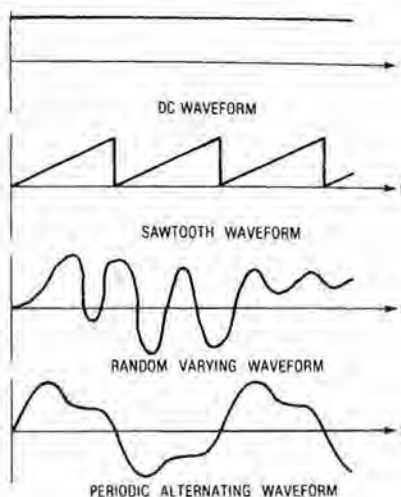
wave filter—A transducer for separating waves on the basis of their frequency. It introduces a relatively small insertion loss to waves in one or more frequency bands, and a relatively large insertion loss to waves of other frequencies. See also filter, 1.

wave fluxing—A wave solder fluxing method. Flux is applied using the liquid wave principle to form a double-sided parabolic wave. Washing action of the wave promotes flux coverage of the underside surfaces, while capillary forces promote thru-hole penetration. See also brush fluxing; foam fluxing; spray fluxing.

waveform—1. The shape of an electromagnetic wave. 2. A graphical representation of the relationship

watthour meter — waveform generator

between voltage, current, or power against time. It also provides a picture of the behavior of signals at given frequencies. 3. A geometrical shape as obtained by displaying a characteristic voltage or current as a function of time. 4. The variations in magnitude and polarity of a current or voltage with respect to time, plotted in graphic form.



Waveforms, 2.

waveform-amplitude distortion—Sometimes called amplitude distortion. Nonlinear waveform distortion caused by unequal attenuation or amplification between the input and output of a device.

waveform analyzer—1. An instrument that measures the amplitude and frequency of the components in a complex waveform. 2. A frequency-selective voltmeter that can be used to determine the frequency and amplitude of each sine-wave component of a complex wave. 3. An instrument that measures the amplitude of a waveform over a specific period, with resolution usually in the low nanosecond range.

waveform digitization—The earliest approach taken for speech synthesis. The technique relies on sampling of the waveform in the time domain at twice the highest frequency of interest (this is known as the Nyquist rate). Critical to the use of this technique is data compression; otherwise, memory requirements are prohibitive.

waveform encoding—A synthesis technique that reproduces speech by reconstructing the original speech waveform.

waveform error—A change in measurement accuracy of an average-reading ac meter, occurring when the waveform of the measured voltage or current departs from a pure sine-wave form.

waveform generator—Also called arbitrary waveform generator. 1. See timing-pulse distributor. 2. An instrumentation that does not necessarily employ mathematically derived relationships between the output voltage and the time base to produce its output waveshape. Most generators of this type develop an output that follows a waveshape drawn out or copied manually from some existing natural phenomenon (e.g., an EKG trace or the stress versus elongation curve from a pull-to-fracture test of a metal sample) or specified via keyboard entries. The waveform may also follow tracings made manually on an accompanying digitizer tablet.

waveform influence—The change in meter indication of the applied current and/or voltage caused solely by a change in waveform from a specified waveform.

waveform monitor—1. An oscilloscope designed for viewing signal waveforms. 2. An oscilloscope designed especially for viewing the waveform of a video signal.

waveform recorder—A general-purpose, waveform-capturing instrument with high-speed, high-resolution analog-to-digital converters and digital memory.

waveform synthesizer—Equipment for generating a signal of a desired waveform.

wavefront—1. With respect to a wave in space, a continuous surface at every point of which the displacement from zero in the positive or negative direction is the same at any instant. In a periodic wave, the displacements of the points on a wavefront are in phase. For a surface wave, the wavefront is a continuous line whose points have the same properties as do the points in the wavefront of a wave in space. 2. That part of a signal-wave envelope between the initial point of the envelope and the point at which the envelope reaches its crest. 3. For a field of electromagnetic energy emanating from a source, the wavefront is a surface connecting all field points that are equidistant from the source. 4. A surface at right angles to rays that proceed from the wave source. The surface passes through those parts of the wave that are in the same phase and travel in the same direction. For parallel rays, the wavefront is a plane; for rays that radiate from a point, the wavefront is spherical.

wave function—In a wave equation, a point function that specifies the amplitude of a wave.

waveguide—1. A system of material designed to confine direct electromagnetic waves in a direction determined by its physical boundaries. 2. A transmission line comprising a hollow conducting tube (rectangular or tubular) within which electromagnetic waves are propagated on a solid dielectric or dielectric-filled conductor.

waveguide attenuator—A waveguide device for producing attenuation by some means (e.g., by absorption and reflection).

waveguide connector—Also called a waveguide coupling. A mechanical device for electrically joining parts of a waveguide system together.

waveguide coupling—See waveguide connector.

waveguide critical dimension—The dimension of waveguide cross section that determines the cutoff frequency.

waveguide cutoff frequency—Also called the critical frequency. The frequency limit of propagation, along a waveguide, for waves of a given field configuration.

waveguide dummy load—Sections of waveguide for dissipating all the power entering the input flange.

waveguide elbow—A bend in a waveguide.



Waveguide elbows.

waveguide flange—See flange.

waveguide lens—A microwave device in which the required phase changes are produced by refraction through suitable waveguide elements acting as lenses.

waveguide mode suppressor—A filter used to suppress undesired modes of propagation in a waveguide.

waveguide phase shifter—A device for adjusting the phase of the output current or voltage relative to the phase at the input of a device.

waveguide plunger—1. In a waveguide, a plunger used for reflecting the incident energy. 2. A movable shorting plate used to adjust the length of a resonant waveguide section.

waveguide post—In a waveguide, a rod placed across the waveguide and behaving substantially like a shunt susceptance.

waveguide propagation—Long-range communications in the 10-kHz to 35-kHz frequency range by the waveguide characteristics of the atmospheric duct formed by the ionospheric D layer and the surface of the earth. See also atmospheric duct.

waveguide resonator—A waveguide device intended primarily for storing oscillating electromagnetic energy.

waveguide shim—A thin metal sheet inserted between waveguide components to ensure electrical contact.

waveguide shutter—A vane within a waveguide, used to protect the receiver system from adjacent radar power by establishing an electrical short across the waveguide when a companion transmitter is operating.

waveguide stub—An auxiliary section of waveguide that has an essentially nondissipative termination and is joined to the main section of the waveguide.

waveguide switch—A transmission-line switch for connecting a transmitter or receiver from one antenna to another or to a dummy load.

waveguide taper—A section of tapered waveguide.

waveguide tee—A junction for connecting a branch section of waveguide in series or parallel with the main transmission line.

waveguide transformer—A device, usually fixed, added to a waveguide for the purpose of impedance transformation.

waveguide tuner—An adjustable device added to a waveguide for the purpose of impedance transformation.

waveguide twist—A waveguide section in which the cross section rotates about the longitudinal axis.

waveguide wavelength—Also called a guide wavelength. For a traveling plane wave at a given frequency, the distance along the waveguide between the points at which a field component (or the voltage or current) differs in phase by 2π radians.

wave heating—The heating of a material by energy absorption from a traveling electromagnetic wave.

wave impedance (of a transmission line)—At every point in a specified plane, the complex ratio between the transverse components of the electric and magnetic fields. (Incident and reflected waves may both be present.)

wave interference—The phenomenon that results when waves of the same or nearly same type and frequency are superimposed. It is characterized by variations in the wave amplitude that differ from that of the individual superimposed waves.

wavelength—1. In a periodic wave, the distance between points of corresponding phase of two consecutive cycles. The wavelength (λ) is related to the phase velocity (v) and frequency (f) by the formula $\lambda = v/f$. 2. The physical distance between cycles. Wavelength also may be stated as being equal to the distance traveled by a wave in the time required for one cycle. Wavelength equals the speed divided by the frequency. (For most purposes, we assume that all electromagnetic waves travel at the speed of light in a vacuum, approximately 186,000 miles