orthoacoustic recording **1.** A system of disc recording in which the inherent differences between high-frequency recording and low-frequency recording are compensated to provide reproduction that more closely resembles the actual sound. **2.** A disc made by the method defined in **1**.

orthogonal axes Perpendicular axes [e.g., those in a Cartesian (rectangular) coordinate system].

Os Symbol for OSMIUM.

OS Abbreviation of OPERATING SYSTEM.

osc Abbreviation of OSCILLATOR.

OSCAR Abbreviation for *Orbiting Satellite Carrying Amateur Radio.* A satellite with a transponder that has an uplink in one amateur band and a downlink in another amateur band.

osciducer See OSCILLATING TRANSDUCER.

oscillate **1.** To fluctuate in amplitude in a uniform manner. **2.** To vary above and below a specified value at a constant rate.

oscillating arc A small arc, especially one produced by slow-opening relay contacts, that generates high-frequency oscillations.

oscillating circuit A closed circuit containing inductance, capacitance, and inherent resistance, in which energy passes back and forth between inductor and capacitor at a frequency determined by the inductance (*L*) and capacitance (*C*) values.

oscillating crystal **1.** A piezoelectric plate maintained in a state of oscillation in a circuit. See, for example, CRYSTAL OSCILLATOR and QUARTZ CRYSTAL. **2.** An oscillating semiconductor diode (see NEGATIVE-RESISTANCE DIODE, **1**, **2**).

oscillating current See OSCILLATORY CURRENT.

oscillating detector A detector provided with positive feedback; therefore, it is capable of generating a signal of its own. Compare NON-OSCILLATING DETECTOR.

oscillating diode **1.** A semiconductor diode biased into its negative-resistance region so that it oscillates in a suitable circuit. **2.** An oscillating tunnel diode. **3.** Any of several microwave diodes, such as the IMPATT diode, which will oscillate in a suitable system. **4.** See MAGNETRON. Also see DIODE OSCILLATOR.

oscillating field An alternating electric or magnetic field.

oscillating rod A rod of magnetostrictive metal maintained in a state of oscillation in a circuit. See, for example, MAGNETOSTRICTION and MAGNETOSTRICTION OSCILLATOR.

oscillating transducer A transducer in which an input quantity varies a frequency proportionately from its center value.

oscillating wire A wire of magnetostrictive metal maintained in a state of oscillation in a circuit. See, for example, MAGNETOSTRICTION and MAGNETOSTRICTION OSCILLATOR.

oscillation The periodic change of a body or quantity in amplitude or position (e.g., oscillation of a pendulum, voltage, or crystal plate).

oscillation constant For an oscillating inductance-capacitance (LC) circuit, the expression $(LC)^{1/2}$, where L is the inductance in henrys and C is the capacitance in farads. The reciprocal of the OSCILLATION NUMBER.

oscillation control A manual or automatic device for adjusting the frequency or amplitude of the signal generated by an oscillator.

oscillation efficiency The ratio, as a percentage, of the alternating-current (signal) power output of an oscillator (P_{out}) to the corresponding direct-current power input (P_{in}). *Efficiency* = $100P_{out}/P_{in}$.

oscillation number For an oscillating circuit, the number of complete oscillation cycles that occur in 6.28 (2 pi) seconds.

oscillation test **1.** A test of an oscillator to determine if a signal is being generated. **2.** A test for transistors wherein the transistor is used as an oscillator to give a rough indication of its condition in terms of oscillation amplitude.

oscillation transformer A tank coil of a radio transformer—especially one that includes an output coupling coil.

oscillator A device that produces an alternating or pulsating current or voltage electronically. The term is sometimes used to describe any alternating-current-producing device other than an electromechanical generator.

oscillator circuit The specific manner in which the components of an OSCILLATOR are interconnected. The three general types are: positive-feedback, negative-resistance, and relaxation.

oscillator coil A tapped coil that provides the input and output windings required for an oscillator circuit. Such coils are used in signal generators, oscillators, and superheterodyne receivers.

oscillator-doubler A circuit consisting of an oscillator and a frequency doubler (e.g., a crystal oscillator whose output frequency is twice the crystal frequency).

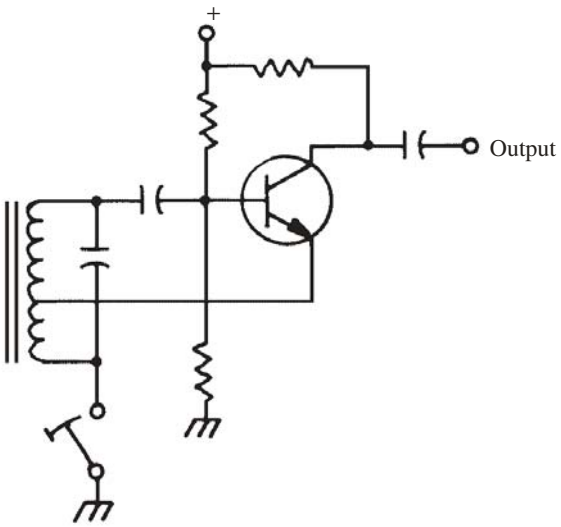
oscillator drift A usually gradual change in frequency of an oscillator caused by such factors as warmup time, voltage variations, capacitance change, inductance change, or change in transistor characteristics.

oscillator frequency The fundamental frequency at which an oscillator operates. It can be determined by a tuned circuit, crystal, cavity, section of waveguide or transmission line, or by a resistance-capacitance circuit.

oscillator harmonic interference In a superheterodyne receiver, interference that is the beat product of local oscillator harmonics and received signals.

oscillator interference Radio-frequency interference caused by signals from the high-frequency oscillator of a receiver.

oscillator keying Keying by making and breaking the signal output, direct-current (dc) power, or dc bias of the oscillator stage of a radiotelegraph transmitter.



oscillator keying

oscillator-mixer **1.** A combination stage in which a transistor functions as a local oscillator and mixer in a receiver or test instrument. **2.** A device designed specifically to function as a local oscillator and mixer.

oscillator-mixer-detector **1.** In a superheterodyne receiver, a stage in which the functions of high-frequency oscillator, mixer, and first detector are performed by a single transistor. **2.** A device designed specifically to function as a local oscillator, mixer, and detector.

oscillator-multiplier A single circuit that serves simultaneously as an oscillator and frequency multiplier. See, for example, OSCILLATOR-DOUBLER.

oscillator padder In a superheterodyne receiver, a small, limited-range variable capacitor connected in series with the oscillator coil for tracking oscillator tuning at the low end of a band. Compare OSCILLATOR TRIMMER.

oscillator power supply **1.** The direct-current or alternating-current power supply for an oscillator. **2.** See OSCILLATOR-TYPE POWER SUPPLY.

oscillator radiation The emission of radio-frequency energy by the oscillator stage of a superheterodyne receiver. Also see OSCILLATOR INTERFERENCE.

oscillator-radiation voltage The radio-frequency voltage at the antenna terminals of a superheterodyne receiver that results from signal emission by the oscillator stage.

oscillator stabilization **1.** The automatic compensation of an oscillator circuit for the frequency drift resulting from changes in temperature, current, voltage, or component parameters. **2.** The automatic stabilization of the operating point of an oscillator circuit against variations resulting from changes in temperature, supply current or voltage, or component parameters.

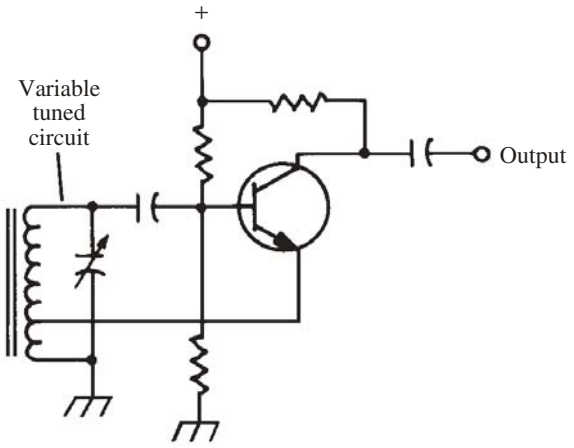
oscillator synchronization The locking of an oscillator in step with another signal source, such as a frequency-standard generator.

oscillator tracking In a superheterodyne receiver, the constant separation of the oscillator frequency from the signal frequency by an amount equal to the intermediate frequency at all settings of the tuning control.

oscillator transmitter A radio transmitter consisting only of a radio-frequency oscillator and its power supply. The oscillator can be modulated in various ways [e.g., on-off keying, frequency-shift keying, voice amplitude modulation (AM), voice frequency modulation (FM)].

oscillator trimmer In a superheterodyne receiver, a small, limited-range capacitor connected in parallel with the oscillator coil for tracking oscillator tuning at the high end of a band. Compare OSCILLATOR PADDER.

oscillator tuning The separate, often ganged, tuning of the oscillator stage in a circuit.



oscillator tuning

oscillator-type power supply A high-voltage, direct-current (dc) power supply in which a radio-frequency (RF) oscillator generates a low-voltage alternating current (ac). This ac voltage is stepped up by an RF transformer, and is finally rectified to obtain high-voltage dc.

oscillator-type transmitter See OSCILLATOR TRANSMITTER.

oscillator wavelength The fundamental wavelength at which an oscillator operates. It is usually expressed in meters, centimeters, or millimeters. It can be determined by a tuned circuit, crystal, cavity, section of waveguide or transmission line, or by a resistance-capacitance circuit.

oscillatory current A current that alternates periodically, particularly the current in an inductance-capacitance (LC) tank circuit that results

from the oscillation of energy back and forth between the inductor and capacitor.

oscillatory discharge An electrical discharge, such as that of a capacitor, that sets up an OSCILLATORY CURRENT.

oscillatory surge A current or voltage surge that includes both positive and negative excursions.

oscillatory transient See OSCILLATORY SURGE.

oscillistor A device consisting essentially of a bar of semiconductor material positioned in a magnetic field; it will produce oscillations under certain conditions.

oscillogram **1.** The image produced on the screen of an oscilloscope. **2.** A permanent, usually photographic, record made from the screen of an oscilloscope.

oscillograph **1.** An instrument that makes a permanent record (photograph or pen recording) of a rapidly varying electrical quantity. Also called *recorder* (see RECORDER, **2**). Compare OSCILLOSCOPE. **2.** An obsolete term for OSCILLOSCOPE.

oscillograph recorder A direct-writing recorder (see RECORDER, **2**).

oscillography The use of a graphic oscillation recorder (OSCILLOGRAPH).

oscillometer A device used for determining the peak amplitude of an oscillation.

oscilloscope An instrument that presents for visual inspection the pattern representing variations in an electrical quantity. Also see CATHODE-RAY OSCILLOSCOPE. Compare OSCILLOGRAPH.

oscilloscope camera A special high-speed, short-focus camera with fixtures for attachment to an oscilloscope to record images from the screen. Standard and instant-film types are available.

oscilloscope differential amplifier An amplifier that processes the difference between two signals, for the purpose of displaying on an oscilloscope or oscillograph.

oscilloscope tube A cathode-ray tube for use in an oscilloscope. It contains an electron gun, accelerating electrode, horizontal and vertical deflecting plates, and a fluorescent screen.

Os-Ir Symbol for OSMIRIDIUM.

OSI-RM Abbreviation of OPEN SYSTEMS INTERCONNECTION REFERENCE MODEL.

OSL Abbreviation of *orbiting space laboratory.*

osmiridium Symbol, Os-Ir. A natural alloy of osmium and iridium.

osmium Symbol, Os. A metallic element of the platinum group. Atomic number, 76. Atomic weight, 190.2.

osmotic pressure The force that causes the positive ions to pass out of a solution toward a metal body immersed in an electrolyte. Also see HELMHOLTZ DOUBLE LAYER.

OSO Abbreviation of *orbiting solar observatory.*

osteophone A bone-conduction hearing aid.

OTA Abbreviation of OPERATIONAL TRANSCONDUCTANCE AMPLIFIER.

OTL Abbreviation of OUTPUT-TRANSFORMERLESS.

O-type backward-wave oscillator Abbreviation, OBWO. A backward-wave oscillator using harmonics having opposing phases.

ounce Abbreviation, oz. A unit of weight equal to $\frac{1}{16}$ pound or 28.35 grams.

ounce-inch Abbreviation, oz-in. A unit of torque equal to the product of a force of 1 ounce and a moment arm of 1 inch. Compare POUND-FOOT.

outage **1.** Loss of power to a system. **2.** Loss of a received signal.

outboard components **1.** Discrete components (capacitors, coils, resistors, or transformers) connected externally to an integrated circuit. **2.** Discrete components connected externally to any existing electronic device.

outcome In statistical analysis, the result of an experiment or test. An outcome can be numerical or nonnumerical.

outdoor antenna An antenna erected outside, usually high above the surface of the earth clear of obstacles. It generally provides superior performance compared with an INDOOR ANTENNA. Also reduces the probability of radio-frequency interference (RFI) when used for transmitting.

outdoor booster A signal preamplifier mounted on an outdoor television receiving antenna for improved reception.

outdoor transformer A weatherproof distribution transformer installed outside the building it services.

outer conductor The outer metal cylinder or jacket of a coaxial cable or coaxial tank. Compare INNER CONDUCTOR.

outgassing **1.** In the evacuation of electronic devices, such as vacuum tubes, the removal of occluded gases from glass, ceramic, and metal by means of slow baking and by flashing an internal metal getter (such as one of magnesium). **2.** The production of gases in certain electrochemical cells and batteries during the final stage of charging.

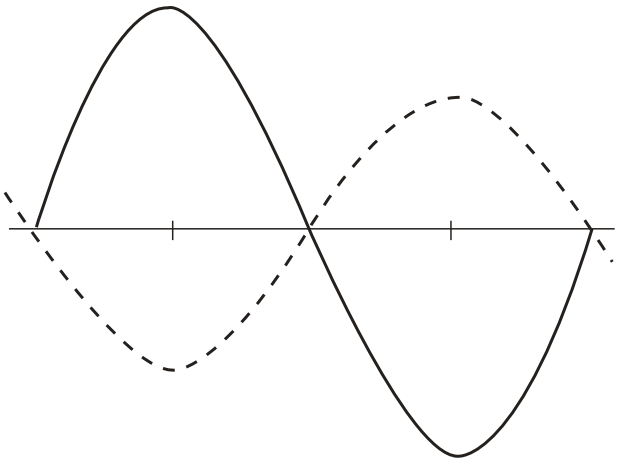
outgoing line A power or signal line that leaves a device, facility, or stage. Compare INCOMING LINE.

outlet A female receptacle that delivers a signal or operating power to equipment plugged into it.

outline flowchart In computer operations, a preliminary flowchart showing how a program will be divided into routines and segments, input and output functions, program entry points, etc.

out-of-line coding Instructions for a computer program routine stored in an area of memory other than that in which the routine's program is stored.

out of phase Pertaining to the condition in which the alternations or pulsations of two or more separate waves or wave phenomena, having identical frequencies, are out of step with each other. Compare IN PHASE.



out of phase

out-of-phase current Reactive current in an alternating-current circuit (i.e., current that is out of phase with voltage. Also see QUADRATURE CURRENT).

out-of-phase voltage Voltage across a reactance; so called because it is out of phase with the current.

outphaser A device that converts a sawtooth wave to a square wave. It is used in electronic organs and synthesizers.

outphasing modulation A system of modulation in which the sideband frequencies are shifted 90 degrees from the phase position in an amplitude-modulated wave. The resulting constant-envelope wave is then amplified with high efficiency and low distortion by a class-C stage; then the signal is reconverted to an amplitude-modulated one by phase shifting the carrier, with respect to the sidebands.

out-plant system A data-processing system in which a central computer receives data from remote terminals.

output **1.** Energy or information delivered by a circuit, device, or system. Compare INPUT, **1**. **2.** The terminals at which energy or information is taken from a circuit, device, or system. Compare INPUT, **2**.

output admittance Symbol, Y_o. The internal admittance of a circuit or device, as "seen" at the output terminals; the reciprocal of OUTPUT IMPEDANCE. Compare INPUT ADMITTANCE.

output amplifier See FINAL AMPLIFIER.

output area In a computer system, the portion of storage holding information for delivery to an output device. Also called *output block.*

output axis For a gyroscope that has received an input signal, the axis around which the spinning wheel precesses.

output block See OUTPUT AREA.

output buffer **1.** A circuit that follows an oscillator and reduces the effects of variable load impedance on the oscillator frequency or signal amplitude. **2.** An amplifier, usually with a voltage gain of 6 dB, that follows a video multiplexer. The amplifier drives a coaxial transmission line.

output bus driver In a computer, a device that amplifies output signals sufficiently to provide signals to other devices without undue loading of the supply line (bus).

output capability The maximum power or voltage output that a circuit can deliver without distortion or other improper operating conditions.

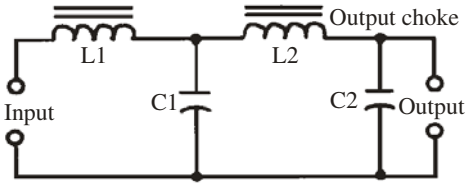
output capacitance Symbol, C_o. The internal capacitance of a circuit or device, as seen at the output terminals. Compare INPUT CAPACITANCE.

output capacitive loading For an operational amplifier at unity gain, the maximum capacitance that can be connected to the output of the amplifier before phase shift increases to the point of oscillation.

output capacitor **1.** In a capacitance-coupled circuit, the output coupling capacitor. Compare INPUT CAPACITOR. **2.** The last capacitor in a power-supply filter circuit.

output capacity The maximum output capability of a device or system expressed in appropriate units, such as current, voltage, power, torque, horsepower, etc.

output choke The last choke (inductor) in a power-supply filter circuit.



output choke

output circuit The circuit or subcircuit that constitutes the output portion of a network or device. Also see OUTPUT and OUTPUT TERMINALS. Compare INPUT CIRCUIT.

output-circuit distortion Distortion in the output portion of a circuit or device (such as a transistor or transformer), usually caused by an overload or nonlinear response.

output conductance Symbol, G_o. The internal conductance of a circuit or device, as "seen" at the output terminals. It is the reciprocal of OUTPUT RESISTANCE. Compare INPUT CONDUCTANCE.

output control **1.** The gain control of an amplifier. **2.** The level control of a variable power supply.

output coupling capacitor See OUTPUT CAPACITOR.

output coupling transformer See OUTPUT TRANSFORMER.

output current **1.** Symbol, I_o. The current delivered by a source, such as a battery, generator, or amplifier. Compare INPUT CURRENT, **1**. **2.** Symbol, I_o. Current flowing in the output leg or electrode of a circuit or device. Compare INPUT CURRENT, **2**.

output device **1.** A load device, such as a resistor, loudspeaker, lamp, relay, motor, etc., that utilizes the output energy delivered by a generator, amplifier, or network. **2.** A device, such as an output transformer, that serves to transfer energy or information from a circuit or device. Compare INPUT DEVICE. **3.** In computer operations, a device that presents the results of computer operation in a comprehensible form. Examples: printer, monitor, disk drive, tape drive, modem, etc.

output efficiency The efficiency of a device, such as a generator or amplifier, in delivering an output signal. For an amplifier, the efficiency ($Eff_{\%}$) is given as a percentage by the formula $Eff_{\%} = 100P_o/P_i$, where P_i is the direct-current power input, and P_o is the alternating-current (signal) power output.

output equipment See OUTPUT DEVICE, **3**.

output filter The direct-current filter of a power supply operating from alternating current. Also see CAPACITOR-INPUT FILTER and CHOKE-INPUT FILTER.

output gap A device via which current or power is intercepted from an electron beam in a beam-power tube.

output impedance Symbol, Z_o. The impedance "looking" into the output terminals of an amplifier, generator, or network. Compare INPUT IMPEDANCE.

output indicator A device, such as an analog meter, digital meter, or bar-graph meter, that provides a visual indication of the output-signal amplitude of an equipment.

output leakage current In an open-collector integrated circuit, the current from collector to emitter with the output in the "off" condition and a certain specified voltage applied to the device. It can be expressed in milliamperes or microamperes.

output limiting A process for automatically maintaining the amplitude of the signal delivered by a generator or amplifier. See, for example, AUTOMATIC GAIN CONTROL, AUTOMATIC MODULATION CONTROL, VOLUME COMPRESSION, and VOLUME LIMITER.

output load See OUTPUT DEVICE, **1**.

output load current **1.** The current through the output load of an amplifier. Generally, this current is expressed in root-mean-square (rms) form. **2.** The highest rms current that an amplifier can deliver to a load of a specified impedance.

output meter A meter that gives a quantitative or qualitative indication of the output of an amplifier or generator. See, for example, OUTPUT-POWER METER.

output offset In an integrated circuit, the voltage at the output when the inputs are grounded.

output port The output terminal of a logic device.

output power Symbol, P_o. The power deliverable by an amplifier, generator, or circuit. Also called *power output.* Compare INPUT POWER.

output-power meter A type of direct-reading wattmeter for measuring the power output of an amplifier or generator.

output regulator A circuit or device that automatically maintains the output of a power supply or signal source at a constant amplitude.

output resistance Symbol, R_o. The internal resistance of a circuit or device, as "seen" at the output terminals. Compare INPUT RESISTANCE.

output routine In computer operations, a routine (program segment) that performs the work involved in moving data to an output device, often including intermediate transferals and modifying the data as necessary.

output section See OUTPUT AREA.

output sink current In an integrated circuit, for a specified set of conditions at the input and output, current into the output as measured in milliamperes or microamperes.

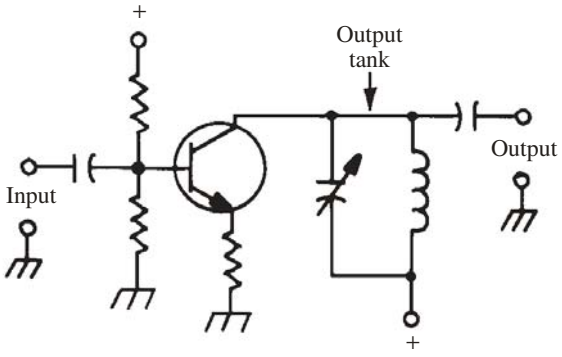
output source current In an integrated circuit, for a specified set of conditions at the input and output, the current out of the output, as measured in milliamperes or microamperes.

output stage The last stage of an amplifier. Delivers the signal to the load.

output terminals Terminals (usually a pair) associated with the output of a circuit or device (see OUTPUT, **1**, **2**). Compare INPUT TERMINALS.

output tank In a transmitter or power generator, a parallel-tuned combination of inductance and capacitance in the collector, drain, or plate circuit, that is generally tuned to resonance at the operating frequency. IT optimizes efficiency and couples the signal to the load. Compare INPUT TANK.

output transformer The output-coupling transformer that delivers signal voltage or power from an amplifier, generator, or network to a load or to another circuit. Compare INPUT TRANSFORMER.



output tank

output-transformerless Abbreviation, OTL. Pertaining to an oscillator, amplifier, or generator that requires no output coupling transformer.

output transistor A transistor in the final stage of an amplifier or generator; usually, it is a power transistor.

output tube A vacuum tube in the final stage of an amplifier or generator; usually, it is a power tube.

output unit See OUTPUT DEVICE.

output voltage **1.** Symbol, E_o or V_o. The voltage delivered by a source, such as a battery, generator, or amplifier. Compare INPUT VOLTAGE, **2**. **2.** Symbol, E_o or V_o. The voltage across the output leg or electrode of a circuit or device. Compare INPUT VOLTAGE, **2**.

output voltage compliance In an integrated circuit, the voltage range over which the output can be made to swing, while keeping the operation of the circuit within a certain maximum allowable nonlinearity limit. It is measured in volts or millivolts.

output voltage noise In an integrated circuit, the output noise over a given range of frequencies, as measured in peak-to-peak millivolts or microvolts. It can also be measured as the root-mean-square (rms) value.

output voltage swing In an integrated circuit with a specified load, the output-voltage change measured as a difference between maximum and minimum in volts or millivolts.

output voltage tracking For an integrated-circuit dual regulator, the difference between the absolute values of the output voltages of a dual regulator. It can be expressed as a specific voltage or as a percentage of the specified output voltage of the device.

output winding The secondary coil of an output transformer.

outside antenna See OUTDOOR ANTENNA.

outside booster See OUTDOOR BOOSTER.

outside diameter Abbreviation, OD. The outermost diameter of a body or figure having two concentric diameters (e.g., tubing or conduit). Compare INSIDE DIAMETER.

outside lead See FINISH LEAD.

outside transformer **1.** See OUTDOOR TRANSFORMER. **2.** A transformer mounted outside of an equipment in whose circuit it is included. External mounting can eliminate hum in the equipment circuit, and can help to prevent overheating.

oven **1.** Also called *crystal oven.* A chamber providing a closely controlled operating temperature for an electronic component, such as a quartz crystal. **2.** An enclosure in which electronic equipment can be tested at selected, precise high temperatures. Compare COLD CHAMBER.

overall feedback Positive or negative feedback around an entire system (such as a public-address system), as opposed to feedback confined to one stage or a few stages within the system.

overall gain The total gain of an entire system (such as a multistage amplifier), as opposed to that of one or several stages.

overall loudness The apparent intensity of an acoustic disturbance, generally measured with respect to the threshold of hearing, and expressed in decibels, relative to the threshold level.

overbiased unit A component, such as a transistor or vacuum tube, whose bias current or voltage is higher than the correct value for a given mode of operation. Compare UNDERBIASED UNIT.

overbunching In a velocity-modulated tube, such as a Klystron, the condition in which the buncher voltage exceeds the value required for optimum bunching.

overcharging In a secondary cell or battery, the application of charging current longer than necessary to obtain full charge. This can sometimes cause problems, such as cell heating.

overcompounded generator A dynamo-type generator having a compound field winding in which the series-field winding increases the field intensity beyond the point needed to maintain the output voltage. Compare UNDERCOMPOUNDED GENERATOR.

overcompounding A characteristic of electromechanical motors, resulting in increased running speed with decreasing load resistance.

overcoupled transformer A transformer having greater than critical coupling between its primary and secondary windings. In tuned circuits, such as intermediate-frequency (IF) transformers, this produces a double-peak response.

overcoupling Extremely close coupling (see CLOSE COUPLING).

overcurrent A current greater than the specified, nominal, or desired level. Compare UNDERCURRENT.

overcurrent circuit breaker A circuit breaker that opens when current exceeds a predetermined value.

overcurrent protection The use of a circuit breaker, relay, or other device to protect a circuit or system from damage resulting from an excessive flow of current.

overcurrent relay A protective relay that opens a circuit when current exceeds a predetermined value. Compare UNDERCURRENT RELAY.

overcutting In disc recording, the condition in which an excessively high amplitude signal causes the stylus to cut through the wall between adjacent grooves. Compare UNDERCUTTING.

overdamping Damping greater than the critical value (see DAMPING ACTION, **2**). Compare UNDERDAMPING.

overdesign Also called *overengineering.* **1.** To use an unnecessarily high safety factor in the design of equipment. **2.** To design equipment for performance superior to that which is required in the intended application. **3.** A design that results from operations defined in **1** and **2**.

overdrive In an analog amplifier, an undesirable operating condition that occurs with the application of excessive input signal voltage or power. This results in increased distortion, nonlinearity, excessive harmonic generation, and excessive output signal bandwidth. In a high-fidelity audio system, such a condition grossly degrades the quality of the sound. The amplifying device (transistor or vacuum tube) is in or near saturation during part of the signal cycle. This reduces the efficiency of the circuit, can cause excessive collector, drain, or plate current, and can overheat the base–collector (B-C) junction of a bipolar transistor. In the worst case, it can destroy the component.

overdriven amplifier See OVERDRIVEN UNIT.

overdriven unit An amplifier, oscillator, or transducer whose driving signal (current, voltage, power, or other quantity) is higher than that which the device can properly or efficiently handle for correct or intended operational performance.

overdub In audio recording, a method of combining two or more signals onto a single tape track. For example, a live voice can be recorded on a tape containing pre-recorded music.

overexcited Receiving higher than normal excitation, as in radio-frequency amplifiers or alternating-current generators.

overflow **1.** In computer or calculator operation, the condition in which an arithmetic operation yields a result exceeding the capacity of the location or display for a result. **2.** The carry digit that results from the condition described in (1).

overflow indicator **1.** In a digital calculator, a display that indicates that a numerical value is too large or too small to be shown with the available number of decimal places. **2.** In data processing, a display that indicates the presence of too many bits or characters for the available storage capacity.

overflow position In a digital computer, an auxiliary register position for developing the overflow digit (see OVERFLOW, **1**, **2**).

overflow record In data processing, a record that will not fit the storage area allotted for it, and that must be kept where it can be retrieved, according to some reference stored in its place.

overflow storage In a calculator or computer, extra storage space, allowing a small amount of overflow without loss of accuracy.

overhanging turns The turns in the unused portion(s) of a tapped coil.

overhead line A power or transmission line suspended above the ground between poles or towers.

over-horizon radar A form of radar used at high frequencies, in which pulses are transmitted and received. The signals are returned to earth via the ionosphere, both in the forward and reflected directions, making it possible to detect such things as missile launchings from thousands of miles away.

over-horizon transmission See FORWARD SCATTER.

overinsulation Use of excessive insulation for a particular application. Compare UNDERINSULATION.

over insulation The insulation (usually a strip of tape) laid over a wire brought up from the center of a coil. Compare UNDER INSULATION.

overlap **1.** The time during which two successive operations are performed simultaneously. **2.** In a facsimile or television system, a condition in which the scanning line is wider than the center-to-center separation between adjacent scanning lines.

overlap radar A long-range radar situated in one sector and covering part of another sector.

overlay **1.** A sheet of transparent or translucent material laid over a schematic diagram for the purpose of tracing connections that have been made in wiring an equipment from the diagram. **2.** In computer operations, a method whereby the same internal storage locations are used for different parts of a program during a program run. It is used when the total storage requirements for instructions exceed the available main storage capacity.

overlay transistor A double-diffused epitaxial transistor having separate emitters connected together by means of diffusion and metallizing to increase the edge-to-area ratio of the emitters. This design raises the current-handling ability of the transistor. Also see DIFFUSED TRANSISTOR and EPITAXIAL TRANSISTOR.

overload **1.** Current or power drain in excess of the rated output of a circuit or device. **2.** An excessive driving signal.

overload circuit breaker See CIRCUIT BREAKER.

overloaded amplifier A power amplifier delivering excessive output power. Compare UNDERLOADED AMPLIFIER, **2**.

overloaded oscillator An oscillator from which excessive power is drawn, causing instability, frequency shift, lowered output voltage, and overheating.

overload indication Any attention-catching method, such as an audible or visual alarm, for warning that a prescribed signal or power level has been exceeded.

overload level The amount of overload that can safely be applied to an equipment (see OVERLOAD, **1**).

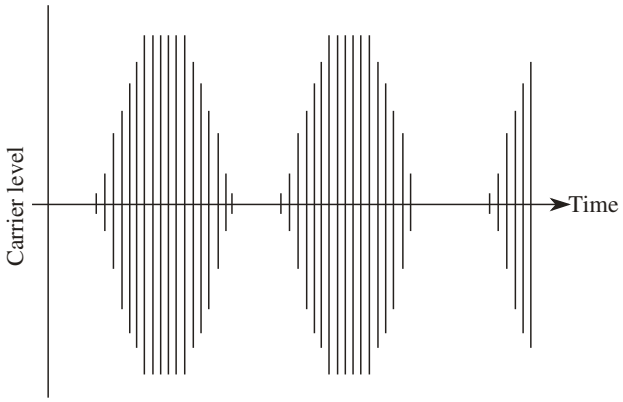
overload protection The use of circuit breakers, relays, automatic limiters, and similar devices to protect equipment from overload damage by reducing current or voltage, disconnecting the power supply, or both.

overload recovery time Following an overdrive at the input of an integrated-circuit device, the time required for the output to resume its normal characteristics.

overload relay A relay actuated when circuit current exceeds a predetermined value. Compare UNDERLOAD RELAY.

overload time The maximum length of time that an equipment can safely be subjected to an overload level of current.

overmodulation Modulation in excess of a prescribed level—especially amplitude modulation greater than 100%. Compare COMPLETE MODULATION and UNDERMODULATION.



overmodulation

overmodulation alarm See OVERMODULATION INDICATOR.

overmodulation indicator A device, such as a neon bulb, incandescent lamp, light-emitting diode, analog meter, or digital meter, adapted to give an alarm when the modulation percentage of a signal exceeds a predetermined value.

overpotential See OVERVOLTAGE.

overpower relay A relay actuated by a rise in power above a predetermined level. Compare UNDERPOWER RELAY.

overpressure For a pressure transducer, pressure in excess of the maximum rating of the device.

override **1.** To intentionally circumvent an automatic control system. **2.** To bridge a functional stage of a system.

overscanning The deflection of the beam of a cathode-ray tube beyond the edges of the screen.

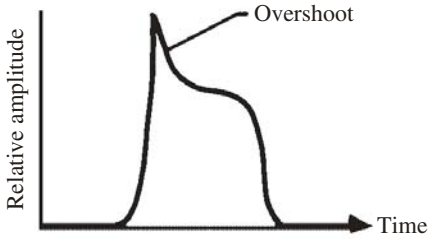
overshoot **1.** The momentary increase of a quantity beyond its normal maximum value (e.g., the spike sometimes seen on a square wave because of the overswing of a rising voltage). **2.** Momentary overtravel of the pointer of an analog meter.

overswing See OVERSHOOT, **2**.

overtemperature protection The use of an automatic device, such as a thermal relay or thermostat, to disconnect a device from the power supply when the device's temperature becomes excessive.

overthrow See OVERSHOOT, **2**.

overtone See HARMONIC.



overshoot

overtone crystal A piezoelectric quartz crystal that oscillates at odd multiples of the frequency for which it was cut. This allows crystal operation at frequencies otherwise obtainable only from a fundamental-frequency crystal ground so thin as to be prohibitively fragile.

overtone oscillator A crystal oscillator using an OVERTONE CRYSTAL.

overtravel See OVERSHOOT, **2**.

overvoltage A voltage higher than a specified or rated value. Compare UNDERVOLTAGE.

overvoltage circuit breaker A circuit breaker that opens when voltage exceeds a predetermined value.

overvoltage protection The use of a special circuit or device to protect equipment from excessive voltage. When voltage increases beyond the overvoltage limit, the protective circuit causes shutdown.

overvoltage relay A relay actuated when voltage rises above a predetermined value. Compare UNDERVOLTAGE RELAY.

overwrite In computer operations, to record new data over existing data (e.g., to update the files on a magnetic disk or tape).

Ovshinsky effect In thin-film solid-state devices, the tendency for switches to have the same characteristics for currents in either direction.

O wave One (the ordinary) of the pair of components into which an ionospheric radio wave is divided by Earth's magnetic field. Compare X WAVE.

Owen bridge A wide-range four-arm bridge that measures inductance in terms of a standard capacitance and bridge-arm resistances.

own coding Additional program steps added to vendor-supplied software so that it can be modified to fit special needs.

ox Abbreviation of OXYGEN.

oxidation **1.** The combination of a substance with oxygen. Generally a slow process, such as the corrosion of iron or aluminum in the atmosphere. The process is accelerated by the presence of moisture and/or high temperatures. **2.** The loss of electrons from a cell or battery during discharge.

oxidation-reduction potential The potential at which oxidation occurs at the anode of an electrolytic cell, and at which reduction occurs at the cathode.

oxide-coated cathode See OXIDE-COATED EMITTER.

oxide-coated emitter An electron-tube cathode or filament coated with a material, such as thorium oxide, for increased electron emission at low emitter temperatures.

oxide-coated filament See OXIDE-COATED EMITTER.

oxide film **1.** The thin film of iron oxide that constitutes the recording surface of a magnetic disk or tape. **2.** The layer of copper oxide formed on the copper plate of a copper-oxide rectifier.

oxide-film capacitor An electrolytic capacitor, so called because the dielectric is a thin oxide film.

oxide rectifier A solid-state rectifier using a junction between copper and copper oxide. Also called COPPER-OXIDE RECTIFIER.

oximeter A photoelectric instrument for measuring the oxygen content of the blood. It operates by passing visible light through the earlobe, and analyzing the color and intensity of the emerging beam. Also called ANOXEMIA TOXIMETER.

oxygen Symbol, O. Abbreviation, O_2. A gaseous element. Atomic number, 8. Atomic weight, 15.999. Constitutes 21% of Earth's atmosphere. It readily combines with various elements to form compounds (see OXIDATION).

oxygen analyzer An electronic gas analyzer designed especially to measure oxygen content. The operation of this instrument is based on the paramagnetic properties of oxygen.

oxygen recombination In nickel-cadmium (NICAD) cells and batteries, a process in which oxygen is generated in the vicinity of the positive electrode, and is reduced with water in the vicinity of the negative electrode. This produces battery heating.

oz **1.** Abbreviation of OUNCE. **2.** Abbreviation of OZONE.

oz-in Abbreviation of OUNCE-INCH.

ozocerite An insulating mineral wax. Dielectric constant, 2.2. Dielectric strength, 4 to 6 kV/mm. Also spelled OZOKERITE.

ozone Symbol, O_3. An allotropic form of oxygen. Its formula indicates that each molecule has three atoms. Produced by the action of ultraviolet rays (or electrical discharge) on oxygen, its characteristic odor (somewhat like weak chlorine) can often be detected around sparking contacts or in the air after a thunderstorm.

ozone layer In the earth's atmosphere, a layer of ozone gas in the upper troposphere and lower stratosphere. It is produced by ultraviolet radiation from space, mainly from the sun. The ozone layer tends to block ultraviolet radiation, reducing the amount that reaches the surface of the earth.

ozone monitor An instrument for measuring the concentration of ozone in the atmosphere. One version measures the extent to which ultraviolet radiation is absorbed by a sample of air; the greater the absorption, the higher the ozone concentration in the sample.

P **1.** Symbol for POWER. **2.** Symbol for PLATE (of a vacuum tube). **3.** Symbol for PHOSPHORUS. **4.** Abbreviation of PRESSURE. **5.** Symbol for PRIMARY. **6.** Abbreviation for prefix PETA-. **7.** Symbol for PERMEANCE. **8.** Abbreviation of POINT.

p **1.** Abbreviation of prefix PICO-. **2.** Subscript for PEAK. **3.** Abbreviation of POUND. **4.** Abbreviation of POINT (often capitalized). **5.** Subscript for PRIMARY. **6.** Subscript for PLATE (of a vacuum tube). **7.** Abbreviation of PITCH. **8.** Abbreviation of PER.

PA **1.** Abbreviation of POWER AMPLIFIER. **2.** Abbreviation of PULSE AMPLIFIER. **3.** Abbreviation of *particular average.* **4.** Abbreviation of *pilotless aircraft.* (Also, P/A.) **5.** Abbreviation of PUBLIC ADDRESS (as in PA system).

Pa **1.** Symbol for PROTACTINIUM. **2.** Symbol for PASCAL.

pA Abbreviation of PICOAMPERE.

pacemaker See CARDIAC STIMULATOR.

pacer See CARDIAC STIMULATOR.

Pacific Standard Time Abbreviation, PST. Local mean time at the 120th meridian west of Greenwich. Also see GREENWICH MEAN TIME, STANDARD TIME, TIME ZONE, and COORDINATED UNIVERSAL TIME.

pack A technique for maximizing a computer memory device's storage capacity, wherein more than one information item is stored in a single storage unit. Also called *crowd.*

package **1.** The enclosure for an electronic device or system. This includes a wide range of housings, from the simple encapsulation of miniature transistors to forced-air-cooled enclosures for heavy power units. **2.** To assemble and house an electronic equipment, or to design a housing for it, in accordance with good engineering techniques. **3.** A computer program of general use for an application (e.g., *payroll package*).

package count The number of discrete packaged circuits in a system.

packaging density **1.** See VOLUMETRIC EFFICIENCY. **2.** Computer storage capacity in terms of the number of information units that can be contained on a given segment of a magnetic medium. Also called PACKING DENSITY. **3.** Within a given integrated circuit, the capacity in terms of the number of active devices that can be contained on a single silicon chip.

packet **1.** A unit of digital information in PACKET COMMUNICATIONS. It consists of a header followed by a certain number of data bits or bytes. **2.** See WAVE PACKET. **3.** See PACKET COMMUNICATIONS. **4.** See PACKET RADIO.

packet communications A method via which data is exchanged through a network between or among people or computers. Information is sent and received in blocks of information called *packets.* Each packet is routed individually through the network according to the most efficient possible path at the time of its transit. At the destination, the packets are reassembled into the original signal. This scheme makes more efficient use of network resources than continuous-connection or single-path methods. However, when network usage is heavy, there can be a delay in the arrival of a sufficient number of packets to produce an intelligible received signal.

packet radio The transmission and reception of PACKET COMMUNICATIONS data via radio.

packet switching In telephony, a method of connection in which data is exchanged between subscribers by splitting the data into units (packets). Each packet is sent over the optimum path at the time of transmission. The signal path can, and usually does, vary from packet to packet. At the destination, the packets are reassembled into the original singal. The connection is in effect nonexistent during periods of silence (no data transmitted by either subscriber). Compare CIRCUIT SWITCHING.

packing In the button of a carbon microphone, bunching and cohesion between the carbon granules.

packing density The number of discrete package circuits within a given surface area or volume.

packing factor **1.** See VOLUMETRIC EFFICIENCY. **2.** In computer operations, the number of bits that can be recorded in a given length of magnetic memory surface. Also called PACKING DENSITY.

pack transmitter A portable transmitter that can be strapped to the operator's back.

pack unit A portable transceiver that can be strapped to the operator's back or carried on an animal's back.

PACM Abbreviation of *pulse-amplitude code modulation.*

pad **1.** An attenuator network (usually a combination of resistors) that reduces the amplitude of a signal by a desired amount while maintaining constant input and output impedance. **2.** In computer operations, to make a record a fixed size by adding blanks or dummy characters to it. **3.** To lower the frequency of an inductance-capacitance (LC) circuit by adding capacitance to an already capacitively tuned network.

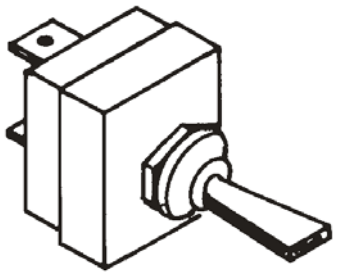
padder See OSCILLATOR PADDER.

padding capacitor See OSCILLATOR PADDER.

padding character In a digital communications system, a character that is inserted solely for the purpose of consuming time while no meaningful characters are sent. The insertion of such characters maintains the synchronization of the system.

paddle-handle switch A toggle switch the lever of which is a flattened rod. Compare BAT-HANDLE SWITCH, ROCKER SWITCH, and SLIDE SWITCH.

PADT Abbreviation of POST-ALLOY-DIFFUSED TRANSISTOR.



paddle-handle switch

page A display of text data on a computer display that completely fills the screen.

page printer A computer peripheral that prints a message in lines on a page, according to an established format, rather than in a single line.

pager **1.** A public-address system used for summoning purposes. **2.** See BEEPER, **2**.

page turning The successive display of pages (see PAGE).

pair **1.** Two wires, especially two insulated conductors in a cable. **2.** A set of two particles or charge carriers (e.g., *electron-hole pair*). **3.** A set of two transistors or vacuum tubes, operating together in push-pull or parallel in a power amplifier.

paired cable A cable consisting of separate twisted pairs of conducting wires.

paleomagnetism The study of certain rocks and minerals to determine the nature of the earth's magnetic field at the time the rocks were formed. When the age of the rock is determined by means of radioactive dating, and numerous rock samples are found covering many different eras, the nature of the earth's magnetic field can be graphed over time.

palladium Symbol, Pd. A metallic element of the platinum group. Atomic number, 46. Atomic weight, 106.42.

palletizing In industrial robots, the automatic placing of objects in a tray according to a computer program.

Palm See HANDHELD COMPUTER.

Palmer scan In radar, a method of simultaneously scanning the azimuth and the elevation.

PalmPilot See HANDHELD COMPUTER.

palmtop computer See HANDHELD COMPUTER.

PAM Abbreviation of PULSE-AMPLITUDE MODULATION.

Pan In radiotelephony, a spoken word indicating that an urgent message is to follow. It is equivalent to the XXX of radiotelegraphy.

pan **1.** To make a panoramic sweep [e.g., to sweep a wide area with a beam (as from an antenna), or to sweep a wide band of frequencies with a suitable tuning circuit]. **2.** A panoramic sweep made as defined in **1**. **3.** In audio engineering, to gradually shift from one audio channel to another or from one reproducer to another.

pan and tilt **1.** An azimuth-elevation mounting for a television camera. **2.** The simultaneous movement of a television camera in the vertical and horizontal directions.

pancake coil See DISK WINDING.

panel A flat surface on which are mounted the controls and indicators of an equipment, for easy access to the operator.

panel lamp **1.** See ELECTROLUMINESCENT PANEL. **2.** See PANEL LIGHT.

panel light A pilot light for illuminating the front panel of a piece of equipment.

panel meter A usually small meter for mounting on, or through an opening in, a panel.

panic button In a security system, a button or switch that immediately triggers an alarm when it is closed.

panoramic adapter An external device that can be connected to a receiver to sweep a frequency band and indicate carriers on the air as pips on a screen at the corresponding frequency points. Also called *pan adapter.*

panoramic display **1.** A wide-angle display. **2.** A spectrum-analyzer display that shows a wide range of frequencies, from zero to well above the maximum frequency in the monitored system.

panoramic radar An omnidirectional radar (i.e., one that transmits wide-beam signals in all directions without scanning).

panoramic receiver A receiver that displays pips on a screen to show carriers on the air in a given frequency band. All frequencies in the band are presented along the horizontal axis of the screen.

panpot A potentiometer with which panning can be achieved (see PAN, **3**).

pan-range A form of radar display in which target motion can be ascertained.

pantography The transmission of radar information to a distant location for observation or recording.

Papa Phonetic alphabet code word for the letter P.

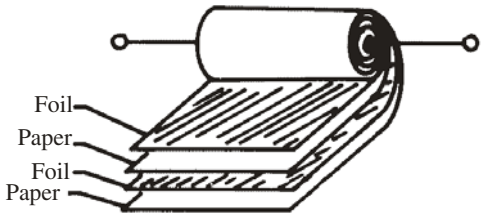
paper advance mechanism In a data-processing system, the part of a printer that moves (sometimes by computer control) the paper through the printer.

paper capacitor A component that is made by placing paper, soaked with mineral oil, between two strips of foil. The assembly is rolled up, and wire leads are attached to the two pieces of foil. Finally, the rolled-up foil and paper are enclosed in a cylindrical case. These components are sometimes found in radio-frequency (RF) electronic equipment. They have values ranging from about 0.001 microfarads (μF) to 0.1 μF, and can handle low to moderate voltages, usually up to about 1000 volts. Compare CERAMIC CAPACITOR, ELECTROLYTIC CAPACITOR, MICA CAPACITOR, PLASTIC-FILM CAPACITOR, TANTALUM CAPACITOR.

PAR Abbreviation of PRECISION APPROACH RADAR.

par Abbreviation of PARALLEL.

parabola A plane curve that is the locus of points that are equidistant from a fixed point (the focus) and a fixed straight line (the directrix). In the Cartesian *xy*-plane, the general equation is $y = ax2 + b$, where a and b are constants.



paper capacitor

parabola control See VERTICAL-AMPLITUDE CONTROL, **2**.

parabola generator A circuit for generating a parabolic-waveform signal.

parabolic microphone A directional microphone mounted at the principal focus of a parabolic sound reflector; the front of the microphone faces the inside of the parabola. It is useful for detecting sounds from great distances.

parabolic reflector Also called *paraboloidal reflector.* A reflector having the shape of a paraboloid. It is particularly useful for focusing or directing radiation. For example, if a radiator, such as an antenna rod, is placed at the focus of the paraboloid, a beam of parallel rays will be emitted by the reflector.

paraboloid The surface generated by a PARABOLA rotated about its axis of symmetry.

paraffin A relatively inexpensive, easily available, solid, white petroleum wax. At one time, it was used to impregnate capacitors and coils and to waterproof paper used for insulating purposes.

parallax The apparent shift in the position of a relatively nearby object when the observer moves or alternately blinks either eye. Thus, a pointer-type meter will seem to give different readings when viewed from different angles. Some meters have mirrored scales to eliminate this effect.

parallel **1.** Pertaining to the type of operation in a computer when all elements in an information item (e.g., bits in a word) are acted upon simultaneously, rather than serially (one at a time). **2.** The condition in which two comparably sized objects or figures are equidistant at all facing points. **3.** Pertaining to the shunt connection of components or circuits.

parallel access In computer operations, inputting or outputting data to or from storage in whole elements of information items (a word, rather than a bit at a time, for example).

parallel adder In a computer or calculator, an adder in which corresponding digits in multibit numbers are added simultaneously. Also see PARALLEL, **1**.

parallel antenna tuning Antenna-feeder tuning in which the tuning capacitor is connected in parallel with the two feeder wires. Compare SERIES ANTENNA TUNING.

parallel arithmetic unit See PARALLEL ADDER.

parallel capacitance **1.** A capacitance connected in parallel (shunt) with some other component. **2.** The capacitance between the turns of a coil. Also see DISTRIBUTED CAPACITANCE.

parallel capacitors Two or more capacitors connected in parallel (shunt) with each other. The total capacitance is equal to the sum of the individual capacitances. Also see PARALLEL CIRCUIT.

parallel circuit A circuit in which the components are connected across each other (i.e., so that the circuit segment could be drawn showing component leads bridging common conductors as rungs would across a ladder). Compare SERIES CIRCUIT.

parallel-component amplifier An amplifier stage in which the active devices (transistors or vacuum tubes) are connected in parallel with each other for increased power output. Also see PARALLEL CIRCUIT.

parallel-component oscillator An oscillator stage in which transistors are connected in parallel with each other for increased power output. Also see PARALLEL CIRCUIT.

parallel computer A computer equipped to handle more than one program at a time, but not through the use of multiple programming or time-sharing.

parallel-cut crystal See Y-CUT CRYSTAL.

parallel-diode half-wave rectifier See PARALLEL LIMITER.

parallel-fed amplifier An amplifier circuit in which the direct-current operating voltage is applied in parallel with the alternating-current output voltage. Also see PARALLEL FEED.

parallel-fed oscillator An oscillator circuit in which the direct-current operating voltage is applied in parallel with the alternating-current output voltage. Also see PARALLEL FEED.

parallel feed **1.** The presentation of parallel alternating-current (ac) and direct-current (dc) voltages to a device. **2.** The presentation of a dc operating voltage in parallel with the ac output voltage of a device (as in a parallel-fed amplifier or oscillator). Also see SHUNT FEED.

parallel gap welding A welding technique using two electrodes separated by a gap.

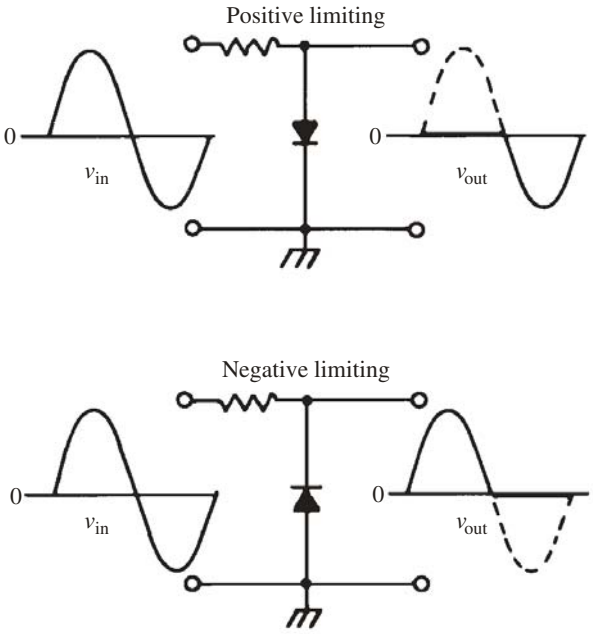
parallel gate circuit **1.** A gate circuit using two bipolar transistors with parallel-connected collectors and emitters, and a common collector resistor. The input signal is applied to one base, and the control signal to the other. **2.** A gate circuit using two field-effect transistors with parallel-connected drains and sources, and a common drain resistor. The input signal is applied to one gate, and the control signal to the other.

parallel inductance An inductance connected in parallel (shunt) with some other component.

parallel inductors Inductors connected in parallel and separated or oriented to minimize the effects of mutual inductance. Also see PARALLEL CIRCUIT.

parallel inverse feedback In a single-ended audio amplifier circuit, a simple system for obtaining negative feedback: A high resistance is connected from the output-transistor collector or drain to the driver-transistor collector or drain.

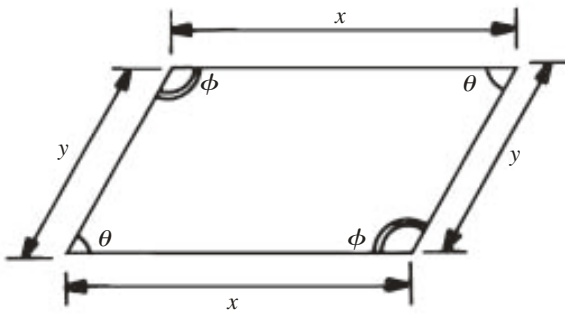
parallel limiter A limiter (clipper) circuit in which the diode is in parallel with the signal. Compare SERIES LIMITER.



parallel limiter

parallel-line tuning At ultra-high frequencies (UHF) and microwave frequencies, the use of two parallel wires or rods for tuning. A straight short-circuiting bar is slid along the wires to accomplish tuning.

parallelogram A two-dimensional geometric figure that has four sides. Opposite pairs of sides are parallel. Opposite interior angles have equal measure.



parallelogram

parallelogram of vectors A graphic device for finding the sum of two vectors. A parallelogram is constructed for which the two vectors are adjacent sides. The sum of the vectors is represented by the diagonal of the parallelogram.

parallel operation In computer operations, the simultaneous transmission of all bits in a multibit word over individual lines, as compared with the serial transmission of a word bit by bit.

parallel output A digital output consisting of two or more lines, all of which carry data at the same time.

parallel processing In computer operations, the simultaneous processing of several different programs through separate channels. Compare SERIAL PROCESSING.

parallel Q Symbol, Q_p. The figure of merit of a parallel circuit of inductance, capacitance, and resistance.

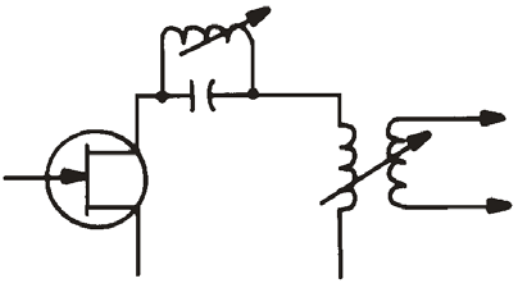
parallel resistance **1.** A resistance connected in parallel (shunt) with some other component. **2.** The resistance between the plates of a capacitor. **3.** The resistance across a coil.

parallel resistors Resistors connected in parallel. If the individual resistances are represented by R_1, R_2, R_3, . . ., Rn, then total resistance R_t is equal to $1/(1/R_1 + 1/R_2 + 1/R_3 + \ldots + 1/R_n)$. Also see PARALLEL CIRCUIT.

parallel resonance Resonance in a circuit consisting of a capacitor, inductor, and alternating-current source connected in parallel. At the resonant frequency, the inductive reactance is equal in magnitude, but opposite in effect, to the capacitive reactance. The capacitor current and inductor current are maximum, the line current is minimum, and the circuit impedance is maximum. Compare SERIES RESONANCE.

parallel-resonant circuit A resonant circuit in which the capacitor, inductor, and alternating-current source are connected in parallel. Compare SERIES-RESONANT CIRCUIT.

parallel-resonant trap A wavetrap consisting of a parallel-resonant inductance-capacitance (LC) circuit. Compare SERIES-RESONANT TRAP.

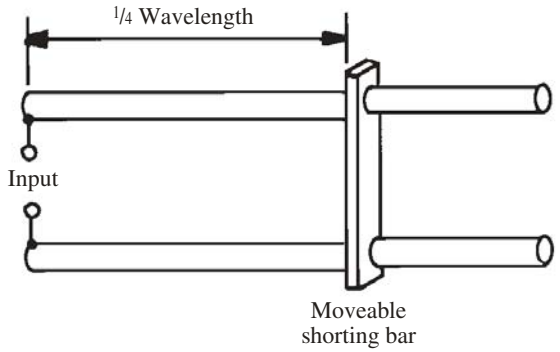


parallel-resonant trap

parallel-resonant wavetrap See PARALLEL-RESONANT TRAP.

parallel-rod oscillator An ultra-high-frequency (UHF) oscillator tuned by means of two straight, parallel quarter- or half-wave rods, one rod connected to the base or gate of a transistor, and the other rod connected to the collector or drain.

parallel-rod tuning Adjustment of the resonant frequency of a section of open-wire transmission line. A movable shorting bar allows quarter-wave resonance. The impedance at resonance is very high.



parallel-rod tuning

parallel-series Also called *series-parallel.* Pertaining to an arrangement of components, usually similar (e.g., resistances), consisting of parallel circuits connected in series with each other, or of series circuits connected in parallel with each other. Usually, the component values or ratings are all identical, so currents and/or voltages are equally shared among them. Also see PARALLEL CIRCUIT and SERIES CIRCUIT.

parallel-series capacitors Capacitors connected in PARALLEL-SERIES, usually to obtain higher voltage and/or current ratings than an individual capacitor can provide.

parallel-series inductors Inductors connected in PARALLEL-SERIES and separated or oriented to minimize the effects of mutual inductance.

parallel-series resistors Resistors connected in PARALLEL-SERIES, usually to obtain a higher power rating than an individual resistor can provide.

parallel storage In a computer, storage in which all information items can be made available in the same amount of time.

parallel-tee amplifier A bandpass amplifier having a parallel-tee network in its negative-feedback path. The null frequency of the network determines the pass frequency of the amplifier.

parallel-tee measuring circuit A parallel-tee network used for measuring circuit constants. Also called TWIN-TEE MEASURING CIRCUIT.

parallel-tee network A resistance-capacitance (RC) network containing two tee sections (with R and C elements opposite in the tees) connected in parallel. The network produces a null at one frequency. Also called TWIN-T NETWORK.

parallel-tee oscillator A resistance-capacitance tuned oscillator having a parallel-tee network in its negative-feedback path. The null frequency of the network determines the oscillator frequency.

parallel transfer A form of digital information transfer, consisting of two or more lines that carry data at the same time.

parallel-wire line A transmission line consisting of two parallel wires whose separation is kept

constant by dielectric rods (open-wire line) or a solid dielectric web (ribbon line).

parallel-wire tank In an ultra-high-frequency (UHF) amplifier or oscillator, a resonant circuit consisting of two separate parallel wires connected to the transistor(s) or tube(s) at one end, and short-circuited or tuned at the other end.

paramagnet A paramagnetic substance (see PARAMAGNETISM). Compare DIAMAGNET.

paramagnetic Possessing PARAMAGNETISM. Compare DIAMAGNETISM.

paramagnetism The state of having a magnetic permeability slightly greater than **1**. Compare DIAMAGNETISM.

parameter **1.** An operating value, constant, or coefficient that can be either a dependent or an independent variable (e.g., a transistor-electrode current or voltage). **2.** The ratio of one coefficient to another, where both are either fixed or variable (e.g., transconductance of a vacuum tube).

parameter word In a computer memory, a place having a capacity of a word (bit group) in which is stored a parameter for a program.

parametric amplifier A radio-frequency power amplifier based on the action of a voltage-variable capacitor in a tuned circuit.

parametric amplifier diode See VARACTOR.

parametric converter A frequency converter in which a parametric device, such as a varactor, is used to change a signal of one frequency to a signal of another frequency. Also see PARAMETRIC DOWN-CONVERTER and PARAMETRIC UP-CONVERTER.

parametric diode A variable-capacitance diode (see VOLTAGE-VARIABLE CAPACITOR, **1**).

parametric down-converter A parametric converter in which the output signal is of a lower frequency than the input signal. Compare PARAMETRIC UP-CONVERTER.

parametric equalizer A set of audio filters similar to a GRAPHIC EQUALIZER, except that the center frequencies are adjustable, rather than fixed. The center frequencies are selected by the operator; then the attenuation level (in decibels) is set for each frequency. It is used in audio recording studios.

parametric modulation Modulation in which either the inductance or capacitance of a tank circuit or coupling device is varied at the modulation frequency.

parametric oscillator An oscillator that generates visible light energy by means of a parametric amplifier and a tunable cavity.

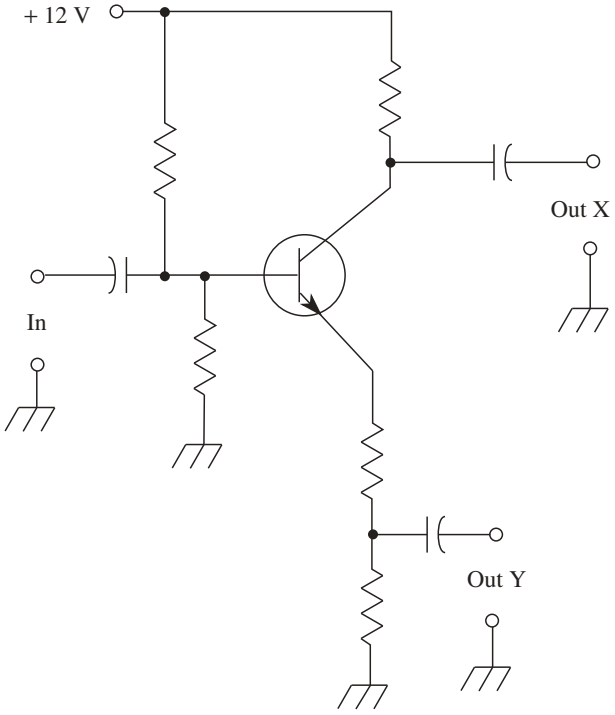
parametric up-converter A parametric converter in which the output signal is of a higher frequency than the input signal. Compare PARAMETRIC DOWN-CONVERTER.

parametron See PHASE-LOCKED OSCILLATOR.

paramistor A device consisting of several digital circuit elements that use parametric oscillators.

paramp Abbreviation of PARAMETRIC AMPLIFIER.

paraphase inverter A single-transistor phase inverter in which the two out-of-phase output signals are obtained by taking one output from the collector or drain, and the other output from the emitter or source. Thus, the 180-degree phase difference between collector/drain and emitter/source is exploited.



paraphase inverter

parasitic See PARASITIC OSCILLATION.

parasitic antenna See PARASITIC ARRAY, PARASITIC ELEMENT.

parasitic array Any of several types of directional antenna employing parasitic elements, sometimes in combination with phasing, to obtain directivity and gain. Common examples include the Yagi and quad. Arrays with numerous parasitic elements (usually directors) can produce upwards of 15 dBd forward gain. When several high-gain arrays are phased, the realizable gain becomes greater still. Two-element, three-element, and four-element arrays are common below 30 MHz. At very-high and ultra-high frequencies, especially above 100 MHz, bays of antennas of this type are used in satellite communications and radio astronomy. See PARASITIC ELEMENT, QUAD ANTENNA, YAGI ANTENNA.

parasitic capacitance Stray capacitance. It can be internal or external to a circuit and can introduce undesirable coupling or bypassing.

parasitic choke A small radio-frequency choke coil (with or without a shunting resistor) that suppresses or eliminates parasitic oscillation in a power amplifier.

parasitic director In a multielement directional antenna, a parasitic element acting as a director; usually, it is a few percent shorter than the driven element.

parasitic element An electrical conductor that comprises an important part of an antenna system, but that is not directly connected to the feed line. Such elements are used for the purpose of obtaining directivity and power gain. They operate via electromagnetic coupling to the driven element(s). The principle of operation was first discovered by the Japanese engineers Yagi and Uda, who observed that antenna elements parallel to a driven element but not connected to anything, at a specific distance from the driven element, and having a certain length, cause the radiation pattern to show gain in one direction and loss in the opposite direction. See DRIVEN ELEMENT, PARASITIC ARRAY, PARASITIC DIRECTOR, PARASITIC REFLECTOR.

parasitic-element directive antenna See PARASITIC ARRAY.

parasitic eliminator See PARASITIC SUPPRESSOR.

parasitic excitation Excitation of a beam-antenna element without a direct connection to the transmitter. Thus, a director or reflector element can be excited by the field of the radiator element.

parasitic inductance Stray inductance (e.g., the internal inductance of a wirewound resistor).

parasitic oscillation Extraneous, useless oscillation present as a fault in an electronic circuit, particularly a radio-frequency power amplifier.

parasitic reflector In a multielement beam antenna, a parasitic element acting as a reflector; usually, it is a few percent longer than the driven element.

parasitic resistance Stray resistance (e.g., the inherent, internal resistance of a multilayer coil).

parasitic suppressor A small resistor, coil, or parallel combination of the two, connected in series with the plate or collector of a vacuum tube or transistor to eliminate parasitic oscillations in a radio-frequency power amplifier.

PARD Abbreviation of PERIODIC AND RANDOM DEVIATION.

parity **1.** At par (with respect to the even-or-odd state of the characters in a group). **2.** Having the quality that the number of bits (or the number of similar bits) are even or odd, as intended.

parity bit **1.** In computer operations, a logic 1 added to a group of bits so that the number of 1s in the group is, according to specification, even or odd. **2.** In computer operations, a check bit that can be a logic 1 or 0, depending on the parity (see PARITY, **1**) of the total of 1s in the bit group being checked.

parity check A check of the integrity of data being transferred by adding the bits in, for example, a word, and then determining the parity bit needed and comparing that with the transmitted parity bit.

parity error An error disclosed by a parity check.

parity tree A digital device used to check parity.

parsec Abbreviation, pc. The distance at which the mean radius of the earth's orbit around the sun subtends an angle of 1 second of arc; 1 pc = 3.0857×10^{13} kilometers or 3.2616 light years.

part See CIRCUIT COMPONENT, **1**.

part failure The usually destructive breakdown of a circuit component.

partial One of the frequencies in a complex musical tone. It might be a harmonic of the fundamental frequency, although this is not always the case.

partial carry The temporary storage of some or all of the carry information in a digital calculation.

particle **1.** A tiny, discrete bit of matter. **2.** A unit of matter smaller and lighter than an atom. See, for example, ANTIPARTICLE, ELECTRON, MESON, NEUTRETTO, NEUTRINO, NEUTRON, NUCLEON, POSITRON, and PROTON.

particle accelerator See ACCELERATOR, **1**.

particle theory of radiation In physics, a model that explains the nature of electromagnetic radiation (radio waves, infrared, visible light, ultraviolet, X rays, and gamma rays) in terms of discrete particles. Each particle, called a PHOTON, carries a certain amount of energy that depends on the wavelength of the radiation.

particle velocity **1.** The speed and direction of the particles from a source of atomic radiation. **2.** The speed and direction of the molecules in the medium of an acoustic disturbance.

partitioning In computer operations, breaking down a large block of data into smaller blocks that can be better handled by the machine.

parton model A model for atomic nuclei, in which protons and neutrons are made up of smaller particles called *partons.* Subparticles have been found, commonly called *quarks.*

Pascal A high-level computer programming language, similar to BASIC or FORTRAN in structure. It is used in some schools to teach computer programming.

pascal Symbol, Pa. The SI (derived) unit of pressure; 1 $Pa = 1\ N/m^2 = 1.4503 \times 10^{-4}\ lb/in^2$.

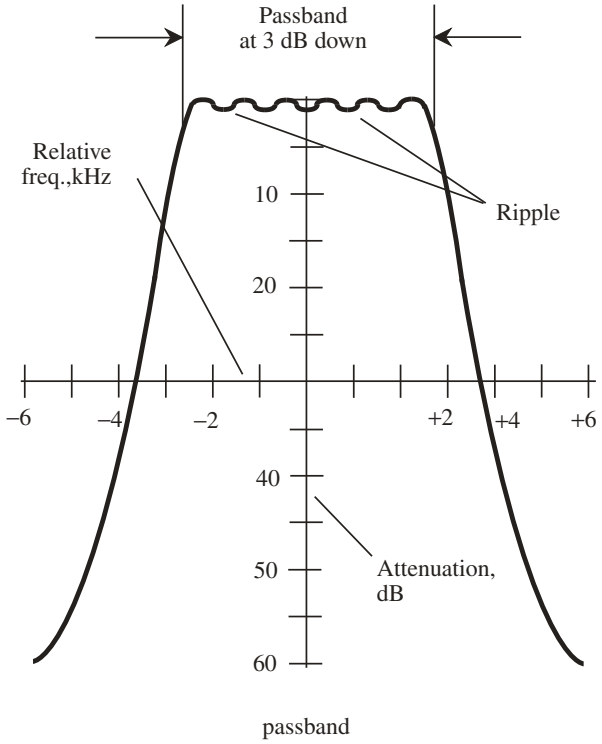
Paschen-Back effect See ZEEMAN EFFECT.

Paschen's law For a two-element, parallel-plate, gas-discharge tube, the plate-to-plate sparking potential is proportional to Pd, where P is the gas pressure, and d is the distance between plates.

pass amplifier A tuned amplifier having the response of a bandpass filter. Like the filter, the amplifier passes one frequency (or a narrow band of frequencies) readily while rejecting or attenuating others. Compare REJECT AMPLIFIER.

passband The continuous spectrum of frequencies transmitted by a filter, amplifier, or similar device. Compare STOPBAND.

passband ripple Multiple low-amplitude attenuation variations within the passband of a filter or tuner, resulting in a ripple pattern on the nose of the response curve.



passband ripple

passivation The process of growing a thin oxide film on the surface of a planar semiconductor device to protect the exposed junction(s) from contamination and short circuits. See, for example, PLANAR EPITAXIAL PASSIVATED TRANSISTOR and PLANAR TRANSISTOR.

passive absorber A substance that reflects minimal sound energy. Examples include acoustical ceiling tile and thick carpeting.

passive circuit A circuit consisting entirely of nonamplifying components, such as capacitors, resistors, inductors, and diodes.

passive communications satellite A communications satellite that reflects electromagnetic waves, but does not contain a transponder; that is, it does not receive and retransmit the signals. Also called *passive comsat.* Compare ACTIVE COMMUNICATIONS SATELLITE.

passive component A device that is basically static in operation (i.e., it is ordinarily incapable of amplification or oscillation and usually requires no power for its characteristic operation). Examples: conventional resistor, capacitor, inductor, diode, rectifier, and fuse. Compare ACTIVE COMPONENT, **1**.

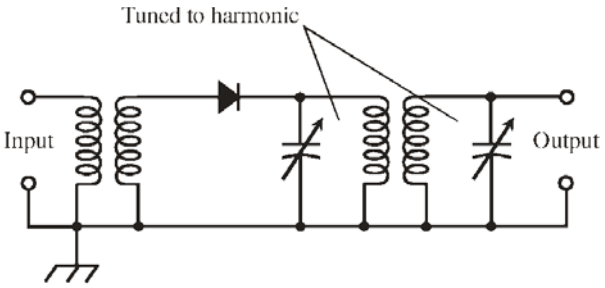
passive comsat See PASSIVE COMMUNICATIONS SATELLITE.

passive decoder A decoder that responds to only one signal code, rejecting all others.

passive detection In reconnaissance, detecting a target without betraying the location of the detector.

passive electric network See PASSIVE NETWORK.

passive frequency multiplier A frequency multiplier that does not require a power supply, but operates only from the input signal energy. Usually consists of one or more semiconductor diodes, sometimes in conjunction with inductors and/or capacitors. The output signals appear at integral multiples of the input frequency.



passive frequency multiplier

passive infrared sensor A device that detects infrared directly, such as that given off by humans because of their body heat. It does not generate energy of any kind. It is used in some intrusion detection systems.

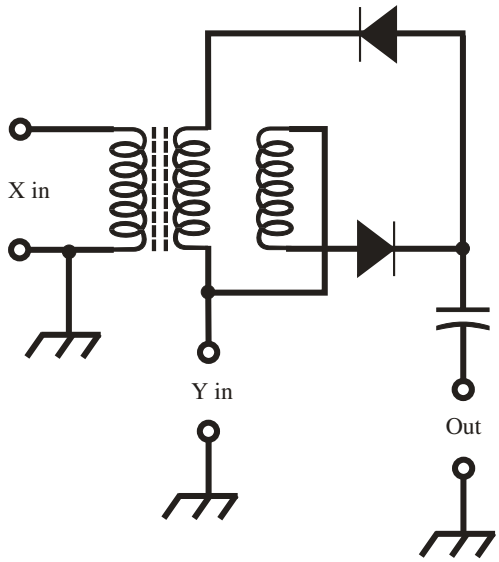
passive mixer A signal mixer using only passive components (diodes, nonlinear resistors, and nonlinear reactances) (i.e., one without active components, such as transistors). Passive mixers introduce some loss. Compare ACTIVE MIXER.

passive modulator A modulator using only passive components (diodes, nonlinear resistors, and nonlinear reactances) (i.e., one without active components, such as transistors). Passive modulators introduce some loss. Compare ACTIVE MODULATOR.

passive network A network composed entirely of passive components (i.e., one containing no generators and providing no amplification).

passive radiator See DRONE CONE.

passive reflector A metal surface used to reflect electromagnetic energy at ultra-high and microwave frequencies.



passive mixer

passive transponder A device that allows a machine, such as a computer or robot, to identify an object. A bar-code reader is a common example. Magnetic labels, such as those on credit cards and bank cash cards, are another example. It is so named because it does not transmit data; it requires a sensor for data detection.

password As a security device in computer operations, a group of characters upon whose presentation to the system via a terminal the user is allowed access to memory or control of information.

password retry limitation A security feature that prevents hackers from making repeated guesses at passwords in an attempt to break into a computer, network, or database. If more than three unsuccessful entries are made in succession, for example, the system will not accept further access attempts for a certain preprogrammed length of time, say 1 hour.

paste In "dry" batteries and electrolytic capacitors, a gelatinous electrolyte.

patch **1.** A temporary signal path, as between a radio receiver and a telephone or, conversely, between a telephone line and a radio transmitter. **2.** To make quick, usually temporary connections, as with a patch cord. **3.** Instructions entered by an unconditional branch to a computer program for the purpose of correction.

patch bay **1.** See PATCH PANEL. **2.** A set of patch panels.

patch cord A flexible line of one or more conductors with a jack or connector at each end, used to interconnect (patch) circuit points exposed for the purpose on a panel or breadboard.

Patchett tone control A dual tone-control circuit using a variable series resistance-capacitance (RC) filter for treble boost, and a variable shunt RC filter for bass boost. The input signal is applied in parallel to both filters. The outputs are combined in an audio mixer.

patching The interconnection of two or more signal media or lines.

patch panel A panel on which the terminals of a system are accessible for interconnection, tests, etc. It is used especially in high-fidelity audio recording systems. It was once commonly used in manual telephone-switching applications.

patch up **1.** To replace faulty or damaged parts in an electronic system with roughly appropriate surrogates to restore operation quickly (usually under emergency conditions). Also see DOCTOR. **2.** To wire a circuit quickly using patch cords for preliminary test and evaluation.

patent **1.** A document awarded by a government body, giving to an inventor the exclusive right to exploit an invention for a specified number of years. Formally called *letters patent.* **2.** The monopoly granted by a document, as defined in **1**.

path **1.** The route over which current flows. **2.** In radio and navigation, the imaginary line extending directly between transmitter and receiver (or target). **3.** In a computer program, the logical order of instructions.

pathometer A form of lie detector that indicates changes in the electrical resistance of the human body.

pattern **1.** An established sequence of steps in a process. **2.** An arrangement of terms in a matrix. **3.** The graphical representation of a varying quantity (e.g., an alternating-current wave pattern). **4.** The image on the screen of an oscilloscope, or the record traced by an oscillograph. **5.** The graphic polar representation of the radiation field of an antenna. **6.** The arrangement of bits in a word or field.

pattern recognition In machine-vision systems, a method of identifying an object or decoding data according to geometric shape. Optical character recognition (OCR) is an example. The machine recognizes combinations of shapes, and deduces their meanings via a computer program.

pause editing In the editing of audio tape recordings, the use of a "pause" switch to temporarily stop the tape when necessary.

PAV Abbreviation of PHASE-ANGLE VOLTMETER.

pawl In a mechanical stepping device, as in a nonelectric clock, a device made to engage the sloping sprockets on a wheel to ensure shaft rotation in one direction only.

PAX Abbreviation of PRIVATE AUTOMATIC EXCHANGE.

pay-per-view Abbreviation, PPV. Television service in which each subscriber pays only for individually selected programs.

pay TV See SUBSCRIPTION TV.

Pb Symbol for LEAD.

P band A radio-frequency band extending from 225 to 390 MHz.

PBX Abbreviation of PRIVATE BRANCH EXCHANGE.

PC **1.** Abbreviation of PERSONAL COMPUTER. **2.** Abbreviation of PRINTED CIRCUIT. **3.** Abbreviation of PHOTOCELL. **4.** Abbreviation of POSITIVE COLUMN. **5.** Abbreviation of POINT-CONTACT. **6.** Abbreviation of PERCENT (also, pct.). **7.** Abbreviation of PROGRAM COUNTER.

pc **1.** Abbreviation of PICOCOULOMB. Also, pC (preferred). **2.** Abbreviation of PICOCURIE. Also, pCi (preferred). **3.** Abbreviation of PARSEC.

pC Abbreviation for PICOCOULOMB.

PCB Abbreviation of PRINTED-CIRCUIT BOARD.

PC board See PRINTED-CIRCUIT BOARD.

PC diode See POINT-CONTACT DIODE.

p-channel JFET See P-CHANNEL JUNCTION FIELD-EFFECT TRANSISTOR.

p-channel junction field-effect transistor Abbreviation, PFET. A junction-type FET in which the gate junction has been formed on a bar or die of p-type semiconductor material. Compare N-CHANNEL JUNCTION FIELD-EFFECT TRANSISTOR.

p-channel MOSFET A metal-oxide semiconductor field-effect transistor in which the channel is composed of p-type silicon. Also see DEPLETION-TYPE MOSFET, DEPLETION-ENHANCEMENT-TYPE MOSFET, and ENHANCEMENT-TYPE MOSFET.

pCi Symbol for PICOCURIE.

PCL Abbreviation of PRINTED-CIRCUIT LAMP.

PCM Abbreviation of PULSE-CODE MODULATION.

PCM-FM Pertaining to a carrier that is frequency modulated by information that is pulse-code modulated. Also see FREQUENCY MODULATION and PULSE-CODE MODULATION.

PCM-FM-FM Pertaining to a carrier that is frequency modulated by one or more subcarriers that are frequency modulated by information that is pulse-code modulated. Also see FREQUENCY MODULATION and PULSE-CODE MODULATION.

PCM level In a pulse-code-modulated signal, one of several different possible signal conditions.

PCM-PM Pulse-code modulation that is accomplished by varying the phase of the carrier wave.

PC relay See PRINTED-CIRCUIT RELAY.

PCS Abbreviation for PERSONAL COMMUNICATION SERVICE.

PC transistor See POINT-CONTACT TRANSISTOR.

PD **1.** Abbreviation of PLATE DISSIPATION. **2.** Abbreviation of PULSE DURATION. **3.** Abbreviation of PROXIMITY DETECTOR. **4.** Abbreviation of POTENTIAL DIFFERENCE.

Pd Symbol for PALLADIUM.

PDA Abbreviation for *personal digital assistant.* See HANDHELD COMPUTER.

PDAS Abbreviation of *programmable data acquisition system.*

P display See PLAN POSITION INDICATOR.

PDM Abbreviation of PULSE-DURATION MODULATION.

PDM-FM Pertaining to a carrier that is frequency modulated by one or more subcarriers that are frequency modulated by pulses that are pulse-duration modulated. Also see FREQUENCY MODULATION and PULSE-DURATION MODULATION.

PDM-FM-FM Pertaining to a carrier that is frequency modulated by one or more subcarriers that are frequency modulated by pulses that are pulse-duration modulated. Also see FREQUENCY MODULATION and PULSE-DURATION MODULATION.

PDM-PM Pertaining to a carrier that is phase modulated by pulse-duration-modulated information. Also see PHASE MODULATION and PULSE-DURATION MODULATION.

PDT Abbreviation of PACIFIC DAYLIGHT TIME.

PDVM Abbreviation of PRINTING DIGITAL VOLTMETER.

PE **1.** Abbreviation of POTENTIAL ENERGY. **2.** Abbreviation of PROFESSIONAL ENGINEER. **3.** Abbreviation of PROBABLE ERROR.

peak **1.** The maximum value of a quantity. **2.** In an alternating-current cycle, the maximum positive or negative current or voltage point. **3.** The frequency at which the transmission by a bandpass circuit or device is maximum (attenuation is minimum), evidenced by a maximum in the frequency-response curve.

peak amplitude **1.** The maximum positive or negative current or voltage of a wave. **2.** The maximum instantaneous power of a signal.

peak anode (plate) current The maximum instantaneous current flowing in the anode (plate) circuit of a vacuum tube.

peak anode (plate) voltage The maximum instantaneous voltage applied to the anode (plate) of a vacuum tube.

peak chopper See PEAK CLIPPER.

peak current Abbreviation, I_p. The highest value reached by an alternating-current half-cycle or a current pulse. Also called MAXIMUM CURRENT.

peak detector See PEAK PROBE.

peak distortion **1.** The maximum instantaneous distortion in a signal, generally expressed as a percentage. **2.** Distortion of a modulated signal at envelope peaks.

peaked sawtooth A wave composed of a sawtooth and peaking-pulse components. The deflection voltage of a magnetic-deflection cathode-ray tube requires this waveform to produce a current sawtooth in the deflecting coils.

peaked waveform An alternating-current waveform having nearly pointed positive and negative half-cycles. Such a wave contains appreciable third-harmonic energy.

peak envelope power Abbreviation, PEP. For a linear radio-frequency (RF) power amplifier handling a modulated signal, the average RF output

peaked sawtooth

power during a single RF cycle at the highest peak of the modulation envelope.

peaker **1.** See PEAK FILTER. **2.** See PEAKING TRANSFORMER.

peaker-notcher See NOTCHER-PEAKER.

peak factor For an alternating-current wave, the ratio E_m/E_{rms} or I_m/I_{rms}, where E_m is the maximum voltage, E_{rms} is the effective (root-mean-square) voltage, I_m is the maximum current, and I_{rms} is the effective current.

peak filter A frequency-selective circuit, such as a bandpass filter, for producing a peak response (see PEAK, **3**).

peak inductor current In a switching regulator, the maximum instantaneous current through the inductor when the device is switching at its fully rated duty cycle.

peaking The adjustment of a control or device for maximum indication on a meter or other display.

peaking coil A small inductor used to compensate the frequency response of a circuit, such as a video amplifier or video detector. Both series and shunt peaking coils are used.

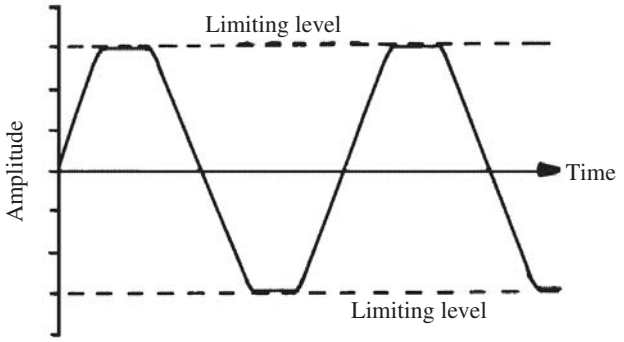
peaking transformer A transformer whose output waveform is sharply peaked (of short duration, with respect to a cycle). The effect is obtained by means of a special core that, because it contains little iron, saturates easily.

peak inverse voltage Abbreviation, PIV. Often used interchangeably with the term PEAK REVERSE VOLTAGE. **1.** The peak value of the voltage applied to a rectifier diode in the reverse direction. **2.** The maximum value of reverse voltage that a rectifier diode will tolerate according to its specifications.

peak level lamp In audio recording and reproduction, a bulb or light-emitting diode (LED) that illuminates when sound peaks exceed a predetermined amplitude.

peak limiting **1.** A method of limiting the maximum amplitude of a signal. When the instantaneous peak amplitude, either positive or negative, exceeds a certain value, the output is clipped at that value. **2.** In pulse-code modulation, the effect resulting from the application of an input signal in excess of the virtual decision value.

peak modulated power In an amplitude-modulated wave, the maximum instantaneous signal power (including the carrier and sidebands). In 100-percent sinusoidal modulation, the peak modulated power is four times the unmodulated carrier power.



peak limiting

peak point The highest current point in the current-voltage response curve of a tunnel diode. Immediately beyond this point, the current decreases as the applied voltage is increased, indicating a negative-resistance region. Compare VALLEY POINT.

peak power **1.** Symbol, P_p. Unit, watt. Alternating-current power that is the product of the peak voltage (E_p) and the peak current (I_p). For E_p in volts and I_p in amperes, the peak power in watts is given by $P_p = E_pI_p$. **2.** The highest output power that an amplifier or device can produce without excessive distortion. **3.** The maximum instantaneous power that a speaker can handle without risk of damage.

peak probe A voltmeter test probe containing a diode circuit whose direct-current output voltage is close to the peak value of the applied alternating-current test voltage.

peak recurrent forward current For a semiconductor diode, the maximum repetitive instantaneous forward current as measured under specified conditions of operation.

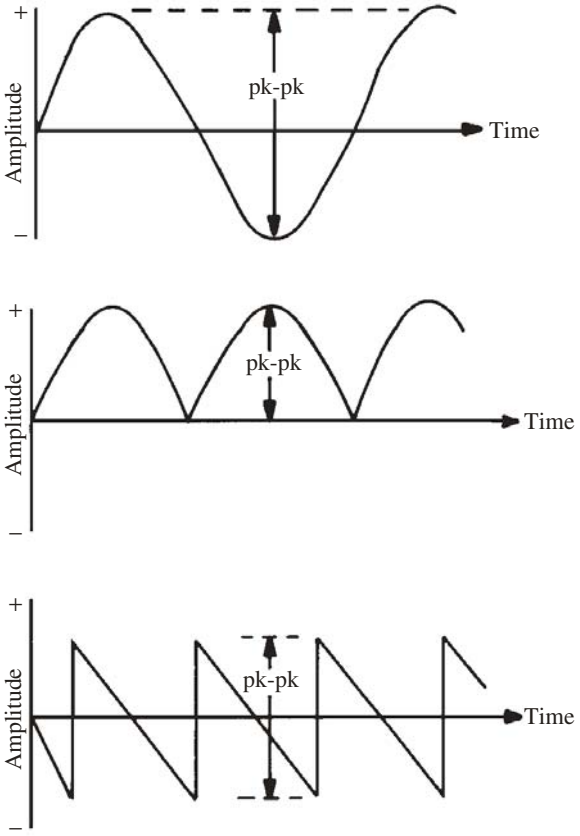
peak reverse voltage Abbreviation, PRV. In semiconductor operations, the peak value of the voltage applied in reverse polarity across the junction. It is often used interchangeably with the term PEAK INVERSE VOLTAGE.

peak signal level The maximum instantaneous signal power or voltage specified for particular operating conditions.

peak-to-peak Abbreviations, p-p or pk-pk. For an alternating-current waveform, pertaining to the arithmetic difference between the positive peak and negative peak values of current or voltage.

peak-to-peak probe A voltmeter test probe containing a diode circuit whose direct-current output voltage is close to the peak-to-peak value of the applied alternating-current test voltage.

peak-to-peak voltage The arithmetic sum of positive and negative peak voltages in an alternating-current (ac) wave. Thus, a symmetrical sine-wave ac voltage of 115.0 V rms has a peak value of 162.63 V and a peak-to-peak value of 325.3 V. Also see PEAK VOLTAGE.



peak-to-peak voltage

peak torque Symbol, T_p. For a torque motor, the maximum useful torque at maximum recommended input current.

peak voltage Abbreviation, E_p. The highest value reached by an alternating-current voltage half cycle, or by a voltage pulse. Also called MAXIMUM VOLTAGE.

peak voltmeter **1.** An alternating-current (ac) voltmeter that responds to the peak value of the applied voltage. **2.** An ac voltmeter that responds to the average value of the applied voltage—even though its scale reads in peak volts.

pea lamp A miniature incandescent bulb, sometimes used as a control-panel or meter light.

PEC Abbreviation of PHOTOELECTRIC CELL.

pedestal See BLANKING PEDESTAL.

pedestal level See BLANKING LEVEL.

pel See PIXEL.

Peltier effect A drop below ambient temperature at the junction between two dissimilar metals when an electric current is passed through the junction.

PEM Abbreviation of *photoelectromagnetic.*

pen-and-ink recorder A graphic recorder in which a fountain-pen-type stylus inscribes an ink line on a paper chart. Also called *pen recorder.*

pencil **1.** A beam of electrons or other particles or rays that either converges to, or diverges from, a specific point. **2.** A pair of geometric entities sharing a property (e.g., lines intersecting at a single point).

pendulum switch A device that closes a circuit when subjected to physical shock. One type consists of a dangling element resembling a pendulum, with one or more nearby contacts.

penetrating frequency For a particular layer of the ionosphere, the lowest high frequency at which a vertically propagated wave penetrates the layer (i.e., it is not reflected back to earth). Also called CRITICAL FREQUENCY.

penetrating radiation Ionizing radiation that passes through otherwise opaque materials. A relative term; low-energy X rays are less penetrating than high-energy X rays, which, in turn, are less penetrating than gamma rays.

penetrating rays See COSMIC RAYS.

penetration depth See DEPTH OF PENETRATION.

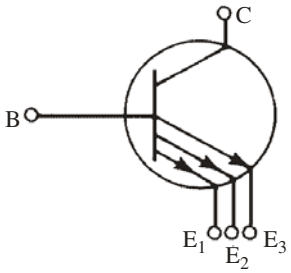
pent Abbreviation of PENTODE.

pentavalent element An element whose atoms have five valence electrons (e.g., antimony or arsenic).

pentode A five-electrode vacuum tube in which the electrodes are an anode, cathode, control grid, screen grid, and suppressor grid.

pentode field-effect transistor A field-effect transistor with three separate gates.

pentode transistor A bipolar transistor with three emitters.



pentode transistor

penumbra **1.** That part of a shadow in which the light source is not fully obscured by the eclipsing object. **2.** In a sunspot, the outer part of the spot; it is less dark than the inner portion.

PEP **1.** Abbreviation of PLANAR EPITAXIAL PASSIVATED. **2.** Abbreviation of PEAK ENVELOPE POWER.

PEP diode See PLANAR EPITAXIAL PASSIVATED DIODE.

PEP reading wattmeter A wattmeter that shows the peak envelope power output of a transmitter.

PEP transistor See PLANAR EXPITAXIAL PASSIVATED TRANSISTOR.

perceived level The level of a disturbance, particularly sound, as sensed by a person. It is generally expressed in decibels, with respect to a certain threshold value. The threshold is assigned an intensity of 0 dB.

percent An expression of a fraction, in terms of hundredths. A quantity of x percent indicates a fraction of $x/100$. Percent is usually abbreviated by the symbol %.

percentage error The amount by which a measured value differs from the true value, expressed as a percentage (the number of parts per 100 that the measurement is in error).

percentage-modulation meter An instrument that provides direct readings of the modulation percentage of an amplitude-modulated signal. The meter scale or dial is graduated in increments from 0 to somewhat more than 100 percent.

percentage uncertainty The maximum possible error in a measurement, expressed as a percentage of the measured value. Also see UNCERTAINTY IN MEASUREMENT.

percent distortion Symbol, $\%D$. In the determination of harmonic distortion, the total harmonic voltage expressed as a percentage of the fundamental voltage, plus total harmonic voltage; $\%D = 100E_h/E_t$, where E_h is the total voltage of the harmonic components, and E_t is the total signal voltage (fundamental plus harmonics).

percent modulation See MODULATION PERCENTAGE.

percent modulation meter See PERCENTAGE-MODULATION METER.

percent ripple The amount of ripple voltage in the direct-current (dc) output of a rectifier or generator, expressed as a percentage of the nominal dc output voltage.

perfect crystal A crystal without defects or impurities. The atoms are arranged in a regular pattern with no faults.

perforated board A plastic panel provided with a number of small holes in orderly columns and rows for the insertion of the pigtails of components, or of push-in terminals to facilitate quick assembly of prototype circuits. Also called *perfboard*.

performance curve A curve depicting the behavior of a component or circuit under specified conditions of operation. Such a curve, for example, might display the variation of output power with input power, the variation of frequency with voltage, etc. Compare CHARACTERISTIC CURVE.

performance test A test made primarily to ascertain how a system behaves. The test is concerned with normal operation, whereas a diagnostic test is a troubleshooting procedure. Compare TROUBLESHOOTING TEST.

perigee **1.** The point at which an earth-orbiting satellite attains its lowest altitude. It occurs once for every complete orbit. At this point, the satellite travels faster than at any other point in the orbit. **2.** The altitude, measured from the earth's surface or the earth's center, of an earth-orbiting satellite at its closest approach.

perihelion **1.** The point at which a solar-orbiting satellite attains its lowest altitude. It occurs once for every complete orbit. At this point, the satellite travels faster than at any other point in the orbit. **2.** The altitude, measured from the sun's surface or the sun's center, of a solar-orbiting satellite at its closest approach.

perimeter protection The use of a security system to restrict or prevent access to a designated area, using sensors and/or barriers around the boundaries of the area.

period Symbol, T. Unit, second. The duration of a complete alternating-current cycle or of any cyclic event; $T = 1/f$, where f is the frequency in Hertz. Also see CYCLE, FREQUENCY, and HERTZ.

periodic and random deviation Abbreviation, PARD. In the direct-current output of a rectifier, the combined PERIODIC DEVIATION, including ripple, noise, hum, and transient spikes.

periodic curve A curve that repeats its shape in each period (e.g., a sine curve).

periodic deviation Repetitive deviation of a quantity from its normal value (e.g., ripple in the direct-current output of a rectifier).

periodic function A mathematical function that is represented by a periodic curve (e.g., the sine function $y = \sin x$).

periodicity In a transmission line, the tendency for power to be reflected at a point or points where the diameter of the line changes.

periodic law The observation that when the chemical elements (see ELEMENT, **3**) are arranged in increasing order of atomic number, their physical and chemical properties recur periodically. Also see PERIODIC TABLE.

periodic table A table in which the chemical elements (see ELEMENT, **3**) are arranged according to the periodic law. The vertical columns in the table, labeled groups, contain elements possessing related properties (e.g., silicon and germanium in group IV). The rows, labeled periods, depict the periodic shift in the properties of the elements.

peripheral **1.** Pertaining to equipment accessory to a central system (e.g., peripheral input/output devices online or offline to computers, data recorders, and indicators). Also see ANCILLARY EQUIPMENT. **2.** Peripheral equipment in a computer system (e.g., printers, modems, external disk drives, tape drives, etc.).

peripheral buffer As part of a peripheral in a computer system, a storage unit in which data temporarily resides on its way to or from the central processing unit. Also called INPUT/OUTPUT BUFFER.

peripheral electron See VALENCE ELECTRON.

peripheral equipment See PERIPHERAL, **1**, **2**.

peripheral interface adapter Abbreviation, PIA. An integrated circuit that acts as an input/output port to interface a microprocessor with peripheral devices.

peripheral transfer In a computer system, the transfer of a unit of data between peripherals, or between a peripheral and the central processing unit.

Permalloy A high-permeability alloy of iron and nickel.

permamagnetic speaker See PERMANENT-MAGNET SPEAKER.

permanent magnet A body that is always magnetized (i.e., without the application of electricity and without requiring the presence of another magnet). Compare TEMPORARY MAGNET.

permanent-magnet erase Erasure of magnetic tape by the field of a permanent magnet. Typically, it is a two-step process: a magnet erases what it can of the signal, leaving any residual magnetization for erasure by a second magnet.

permanent-magnet focusing In a cathode-ray tube, the focusing of the electron beam by means of permanent magnets.

permanent-magnet generator An electromechanical generator in which the field (either stationary or rotating) is provided by a multipole permanent magnet. Also called *magneto.*

permanent-magnet loudspeaker See PERMANENT-MAGNET SPEAKER.

permanent-magnet magnetizer A magnetizer using a permanent magnet as the magnetic-field source.

permanent-magnet meter An indicating meter in which a movable coil rotates between the poles of a permanent magnet. Compare ELECTRODYNAMOMETER and IRON-VANE METER.

permanent-magnet motor A motor having a permanent-magnet field.

permanent-magnet relay A polarized relay using a permanent magnet.

permanent-magnet speaker An acoustic loudspeaker in which the core is a strong permanent magnet (as opposed to a direct-current electromagnet). Also see MAGNETIC SPEAKER.

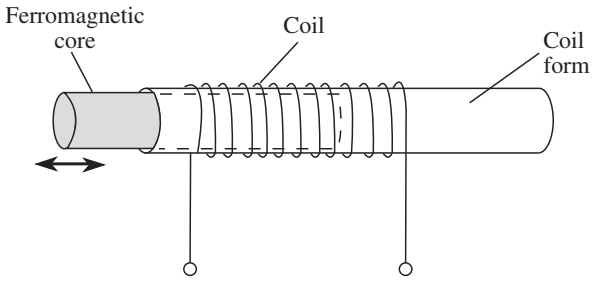
permanent storage See NONVOLATILE MEMORY.

permeability Unit, H/m. A quantitative indicator of the extent to which a material concentrates magnetic flux: for a given constant magnetic-field intensity, the ratio of magnetic flux density in the material to the magnetic flux density in air.

permeability curve See B-H CURVE.

permeability-tuned oscillator A radio-frequency oscillator in which the frequency is varied or adjusted by moving a ferromagnetic core in and out of the coil of an inductance-capacitance (LC) tuned circuit.

permeability tuning Variation of the resonant frequency of an inductance-capacitance LC circuit by changing the position of a magnetic core within the inductor. This type of tuning is used in amplifiers, oscillators, filters, and wavetraps.



permeability tuning

permeameter An instrument for measuring permeability.

permeance Unit, Wb/A. In a magnetic circuit, the ease with which a magnetic field is established. The reciprocal of RELUCTANCE.

Permendur A high-permeability magnetic alloy containing equal parts of iron and cobalt. At saturation, the flux density of this material can be 2 teslas (20,000 gauss).

Perminvar A high-permeability magnetic alloy of cobalt, iron, and nickel. At saturation, the flux density of this material can approach 1.2 teslas (12,000 gauss).

permittivity See DIELECTRIC CONSTANT.

permutation A selection of several factors or objects from a group, in a specific ordered sequence. For example, one of the permutations of the elements of the set (1, 2, 3, 4, and 5) is the ordered sequence 4, 1, 3, 5, 2.

permutation modulation A method of modulation accomplished by varying the sequence of digital bits.

peroxide of lead In a lead-acid cell or battery, a compound of lead and oxygen that composes the positive electrode or electrodes.

persistence **1.** The effect whereby the retina of the eye continues to register a projected scene for approximately 0.05 second after the scene disappears. This allows perception of a sequence of video frames as a continuous moving image. **2.** The tendency of certain phosphors to glow after the excitation has been removed. Thus, after the electron beam in a cathode-ray tube has passed over the screen, the phosphor might continue to glow for a certain time along the path traced by the beam. Some phosphors, such as those used in high-speed oscilloscopes, have virtually no persistence, whereas others have long persistence.

persistent oscillations Successive oscillations of constant amplitude. Also called CONTINUOUS WAVE.

persistor A device used at low temperatures for temporary memory storage that operates between superconducting and normal conditions.

personal communications service Abbreviation, PCS. Also called *digital cellular*. An enhanced wireless network using digital modulation, cellular repeaters, and facilitating telephone and Internet connections. Emphasis is on maximizing user mobility and portability, and minimizing blind zones. Compare CELLULAR COMMUNICATIONS.

personal computer A small computer equipped with a keyboard, display, hard disk, diskette drive(s), a modem or fax/modem, one or more serial data ports, and one or more parallel data ports. They are used extensively by individuals and businesses for record keeping, data processing, communications, word processing, graphics, etc.; they are also used in schools as an educational aid.

personal digital assistant Abbreviation, PDA. See HANDHELD COMPUTER.

personal equation The value of systematic error for a person observing specific phenomena or making measurements.

personality Characteristics that make an intelligent computer or robot human-like. In general, the more powerful the computer, the more personality it can have, depending on the installed software. In some cases, certain malfunctions in a computer can produce personality quirks.

personal robot A usually autonomous robot intended for use by individuals. The most common examples are robot toys, programmable with a PERSONAL COMPUTER, intended for the education and entertainment of children. More sophisticated devices can perform domestic tasks, such as cleaning floors and mowing lawns.

peta- Abbreviation, P. A prefix meaning 10^{15}.

petagram Abbreviation, Pg. A large unit of mass or force, equal to 10^{15} grams or 10^{12} kilograms.

petameter Abbreviation, Pm. A large unit of (astronomical) distance, equal to 10^{15} meters or 10^{12} kilometers.

pF Abbreviation of PICOFARAD.

pf Symbol for POWER FACTOR.

PFET Abbreviation of P-CHANNEL JUNCTION FIELD-EFFECT TRANSISTOR.

PFM Abbreviation of PULSE-FREQUENCY MODULATION.

PG Abbreviation of POWER GAIN.

Pg Abbreviation of PETAGRAM.

pH **1.** Symbol for *hydrogen-ion concentration.* Numerically, pH is the negative logarithm of the effective hydrogen-ion concentration in gram equivalents per liter. The scale runs from zero to 14, on which 7 denotes neutrality relative to acidity vs. alkalinity; values between zero and 7 denote acidity, and values between 7 and 14 denote alkalinity. **2.** Abbreviation of PICOHENRY.

phantom Radio interference in the form of a beat note (heterodyne), resulting from interference between two strong carriers, often from local radio stations. When the phantom frequency lies within the tuning range of a receiver, the phantom can be tuned in as a separate signal. But when the phantom corresponds to the intermediate frequency (IF) of the receiver, it will ride into the IF amplifier and be present as an untunable interferential signal.

phantom channel In a properly phased high-fidelity stereo sound system, the apparent sound source centered between the left- and right-channel loudspeakers.

phantom circuit In wire telephony, a third circuit that has no wires; it results from a method (using repeating coils) of making two other circuits do the work of (this third) one.

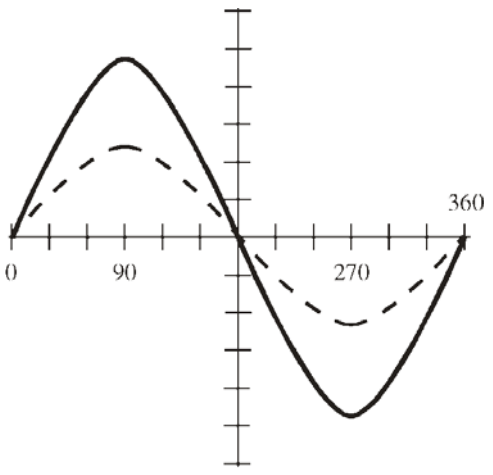
phantom signal Also called *bogey.* In a radar system, a signal that does not correspond to an actual target. The origin of the phantom signal or echo cannot be readily determined.

phantom target See ECHO BOX.

phase angle Unit, degree or radian. In an alternating-current (ac) circuit, the lag or lead between the instant that one alternating quantity reaches its maximum value and the instant that another alternating quantity reaches its maximum value. It is usually given in degrees (a complete cycle being 360 degrees) along the horizontal axis of the time-versus-magnitude graph of the ac quantity.

phase-angle voltmeter An instrument that indicates both the magnitude and phase of a voltage.

phase coincidence For signals having the same frequency, the condition of their coinciding in terms of instantaneous amplitudes, so positive peaks of the first signal correspond to positive peaks of the second signal, and negative peaks of the first signal correspond to negative peaks of the second signal. For periodic waves that do not change their characteristics with time, this is the same thing as being shifted by an integral multiple of 360 degrees in phase. Compare PHASE OPPOSITION.



phase coincidence

phase compensation In an operational amplifier, compensation for excessive phase shift in the feedback.

phase compressor A push-pull phase-inverter circuit in which a capacitor is connected between each collector or drain and the opposite output terminal to attenuate in-phase components, such as even-numbered harmonics.

phase constant A figure providing the rate (in degrees of phase per unit length) at which the phase lag of the current or voltage field component in a traveling wave increases linearly in the propagation direction.

phase corrector A circuit that returns a signal to a certain phase after the signal has passed through a circuit or medium that has caused phase distortion.

phased antenna See PHASED ARRAY.

phased array Also called *phased antenna*. An antenna system having two or more driven elements fed with a certain relative phase, and spaced at a certain distance, resulting in a directivity pattern that exhibits gain in some directions and little or no radiation/response in other directions. Such an array can have two elements, producing a unidirectional cardioid or bidirectional figure-eight pattern. More complex arrays have several elements, usually vertical antennas, strategically positioned and fed with signals of specified phase to produce a highly tailored pattern. The most sophisticated systems have rotatable or steerable radiation/response patterns.

phase-delay equalizer See DELAY EQUALIZER.

phase detector See PHASE-SENSITIVE DETECTOR.

phase diagram A graphical representation of waves having equal frequency, but differing in phase. The phase difference for two identical waveforms is greater than or equal to zero degrees, but less than 360 degrees.

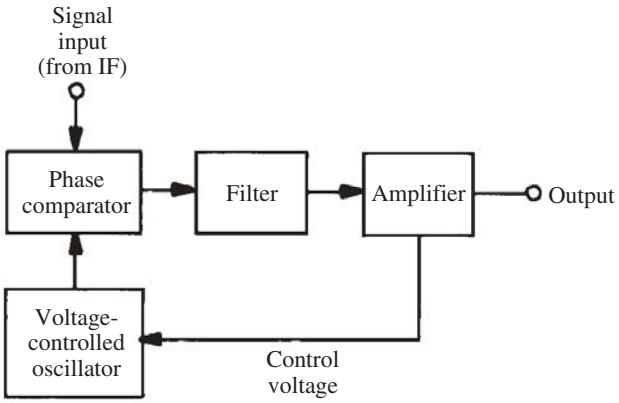
phase difference **1.** The difference (in time, angle, or fractional cycle) between the instants at which two alternating quantities reach a given value. **2.** For a dielectric, the complement of PHASE ANGLE; that is, 90 degrees minus the phase angle in degrees.

phase discriminator See DISCRIMINATOR, FOSTER-SEELEY DISCRIMINATOR, RATIO DETECTOR, and TRAVIS DISCRIMINATOR.

phase distortion Distortion characterized by input/output phase shift between various components of a signal passed by a circuit or device.

phase inverter A resistance-capacitance-coupled amplifier with a single-ended input and a push-pull output. This circuit enables a push-pull amplifier to be driven without an input transformer.

phase-locked loop Abbreviation, PLL. An oscillator that combines the flexibility of a conventional variable-frequency oscillator (VFO) with the stability of a crystal oscillator. The oscillator output is passed through a programmable divider that divides the frequency by a specific integral value *n* chosen by the operator. The output frequency of the divider is locked, by means of a phase comparator, to the signal from a crystal-controlled reference oscillator. As long as the output from the divider is exactly at the reference-oscillator frequency, the two signals are in phase, and the output of the phase comparator is zero volts dc. If the VCO frequency changes, the phase also changes, and the phase comparator produces a dc error voltage. The error voltage is applied to the VCO, causing the VCO frequency to correct itself. This maintains the VCO frequency at precisely *n* times the reference-oscillator frequency.



phase-locked loop

phase-locked oscillator An oscillator in which the inductance or the capacitance is varied periodically at half the driving frequency.

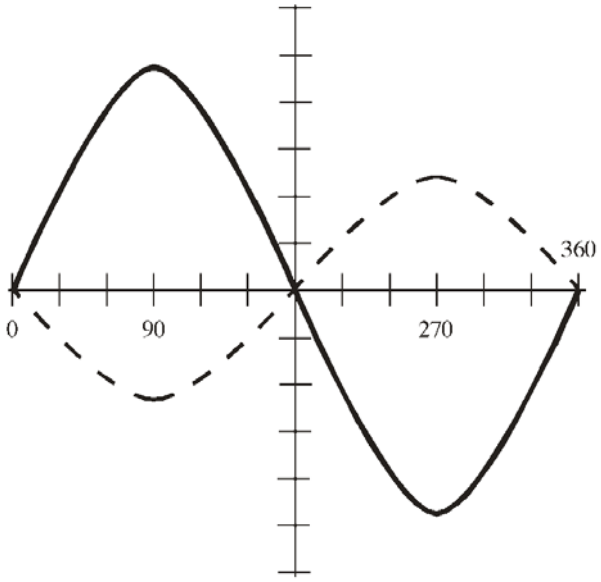
phase margin In an integrated-circuit amplifier, the extent to which the device shifts the phase of a signal more or less than one-half cycle (180 degrees) for a certain signal voltage.

phase modulation Abbreviation, PM. A method of modulation in which the phase of the carrier current is varied in accordance with the instantaneous modulating-signal voltage. The result is similar to FREQUENCY MODULATION.

phase modulator A circuit or stage that produces PHASE MODULATION.

phase multiplier A circuit used for the purpose of phase comparison between signals. The frequency of the measured signal is multiplied, resulting in multiplication of the phase difference. This improves the sensitivity of the measuring apparatus.

phase opposition For signals having the same frequency, the condition of their being inverted relative to each other in terms of instantaneous amplitudes, so positive peaks of the first signal correspond to negative peaks of the second signal, and negative peaks of the first signal correspond to positive peaks of the second signal. This is not the same thing as being shifted by an odd



phase opposition

integral multiple of 180 degrees in phase, although in practice, with sine waves and square waves, the effect is the same. Compare PHASE COINCIDENCE.

phase resonance See VELOCITY RESONANCE.

phase reversal **1.** The inversion of an alternating-current (ac) signal. The instantaneous amplitude (current or voltage) is multiplied by a negative constant. Thus, the positive half-cycles become negative, and the negative half-cycles become positive. **2.** A phase shift of ±180 degrees (±½ cycle) in an ac signal.

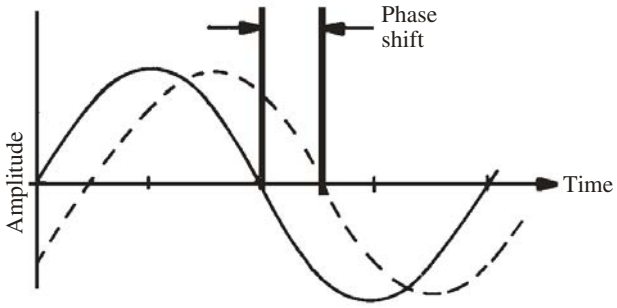
phase-rotation relay See PHASE-SEQUENCE RELAY.

phase-rotation system A system for producing single-sideband signals without using selective filters. In one such system, two balanced modulators are used. One of these receives carrier and modulating voltages that are 90 degrees out of phase with voltages that are fed to the other balanced modulator.

phase-sensitive detector Abbreviation, PSD. A detector for frequency modulation (FM) and phase modulation (PM). It delivers a direct-current output voltage whose value is proportional to the difference in phase between a reference signal and the signal from a local oscillator.

phase-sequence relay In a polyphase system, a relay or relay circuit that is actuated by voltages reaching maximum positive amplitude in a predetermined phase sequence. Also called PHASE-ROTATION RELAY.

phase shift **1.** A change in the displacement, as a function of time, of a periodic disturbance having constant frequency. **2.** The magnitude of a



phase shift

change, as defined in **1**, measured in fractions of a wavelength or in electrical degrees.

phase-shift bridge A four-arm-bridge circuit for shifting the phase of an alternating-current signal. Such a circuit is often used (with one arm variable) to shift the phase of the firing voltage for a thyratron.

phase-shift discriminator See FOSTER-SEELEY DISCRIMINATOR.

phase shifter A circuit, such as an inductance-capacitance (LC) or resistance-capacitance (RC) network, or a device, such as a Helmholtz coil or phase-shifting capacitor, that introduces a phase shift between input and output signals.

phase-shifting capacitor A special four-stator, one-rotor variable capacitor that, with a transformer-coupled resistance-capacitance (RC) circuit, provides 360 degrees of continuously variable phase shift for one rotation of the rotor. The rotor plate turns like a cam under the stators because of the off-center insertion of the rotor shaft.

phase-shift oscillator A single-stage oscillator in which the required 180-degree phase shift in the signal (fed back from output to input) is obtained by passing the output through a phase-shifting network.

phase-shift-type distortion meter A distortion meter in which the output signal of a device under test is compared with a distortion-free input test signal. The output signal phase is shifted 180 degrees, with respect to the input, and the two amplitudes are made equal. If there is no distortion, the signals cancel each other, and the result is zero. Any remaining signal is proportional to the total harmonic distortion (THD).

phase-splitting circuit A circuit that produces, from a single input signal, two output signals differing in phase.

phase-splitting driver A PHASE INVERTER used as the driver of a push-pull amplifier.

phase velocity The velocity of a wave, provided by the product of the frequency and the wavelength.

phase windings In an alternating-current generator, windings that deliver voltages that differ in phase.

phasing capacitor In a crystal filter, a small variable capacitor that constitutes one arm of a four-arm bridge in which the crystal is another arm. Adjustment of this capacitor balances the bridge, thus preventing the undesirable passage of a signal through the capacitance of the crystal holder.

phenol-formaldehyde plastics A family of plastic insulating materials made with phenolic resin, and occasionally used as dielectrics and air-core coil forms. Some of the trade names for these materials include *Bakelite*, *Catalin*, *Durez*, *Durite*, *Formica*, and *Micarta.*

phenolic insulants See PHENOL-FORMALDEHYDE PLASTICS.

phenolic resin A synthetic resin made by condensing phenol (carbolic acid) with formaldehyde.

phenomenon An event or circumstance that can be verified by the senses, as opposed to one subject to theory or speculation (e.g., the phenomenon of magnetic attraction).

Phillips gate A device that allows measurement of the gas pressure in a confined chamber. A current is passed through the gas. The magnitude of the current, for a given gas, is a function of the gas pressure and temperature.

Phillips screw A screw with a pair of slots in its head. The slots are arranged like an x. Phillips screws are available in many different sizes, as are ordinary screws. The x-shaped pair of slots reduces the tendency for the screwdriver to slip out of the screw head as the screw is rotated.

Phi phenomenon The illusion of motion resulting from the rapid presentation to the eye of pictures showing objects in a succession of different positions. Television and motion pictures exploit this illusion. Also see PERSISTENCE.

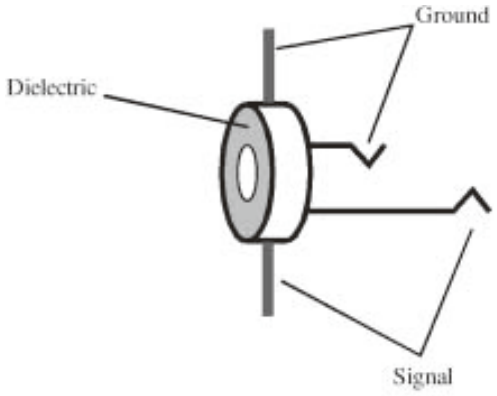
pH meter An instrument used to measure the acidity or alkalinity of solutions. Also see PH, **1**.

phon A unit of apparent change in loudness discerned by a listener. Unlike the decibel, the phon includes compensation for the ear's nonlinear response to attendant frequency changes. At a frequency of 1 kHz, a change in loudness of 1 phon is the equivalent of 1 decibel.

phone **1.** Telephone (wire or radio). **2.** To establish communication via telephone. **3.** Colloquialism for voice communication (radiotelephone), particularly via amateur-radio single sideband on the high-frequency bands (160 through 10 meters). **4.** A minimal, unique speech sound. Also called SOUND UNIT.

phoneme An individual sound or syllable in the human voice, with a characteristic amplitude-vs. frequency spectral pattern. It is important in speech recognition and speech synthesis. Computers can be programmed to identify and transcribe these sounds; computers can also be programmed to generate the sounds from text data.

phone jack The female mating device for a PHONE PLUG.

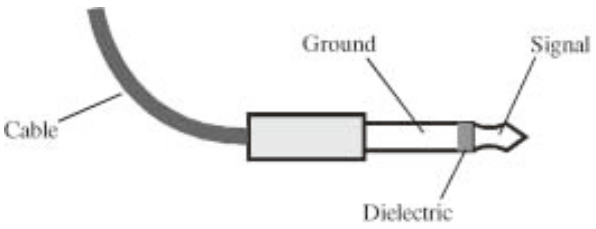


phone jack

phone monitor A simple device for listening to amplitude-modulated radio transmissions to test their quality. In its most rudimentary form, it consists of a pickup antenna, semiconductor-diode detector, and high-resistance headphones.

phone patch A device for establishing a connection (patch) between radio and wire-telephone facilities. Also see PATCH.

phone plug A type of plug originally designed for patching telephone circuits, now widely used in electronics and instrumentation. In its conventional form, it has a rod-shaped neck that serves as one contact, and a ball on the tip of the neck, but insulated from it, that serves as the other contact. Typical diameters are ⅛ inch and ¼ inch.



phone plug

phone test set An instrument for checking the performance of a radiotelephone transmitter. The set combines the functions of field-strength meter, modulation indicator, and aural monitor. Sometimes it includes a volt-ohm-milliammeter for troubleshooting the transmitter.

phonetic alphabet Words whose initial letters are used to identify the letters of the alphabet for

which they stand. These words are spoken in radiotelephony to identify letters that, if spoken by themselves, might not be clearly heard.

Phonetic alphabet

Letter	Phonetic (Capitals indicate emphasis)
A	AL-fa
B	BRAH-vo
C	CHAR-lie
D	DEL-ta
E	ECK-o
F	FOX-trot
G	GOLF
H	ho-TEL
I	IN-dia
J	Ju-li-ETTE
K	KEE-low
L	LEE-ma
M	Mike
N	No-VEM-ber
O	OS-car
P	pa-PA
Q	Que-BECK
R	ROW-me-oh
S	see-AIR-ah
T	TANG-go
U	YOU-ni-form
V	VIC-tor
W	WHIS-key
X	X-ray
Y	YANK-key
Z	ZOO-loo

phonetic alphabet code word In radio and wire telephony, a word chosen for its easy recognition by ear to identify the letter of the alphabet with which it begins. For example: *Golf* for G, *Juliet* for J, *X-ray* for X.

phonics See ACOUSTICS, **1**.

phonocardiogram The record made by a PHONOCARDIOGRAPH.

phonocardiograph An instrument that makes a graphic record of heart sounds.

phono cartridge The vibration-to-electricity transducer (pickup) of a phonograph; it is actuated by the stylus (needle). Common types are ceramic, variable-inductance, and variable-reluctance. See PHONOGRAPH and PHONOGRAPH DISC.

phonocatheter A microphone that can be inserted into the body for the purpose of listening to the functions of internal organs.

phonograph A device for reproducing sound recorded on disc. It consists of a turntable, an amplifier, and one or more speakers.

phonograph cartridge See PHONO CARTRIDGE.

phonograph disc A thin, lightweight disc, usually made of vinyl or similar plastic, on which audio-frequency signals are recorded as irregularities in a spiral groove. In reproduction, these irregularities cause vibration in a PHONO CARTRIDGE as the turntable rotates.

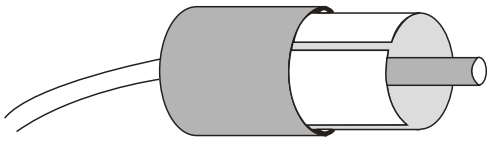
phonograph oscillator See PHONO OSCILLATOR.

phono jack Also called *RCA jack.* A jack similar to a PHONE JACK, designed especially for the quick connection and disconnection of coaxial cables used with audio and low-frequency devices.

phonon A unit of energy resulting from vibration, as of a piezoelectric crystal.

phono oscillator A small radio-frequency (RF) oscillator modulated by the audio-frequency (AF) voltage from a phonograph. The modulated RF signal is picked up by a remote radio receiver (usually in the same room), and the sound is reproduced through a loudspeaker connected to the receiver.

phono plug Also called *RCA plug.* A plug similar to a PHONE PLUG, designed especially for the quick connection and disconnection of coaxial cables used with audio and low-frequency devices.



phono plug

phonoreception The hearing of high-frequency sounds.

phonorecord A PHONOGRAPH disc.

phonoselectroscope A special type of stethoscope, in which the main heartbeat is attenuated. This makes abnormal sounds more audible. The device can be adjusted in various ways to listen for abnormalities characteristic of various heart diseases.

phosphor A substance that glows when an electron beam strikes it. Such a substance is used as a coating on the screens of cathode-ray tubes. See also BEAT ZINC SILICATE; CADMIUM BORATE, SILICATE, and TUNGSTATE; CALCIUM PHOSPHATE, SILICATE, and TUNGSTATE; MAGNESIUM FLUORIDE, SILICATE, and TUNGSTATE; ZINC ALUMINATE; ZINC BERYLLIUM SILICATE; ZINC BERYLLIUM ZIRCONIUM SILICATE; ZINC BORATE; ZINC CADMIUM SULFIDE; ZINC GERMANATE; ZINC MAGNESIUM FLUORIDE; ZINC ORTHOSILICATE; ZINC OXIDE; ZINC SILICATE; and ZINC SULFIDE.

phosphor bronze A form of bronze whose elasticity, hardness, and toughness have been greatly improved by the addition of phosphorus. The metal is used for brushes, springs, switch blades, and contacts.

phosphor copper An alloy of copper and phosphorus used in the manufacture of PHOSPHOR BRONZE.

phosphorescence The property of some materials that ordinarily fluoresce to continue to glow after the stimulus (light or an electron beam) has been removed. Compare FLUORESCENCE.

phosphorescent screen A viewing screen coated with a phosphor (e.g., oscilloscope screen).

phosphorous Exhibiting the properties of phosphor (e.g., glowing after stimulation with light). Not to be confused with PHOSPHORUS.

phosphorus Symbol, P. A nonmetallic element of the nitrogen family. Atomic number, 15. Atomic weight, 30.974. It is used as a dopant in semiconductor processing.

phot The cgs unit of illumination: The direct illumination produced upon a one-centimeter-distant surface by a uniform point source of one international foot-candle. Equivalent to one lumen per square centimeter.

photocathode **1.** The photomosaic of a video camera tube. **2.** The light-sensitive cathode in a phototube.

PhotoCD Trade name for an image-recording system developed by Kodak, in which photographs can be stored on compact discs. Viewing is accomplished using personal computers.

photocell See PHOTOELECTRIC CELL.

photocell amplifier An amplifier used to boost the output of a photocell. With respect to the nature of the input signal, it can be an alternating-current (ac) or direct-current (dc) amplifier, depending on whether the output of the photocell is modulated dc or pure dc.

photochemical effect The phenomenon whereby certain substances undergo chemical change when exposed to light or other radiant energy. An example of such a substance is the silver bromide, silver chloride, or silver iodide on photographic film.

photoconductive cell A photoelectric cell, such as the cadmium-sulfide type, whose resistance is proportional to the intensity of light impinging upon it. The photoconductive cell acts as a light-sensitive variable resistor in a current path. Also see PHOTOCONDUCTIVE MATERIAL.

photoconductive effect The tendency for the electrical resistance of a substance to change when infrared radiation, visible light, or ultraviolet radiation strikes it. Different substances exhibit different degrees of this effect.

photoconductive material A substance that exhibits decreased electrical resistance when exposed to infrared rays, visible light, or ultraviolet. Some photoconductive substances are cadmium selenide, cadmium sulfide, germanium, lead sulfide, selenium, silicon, and thallous sulfide. Also see ACTINOELECTRIC EFFECT.

photoconductivity The phenomenon whereby the electrical resistance of certain materials (such as cadmium sulfide, cadmium selenide, germanium, selenium, and silicon) is lowered upon exposure to infrared rays, visible light, or ultraviolet. Also see PHOTOCONDUCTIVE MATERIAL.

photoconductor **1.** See PHOTOCONDUCTIVE MATERIAL. **2.** See PHOTOCONDUCTIVE CELL.

photocurrent See PHOTOELECTRIC CURRENT.

photo-Darlington Also, *photodarlington.* **1.** A phototransistor fabricated as a Darlington amplifier for high output current. **2.** A combination of photodiode (see LIGHT-SENSITIVE DIODE) and Darlington amplifier.

photodecomposition Chemical breakdown by the action of radiant energy. Also called *photolysis.*

photodetachment The removal of an electron from an atom or ion, resulting from the impact of a PHOTON.

photodetector **1.** An illumination meter that uses a PHOTOCELL. **2.** See OPTOELECTRONIC COUPLER.

photodielectric effect The tendency for the dielectric constant of a substance to change when infrared radiation, visible light, or ultraviolet radiation strikes it. Different substances exhibit different degrees of this effect.

photodiffusion effect See DEMBER EFFECT.

photodiode See LIGHT-SENSITIVE DIODE.

photodisintegration In the nucleus of an atom, disintegration resulting from PHOTON bombardment.

photoelasticity The tendency for the light-transmission characteristics of a substance to change with externally applied forces.

photoelectric alarm An alarm actuated when a light beam impinging on a photocell is interrupted.

photoelectric amplifier **1.** An amplifier for boosting the output of a photosensitive device. **2.** An OPTOELECTRONIC COUPLER possessing gain.

photoelectric cell A device that converts infrared, visible-light, or ultraviolet energy into electricity or electrical effects. It can function by producing a voltage (see PHOTOVOLTAIC CELL, SELENIUM CELL, SILICON CELL, SOLAR CELL, and SUN BATTERY) or by acting as a light-sensitive resistor (see LIGHT-SENSITIVE DIODE, PHOTOCONDUCTIVE CELL, and SELENIUM CELL).

photoelectric constant The quantity h/e, where h is Planck's constant and e is the unit electron charge.

photoelectric counter A counting device (electromechanical or fully electronic) that counts objects as they interrupt a light beam impinging upon a photocell.

photoelectric disintegration See PHOTODISINTEGRATION.

photoelectric effect The phenomenon whereby temporary changes occur in the atoms of certain substances under the influence of infrared, visible light, or ultraviolet radiation. Some of these materials undergo a change in their electrical resistance, whereas others generate electric current (see, for comparison, PHOTOCONDUCTIVE MATERIAL and PHOTOVOLTAIC MATERIAL).

photoelectric efficiency See QUANTUM YIELD.

photoelectric field-effect transistor See PHOTOFET.

photoelectricity Electricity produced by the action of light on certain materials, such as cesium, selenium, and silicon. Also see PHOTOEMISSION and PHOTOVOLTAIC CELL.

photoelectric material See PHOTOCONDUCTIVE MATERIAL and PHOTOEMISSIVE MATERIAL.

photoelectric multiplier A device that internally amplifies the current resulting from bombardment by infrared, visible light, or ultraviolet radiation. A PHOTOMULTIPLIER TUBE is an example of such a device.

photoelectric photometer An instrument that uses a photoelectric device for the purpose of measuring the intensity of infrared radiation, visible light, or ultraviolet radiation.

photoelectric proximity sensor A device that uses a light-beam generator, a photodetector, an amplifier, and a microprocessor to detect the presence of nearby objects. It is useful in robot guidance systems.

photoelectric pyrometer An optical pyrometer in which a photocell and appropriate filters act instead of the human eye.

photoelectric relay A relay actuated directly by a photocell or a photocell and amplifier. This type of relay is the basis of some PHOTOELECTRIC ALARM devices.

photoelectric sensor **1.** See ELECTRIC EYE. **2.** See PHOTOELECTRIC PROXIMITY SENSOR. **3.** See PHOTOELECTRIC CELL.

photoelectric smoke alarm An alarm that is tripped by a PHOTOELECTRIC SMOKE DETECTOR when the density of smoke exceeds a safe level.

photoelectric smoke control A system for making automatic adjustments to a burning process when the smoke density exceeds a prescribed level. The initial element in the system is a PHOTOELECTRIC SMOKE DETECTOR.

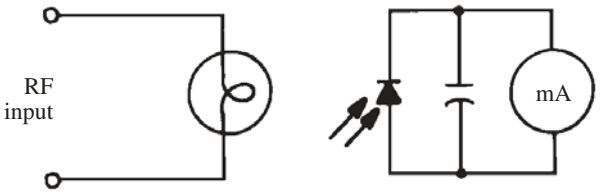
photoelectric smoke detector A smoke detector in which a photocell, photodiode, phototransistor, or phototube is excited by a light beam passing through the air. The cell output current decreases when smoke fills the air. This current change trips an alarm or deflects an indicating meter when the density of the smoke exceeds a prescribed level.

photoelectric tape reader A punched-tape reader using a photocell, photodiode, phototransistor, or phototube to sense light passing through the holes.

photoelectric transducer A photocell, photodiode, phototransistor, or phototube used as a sensor.

photoelectric tube See PHOTOTUBE.

photoelectric wattmeter A power-measuring instrument useful for the approximate measurement of radio-frequency power. It consists of an incandescent lamp sharing an opaque enclosure with a photovoltaic cell. The power to be measured is applied to the lamp, which glows proportionately. The light excites the cell, causing it to deliver a direct current proportional to the power. This current deflects a milliammeter or microammeter. The meter can be calibrated to read directly in watts.



photoelectric wattmeter

photoelectromotive force The electromotive force (voltage) produced by a photovoltaic cell.

photoelectron An electron displaced within, or ejected from, an atom, as the result of infrared, visible light, or ultraviolet radiation striking the atom.

photo-emf See PHOTOELECTROMOTIVE FORCE.

photoemission The ejection of electrons from certain materials, such as cesium, when these materials are exposed to infrared, visible light, or ultraviolet radiation. Also see PHOTOEMISSIVE MATERIAL.

photoemissive material A substance that emits electrons when exposed to infrared, visible light, or ultraviolet radiation. A typical use of such a material is in the coating of the light-sensitive cathode of a phototube. The metals cesium, potassium, rubidium, and sodium are photoemissive.

photofabrication **1.** A method of circuit-board manufacturing. The etching pattern is placed over the circuit-board material, the board is placed in a special solution, then the assembly is exposed to visible light. The light interacts with the solution to dissolve the metal in areas exposed to the light, but not in areas covered by the etching pattern. **2.** The technique in **1**, applied to the manufacture of integrated circuits.

photoFET A FIELD-EFFECT TRANSISTOR that exhibits properties similar to those of a bipolar PHOTOTRANSISTOR.

photoflash See ELECTRONIC FLASH, **1**.

photoglow tube See DISCHARGE LAMP.

photogram The permanent shadow produced by an object placed between a light source and photographic paper.

photographic exposure meter See EXPOSURE METER, **1**.

photographic recorder A graphic recorder that uses a light beam, deflected by galvanometer movement, that moves across photographic film or paper to produce a trace representing a varying quantity.

photographic sound recording See OPTICAL SOUND RECORDING.

photograph reception **1.** The use of FACSIMILE to print photographs transmitted in analog form via wire or radio. **2.** The use of a computer, equipped with a modem and graphics software, to display and/or store photographs transmitted in digital form via wire or radio.

photograph transmission **1.** The use of FACSIMILE to scan and send photographs in analog form via wire or radio. **2.** The use of a computer, equipped with a modem and video camera or optical scanner, to digitize and send photographs via wire or radio.

photoionization The ejection of electrons from atoms or molecules by the action of infrared, visible light, or ultraviolet radiation.

photoisolator See OPTOELECTRONIC COUPLER.

photojunction cell A photocell consisting of a semiconductor pn junction. The cell is useful mainly for its photoconductivity, although infrared, visible light, or ultraviolet energy striking the junction produces a small amount of photovoltaic action.

photokinesis Light-induced motion, as in a RADIOMETER.

photolithographic process A method of producing integrated circuits and printed circuits by photographing (often at considerable reduction) an enlarged pattern of the circuit on a suitable light-sensitized surface of metal or semiconductor, and chemically etching away unwanted portions of the surface.

photolysis See PHOTODECOMPOSITION.

photomagnetic effect Light-sensitive magnetic susceptibility in some materials.

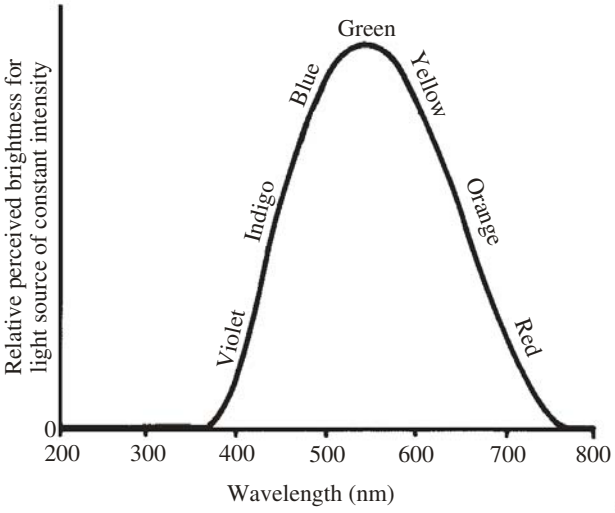
photomap A photo taken of terrain from a high altitude and usually overlaid with a reference grid.

photomask In PHOTOFABRICATION, the transparent film or template on which the etching pattern is drawn.

photometer An instrument used to compare the luminous intensity of two light sources.

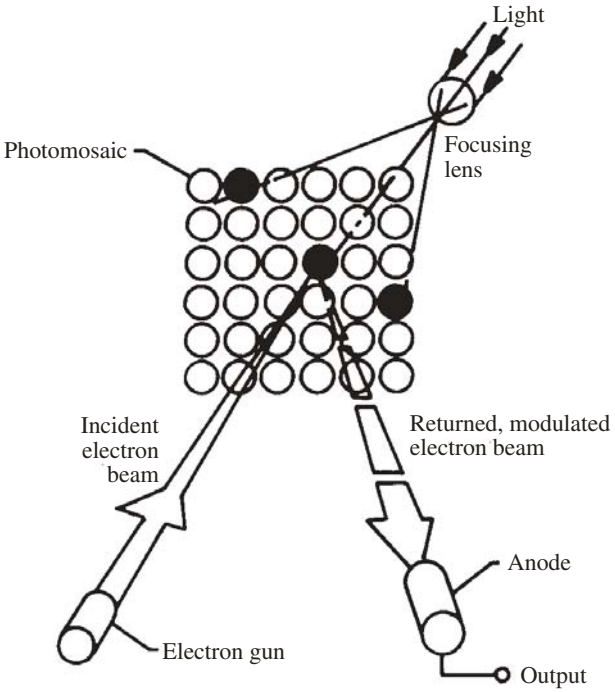
photometric measurement of power See PHOTOELECTRIC WATTMETER.

photometry The science of visible-light measurement. The response of the human eye is used as the basis for preferred sensors (those used with photometric instruments, which have spectral sensitivity curves resembling those of the eye). Compare RADIOMETRY.



photometry

photomosaic In a television camera tube, the flat photocathode screen on which the image is projected by the lens system and scanning electron beam. The surface of the screen is covered with tiny light-sensitive droplets. Also see DISSECTOR TUBE, ICONOSCOPE, and ORTHICON.



photomosaic

photomultiplier tube A type of PHOTOTUBE that delivers high output current for a given light intensity by utilizing the secondary emission of electrons. The initial light-sensitive cathode emits electrons; these strike a specially placed metal plate with a force that dislodges more electrons. These electrons, together with the initial emission, are reflected to a second plate, where they dislodge still more electrons. This process continues from deflection plate to deflection plate through the tube. The final plate deflects the accumulated electrons to the anode (collector electrode).

photon A quantum of radiant energy whose energy constant W (in joules) is equal to hf, where h is the PLANCK CONSTANT and f is the frequency in Hertz.

photoneutron A neutron released by PHOTODISINTEGRATION.

photophone **1.** A telephone-type communication system using a modulated light beam transmitted between stations. **2.** A process for recording sound on motion-picture film (see OPTICAL SOUND RECORDING).

photorelay See PHOTOELECTRIC RELAY.

photoresistive cell See PHOTOCONDUCTIVE CELL.

photoresistive material See PHOTOCONDUCTIVE MATERIAL.

photoresistivity See PHOTOCONDUCTIVITY.

photoresistor See PHOTOCONDUCTOR, **1**, **2**.

photosensitive device A light-sensitive electronic device. See, for example, PHOTOCONDUCTIVE CELL, PHOTODIODE, PHOTOFET, PHOTOMULTIPLIER TUBE, PHOTOTRANSISTOR, PHOTOTUBE, and PHOTOVOLTAIC CELL.

photosphere The luminous layer at the surface of a star.

photoswitch A light-activated switch. Some photoswitches contain an electromechanical relay; others, such as the light-activated silicon-controlled switch, have no moving parts.

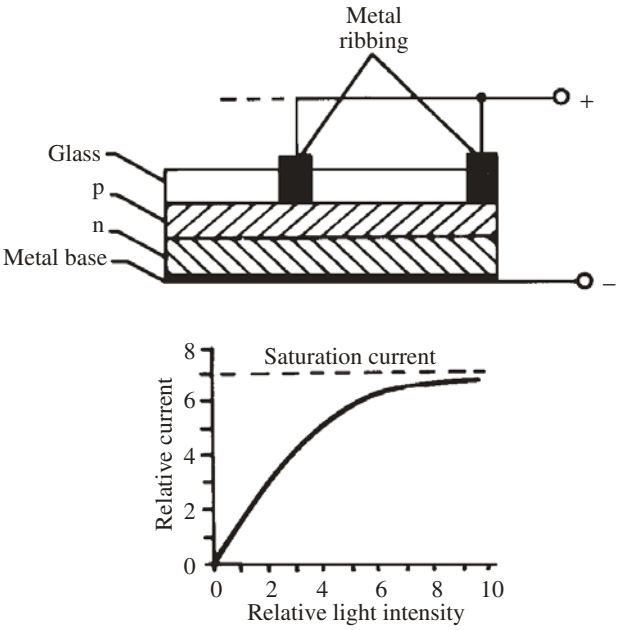
phototimer An electronic timer for timing photographic processes.

phototransistor A transistor in which current carriers emitted as a result of illumination constitute an input-signal current. This current is amplified by the transistor. The output signal delivered by the transistor, accordingly, is larger than the output of an equivalent photodiode.

phototube An electron tube that converts light energy into electrical energy by acting as a light-sensitive resistor. Characteristically, the tube contains an illuminated cathode coated with a photoemissive material, and an anode wire situated nearby. Light energy causes electrons to be emitted from the cathode in amounts proportional to light intensity; the electrons are attracted by the anode, which is connected externally to a positive direct-current voltage.

photovoltaic cell Also called *solar cell*. A semiconductor diode, usually made from silicon, that converts visible light, infrared, and/or ultraviolet directly into electric current. The device consists of a flat P-N junction; the assembly is transparent so that radiant energy can fall directly on the P-type silicon. Metal ribbing, forming the positive electrode, is interconnected with tiny wires. The negative electrode is a metal backing, placed in contact with the N-type material. The component produces about 0.5 to 0.6 volts in direct sunlight under no-load conditions.

photovoltaic material A substance that generates a voltage when exposed to light. The principal substances exhibiting this effect are silicon, selenium, and germanium. Also see ACTINOELECTRIC EFFECT.



photovoltaic cell

photran A light-sensitive, four-layer semiconductor device, used for switching purposes.

physical properties The distinguishing characteristics of matter, apart from its chemical properties. Included are *boiling point*, *density*, *ductility*, *elasticity*, *electrical conductivity*, *hardness*, *heat conductivity*, *index of refraction*, *malleability*, *melting point*, *specific heat*, and *state* (solid, liquid, gaseous, or plasma).

physical quantity A quantity expressing the actual number of physical units under consideration, as compared with a dimensionless number. Examples: 50 volts, 39 kilometers, and 30 picofarads. Compare DIMENSIONLESS QUANTITY.

physics The science of energy and matter and their interactions. Physics is subdivided into several fields, including *mechanics*, *thermodynamics*, *acoustics*, *optics*, and *electricity/magnetism*. Many subdivisions are within the traditional fields.

P_i Symbol for INPUT POWER.

picket fencing An effect often observed at very-high frequencies (VHF) and ultra-high frequencies (UHF), in which movement of the transmitting station antenna, the receiving station antenna, or both antennas causes rapid fading. The fading is the result of phase effects between the direct wave and indirect wave(s). These effects are most pronounced with vertically polarized antennas.

PIA Abbreviation of PERIPHERAL INTERFACE ADAPTER.

pickoff **1.** To monitor a voltage, current, or other characteristic in an active circuit, without dis-

turbing the operation of the circuit. **2.** A device for electronically monitoring linear or angular displacement.

pickup **1.** A device that serves as a sensor of a signal or quantity. This covers a wide variety of items, including *temperature sensors*, *vibration detectors*, *microphones*, *phonograph pickups*, etc. **2.** Collectively, energy or information that is received (e.g., *sound pickup*).

pickup arm The pivoted arm that holds the cartridge and stylus of a phonograph.

pickup cartridge See PHONO CARTRIDGE.

pickup current **1.** The current required to close a relay. **2.** Current flowing through, or generated by, a pickup.

pickup pattern The directional pattern of a microphone or other transducer that converts acoustic energy into electrical signals.

pickup voltage **1.** The voltage required to close a relay or circuit breaker. **2.** The voltage delivered by a pickup.

pico- **1.** Abbreviation, p. A prefix meaning 10^{-12}. **2.** A prefix meaning extremely small.

picoammeter A usually direct-reading instrument used to measure current in the picoampere range. Also see CURRENT METER.

picoampere Abbreviation, pA. A small unit of current equal to 10^{-12} ampere.

picocoulomb Abbreviation, pC. A small unit of electrical quantity equal to 10^{-12} coulomb.

picocurie Abbreviation, pCi. A small unit of radioactivity equal to 10^{-12} curie.

picofarad Abbreviation, pF. A small unit of capacitance equal to 10^{-12} farad.

picohenry Abbreviation, pH. A small unit of inductance equal to 10^{-12} henry.

picosecond Abbreviation, ps or psec. A small unit of time equal to 10^{-12} second.

pi coupler See COLLINS COUPLER.

picovolt Abbreviation, pV. A small unit of voltage equal to 10^{-12} volt.

picovoltmeter A usually direct-reading electronic instrument used to measure electromotive force in the picovolt range.

picowatt Abbreviation, pW. A small unit of power equal to 10^{-12} watt.

pictorial See PICTORIAL WIRING DIAGRAM.

pictorial diagram See PICTORIAL WIRING DIAGRAM.

pictorial wiring diagram A wiring diagram in the form of a drawing or photograph of the components, as opposed to one of circuit symbols. The components are shown in their positions in the finished equipment, and the wiring as lines running between them.

picture black In facsimile or television, the signal condition resulting from the scanning of a black portion of the image.

picture detector See VIDEO DETECTOR.

picture diagram See PICTORIAL WIRING DIAGRAM.

picture element See PIXEL.

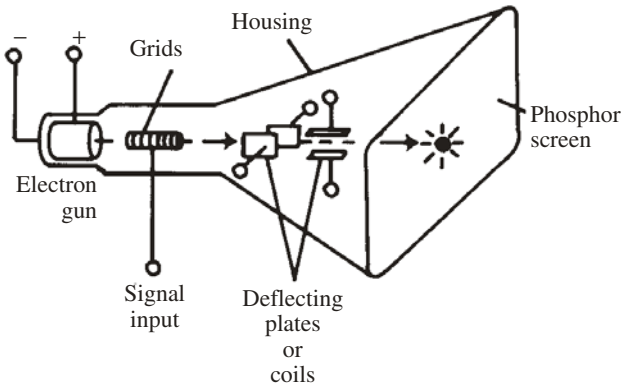
picture information In a television signal, the variable-amplitude component (i.e., the one carrying energy corresponding to the picture elements) that fills the space between blanking pulses.

picture-in-picture Abbreviation, PIP. In some television receivers, a feature that allows simultaneous viewing of two programs. One program occupies the full screen, and another program appears in a small portion of the screen.

picture reception **1.** See PHOTOGRAPH RECEPTION. **2.** The reception of television signals.

picture transmission **1.** See PHOTOGRAPH TRANSMISSION. **2.** The transmission or broadcasting of television signals.

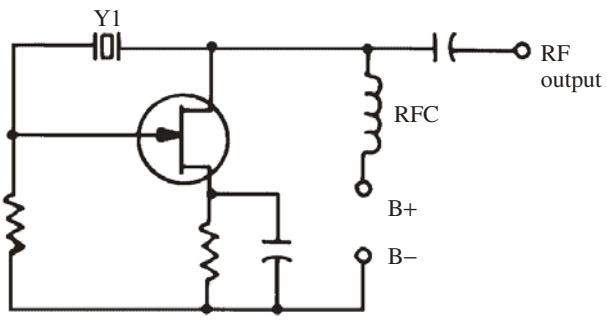
picture tube The cathode-ray tube used in a television receiver to display the image. Also called KINESCOPE.



picture tube

pie chart See CIRCLE GRAPH.

Pierce oscillator A simple crystal oscillator in which the crystal is connected directly between the input and output terminals of the active device (usually a bipolar or field-effect transistor). A tuned inductance-capacitance (LC) circuit might be included, but is not required.



Pierce oscillator

pie winding A method of coil winding in which two or more separate, multilayer coils are connected in series and placed along a common axis. It is sometimes used in radio-frequency chokes to minimize capacitance among the windings.

piezo- A prefix meaning *pressure* (see PRESSURE, **2**).

piezodielectric A substance that, when stretched or compressed, exhibits a change in dielectric constant.

piezoelectric accelerometer An accelerometer using a piezoelectric crystal, whose voltage output is proportional to acceleration.

piezoelectric ceramic A ceramic material that delivers a voltage when deformed, or that changes in shape when a voltage is applied to it.

piezoelectric crystal A crystal (such as quartz, Rochelle salt, tourmaline, or various synthetics) that delivers a voltage when mechanical force is applied between its faces, or that changes its shape when a voltage is applied between its faces.

piezoelectric earphone See CRYSTAL EARPHONE.

piezoelectric filter See CRYSTAL FILTER and CRYSTAL RESONATOR.

piezoelectricity Electricity produced by deforming (squeezing, stretching, bending, or twisting) certain crystals, such as those of quartz, Rochelle salt, or tourmaline.

piezoelectric loudspeaker See CRYSTAL LOUDSPEAKER.

piezoelectric microphone See CERAMIC MICROPHONE and CRYSTAL MICROPHONE.

piezoelectric oscillator See CRYSTAL OSCILLATOR.

piezoelectric pickup See CRYSTAL PICKUP.

piezoelectric resonator See CRYSTAL FILTER and CRYSTAL RESONATOR.

piezoelectric sensor See CRYSTAL TRANSDUCER.

piezoelectric transducer See CRYSTAL TRANSDUCER.

piezoid A complete piezoelectric crystal device.

piezoresistance In certain substances, the tendency of the resistance to change with stretching or compression.

piezo tweeter A tweeter of the piezoelectric type (see CRYSTAL LOUDSPEAKER).

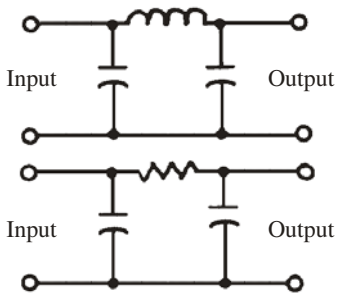
pi filter An unbalanced filter section having one series arm and two shunt arms; its schematic representation has the general shape of the uppercase Greek letter pi.

piggyback component See OUTBOARD COMPONENT.

piggyback control See CASCADE CONTROL.

piggyback tuner A separate ultra-high-frequency (UHF) television tuner operated in conjunction with the very-high-frequency (VHF) tuner of the receiver.

pigtail **1.** A usually long and sometimes flexible lead, such as the pigtail of a fixed capacitor.



pi filters

2. Descriptive of a device containing a long lead or leads, and usually mounted by such leads.

pile **1.** See VOLTAIC PILE. **2.** See NUCLEAR REACTOR. **3.** A battery of electrochemical cells. **4.** Any packed group of particles or granules.

pillow speaker A small, flat loudspeaker intended for use under a pillow.

PILOT Acronym for *programmed inquiry learning or teaching.* A straightforward high-level computer programming language, used in computer-assisted instruction (CAI).

pilot lamp See PILOT LIGHT.

pilot light A usually small, incandescent or neon lamp. When glowing, it serves as a signal that a piece of equipment is in operation.

pilot model A preliminary model of a circuit or device constructed primarily to test the efficacy of a production process. The pilot model usually follows the PROTOTYPE.

pilot production The often small-scale production of a device in a special assembly line apart from the main line in a factory.

pilot regulator A variable-gain circuit that maintains a constant output—even if the input amplitude changes.

PIM Abbreviation of PULSE-INTERVAL MODULATION.

pi mode In a vane-anode magnetron, the mode of operation in which adjacent vanes have radio-frequency voltages of opposite polarity.

pin **1.** A semiconductor junction consisting of a layer of instrinsic semiconductor material situated between n and p layers. **2.** A slender, straight, stiff prong used as a terminal or locking device (see, for example, BASE PIN and BAYONET BASE).

pinchoff In a junction field-effect transistor, the condition in which the gate voltage causes the two depletion regions to meet and close the channel to obstruct drain-current flow.

pinchoff voltage In a junction field-effect transistor, the lowest value of gate voltage that will produce pinchoff.

pinch roller In a tape recorder, a rubber-tired, rotating cylinder that helps to pull the tape past the recording and/or playback heads.

pincushion A type of television picture distortion in which each side of the raster sags toward center screen. Also see ANTIPINCUSHIONING MAGNETS.

pincushion-correction generator A circuit for generating a deflection signal to correct pincushion distortion (see PINCUSHION). One form consists of a parabola generator and op-amp-type differentiator.

pin diode A silicon junction diode having a lightly doped intrinsic layer serving as a dielectric barrier between p and n layers.

pi network See COLLINS COUPLER.

ping An acoustic pulse; it can be audible sound or ultrasound.

pinhole **1.** A tiny hole present as a defect in a film of dielectric, semiconductor, or metal. **2.** A tiny aperture that acts as a universal lens by permitting the passage of a very small bundle of light rays. The smaller the aperture, the greater the depth of field.

pinhole detector An electronic device for finding pinholes in materials. Also see PINHOLE, **1**.

pin jack A jack into which a pin plug is inserted for quick connection.

pink noise Acoustical noise whose amplitude is inversely proportional to the frequency within a limited frequency spectrum. In the extreme, it creates a hissing sound. Compare WHITE NOISE.

pinout A diagram of an integrated circuit depicting the locations of the pins for various functions. It generally takes the form of a rectangle for the circuit itself, and short lines for the pins with designators printed next to the lines.

pin plug A plug consisting of a slender metal pin inserted between the blades of a PIN JACK for a quick connection. The plug usually has a small insulated back for convenient handling.

pin straightener A device for straightening the pins of a transistor, integrated circuit, or other electronic component.

pin switch A switch that changes state when a small pin is pushed or pulled.

pin-usage factor For an integrated circuit, the number of gate equivalents per package pin. Also see GATE EQUIVALENT.

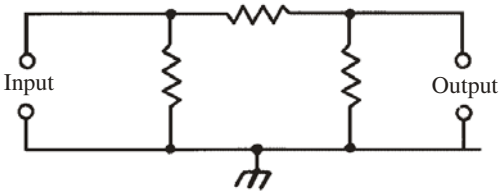
PIO Abbreviation of *parallel input/output.*

pion A subatomic particle consisting of one quark and one antiquark.

PIP Abbreviation of PICTURE-IN-PICTURE.

pip See BLIP.

pi pad A resistance-type attenuator having a series arm, a shunt input arm, and shunt output arm; its name is derived from its resemblance to the Greek letter pi. Also see PAD.



pi pad

pipe radiator A waveguide having an open end from which microwave energy is radiated.

Pirani gauge A type of vacuum gauge in which a heated filament, composing one arm of a four-arm resistance bridge, is sealed into the vacuum system. The bridge is balanced before evacuation starts. As evacuation progresses, the heat removed from the filament becomes proportional to the pressure in the system, and the resistance of the filament changes accordingly. The bridge is then rebalanced, and the difference between initial and subsequent null conditions indicate the extent of the vacuum when the bridge has been appropriately calibrated.

pi section An unbalanced filter or tuner section whose schematic representation has the general shape of the uppercase Greek letter pi.

pi-section coupling Use of a PI SECTION for coupling a radio transmitter to an antenna. Also see COLLINS COUPLER and PI-SECTION TANK.

pi-section filter A pi section used as either a low-pass or high-pass filter, depending on the position of the capacitors in the circuit.

pi-section tank A pi section used as the collector, drain, or plate tank circuit of a radio-frequency power amplifier, and also serving as an antenna coupler.

piston **1.** The movable element (cone) of a loudspeaker. **2.** The movable, solid plunger of a trimmer capacitor that consists of a plug within a cylinder.

piston directivity Directivity of sound emitted by the piston of a loudspeaker (see PISTON, **1**). As the frequency of the audio signal increases, radiation from a loudspeaker tends to be concentrated along the axis of the piston.

pit **1.** A microscopic depression in a compact disc; scatters and/or absorbs light from the laser, rather than reflecting it. Compare LAND, **1**. **2.** In a printed-circuit board, a pockmark in a component or foil run. **3.** A pockmark in a metallic substance, resulting from corrosion.

pitch **1.** The frequency of a sound, either in general terms (e.g., low, midrange, and high) or as a specific quantity (e.g., 2450 Hz). **2.** The distance between the peaks of adjacent grooves on a phonograph disc. **3.** The distance between adjacent threads of a screw. **4.** The distance between centers of turns in a coil (see PITCH OF WINDING) **5.** The number of teeth or threads per unit length. **6.** The distance along its axis a propeller moves in a revolution. **7.** Up-and-down motion of a robot end effector or other electromechanical device. **8.** The extent or range of movement, as defined in **7**.

pitch of winding In a coil, the distance from the center of one turn to the center of the adjacent turn in a single layer of winding.

PIV Abbreviation of PEAK INVERSE VOLTAGE.

pivot The sometimes jeweled, stationary member of the bearing in an analog meter movement.

pi-wound choke A choke coil consisting of several series-connected sections, mounted on a single core and separated to reduce internal capacitance.

pix Abbreviation of PICTURE.

pixel Contraction of *picture element.* The smallest bit of data in a video image. Also called *pel.* The smaller the size of the pixels in an image, the greater the resolution for a given image area.

pixel aspect ratio In a video image, the ratio of PIXEL height to pixel width.

pix tube See PICTURE TUBE.

PL Abbreviation for PRIVATE LINE.

place effect An apparent change in the perceived pitch of a sound, caused by variations in the way the waves interact inside the human ear.

planar diffusion In the production of a semiconductor device, the diffusion of all the elements into one face of a wafer. Consequently, connections to the elements all lie in one plane. Also see EPITAXIAL PLANAR TRANSISTOR and PLANAR TRANSISTOR.

planar diode A semiconductor diode, having a pn junction that lies entirely within a single plane.

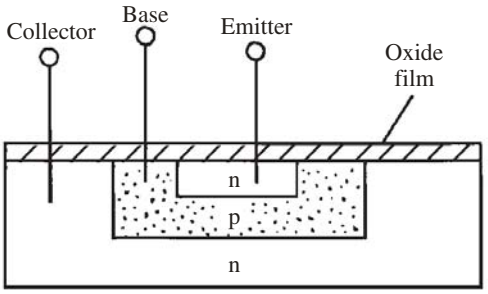
planar epitaxial passivated diode A junction diode that, like the planar epitaxial transistor, has been manufactured by planar diffusion, then passivated to protect the junction. Also see EPITAXIAL GROWTH, EPITAXY, PASSIVATION, and PLANAR DIFFUSION.

PL/1 A computer programming language that is a hybrid of scientific and commercial types (like ALGOL and COBOL), the combined features being powerful problem-solving and mass-data-handling abilities.

planar epitaxial passivated transistor A planar epitaxial transistor that has been passivated to protect the exposed junctions. Also see EPITAXIAL PLANAR TRANSISTOR, PLANAR TRANSISTOR, EPITAXIAL TRANSISTOR, PASSIVATION, and PLANAR TRANSISTOR.

planar transistor A transistor in which the emitter, base, and collector elements terminate on the same face (plane) of the silicon wafer. A thin film of silicon dioxide is grown on top of the wafer to insulate the exposed junctions after the leads have been attached (i.e., the transistor is passivated).

Planck constant Symbol, *h.* Unit, joule-second. The constant of proportionality in the fundamental law of the quantum theory, stating that radiant energy is composed of quanta proportional to the frequency of the radiation; $h = q/f = 6.62608 \times 10^{-34}$ J•s, where q is the value of the quantum and f is the frequency in Hz.



planar transistor

plane of polarization The plane containing the direction of propagation and the electric field vector of a plane-polarized wave (see POLARIZATION, **3** and POLARIZED LIGHT).

plane-polarized light See POLARIZATION, **3** and POLARIZED LIGHT.

plane-reflector antenna A directive antenna in which the reflector is a sheet of metal or a metal screen. In a corner-reflector antenna, the reflector is a folded sheet, or two sheets joined along one edge.

planetary electron See ORBITAL ELECTRON.

planimeter A mechanical instrument for measuring the area of a closed figure. The outline of the figure is traced with the pointer of the device, and the area is read from a pair of dials. In this application, the planimeter does the work of integral calculus.

PLANNER A high-level computer programming language sometimes used in artificial intelligence. It is a "goal-oriented" language in that it seeks a solution to a problem using various schemes, as necessary.

plan position indicator Abbreviation, PPI. A radar display on whose screen small spots of light reconstruct the scanned vicinity, revealing objects, such as buildings, boats, aircraft, etc. The distance from the center of the screen to a spot depicts the range of an object, and the radial angle reveals its bearing.

plant In computer operations, to put the result of an operation specified by a routine in a storage location from which it will be taken for implementation of an instruction further on in the program.

plaque resistor A flat, noninductive, power resistor, often used as a dummy load during high-frequency power measurements.

plasma A usually high-temperature gas that is so highly ionized that it is electrically conductive and susceptible to magnetic fields; it is recognized as one of the states of matter. Also see PHYSICAL PROPERTIES.

plasma diode A diode in which a plasma substance produces conduction in one direction, but not in the other.

plasma length See DEBYE LENGTH.

plasma oscillation In a plasma, a form of electric-field oscillation of the rapidly moving electrons.

plasma torch A torch, used for such high-heat applications as melting metal, in which a gas is heated by electricity to the high temperature at which it becomes a plasma.

plasmatron A form of amplifier tube sometimes used at ultra-high and microwave frequencies. It is similar to a thyratron. An inert gas is excited until it becomes a plasma, producing amplification under certain operating conditions.

Plastacele See CELLULOSE ACETATE.

plastic A synthetic material usually made from various organic compounds through polymerization (see POLYMERIZE). Plastics can be molded into solid shapes and are available as films. Examples: *celluloid*, *cellulose acetate*, *cellulose nitrate*, *polyethylene*, and *polystyrene.* Also see THERMOPLASTIC MATERIAL and THERMOSETTING MATERIAL.

plastic-film capacitor A capacitor made using polyester, polyethylene, or polystyrene. The method of manufacture is similar to that for paper capacitors when the plastic is flexible. Stacking methods can be used if the plastic is more rigid. The geometries can vary, and these capacitors are therefore found in several different shapes. Capacitance values for plastic-film units range from about 50 pF to several tens of microfarads. Most often they are in the range of 0.001 μF to 10 μF. Plastic-film capacitors are employed in audio equipment, and also in wireless transmitters and receivers. The efficiency is good, although not as high as that for mica-dielectric units. Compare CERAMIC CAPACITOR, ELECTROLYTIC CAPACITOR, MICA CAPACITOR, PAPER CAPACITOR, TANTALUM CAPACITOR.

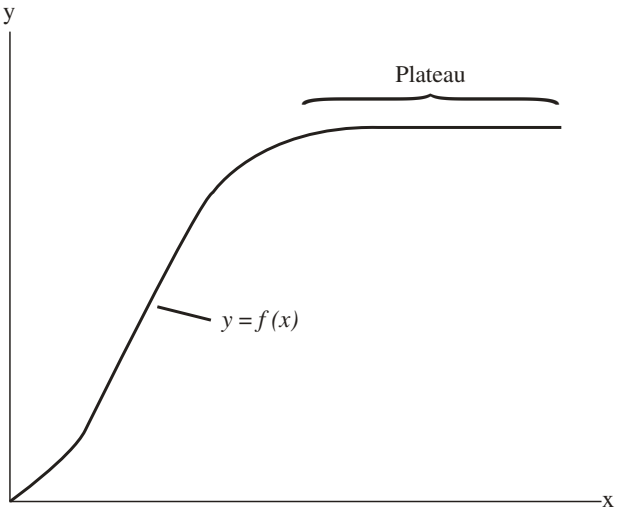
plasticizer A substance added to a plastic to make it softer or more flexible.

plastic-leaded chip carrier Abbreviated PLCC. A surface-mounted package for an integrated circuit. It is small in size and has high electrical and mechanical reliability.

plate **1.** The anode of an electron tube. **2.** One of the electrodes of a primary or secondary battery cell. **3.** One of the electrodes of a capacitor.

plateau In a response curve, a region in which an increase in the independent variable produces no further change in the dependent variable. Example: the saturation region in a common-base transistor collector-current curve.

plate blocking capacitor A capacitor connected between the plate of an electron tube and the plate tank. It allows the direct-current supply voltage to be applied directly to the plate without it passing through the tank coil, while at the same time preventing the tank coil from short-circuiting the plate power supply. The capacitor freely transmits alternating-current signal energy to the tank.



plateau

plate capacitance See PLATE-CATHODE CAPACITANCE.

plate-cathode capacitance Symbol, C_{PK}. Unit, pF. The internal capacitance between the plate and cathode of an electron tube. Also called OUTPUT CAPACITANCE.

plate characteristic For an electron tube, the family of plate current-vs-plate voltage curves for various grid-bias voltages.

plate circuit The external circuit associated with the plate of an electron tube.

plate-circuit relay A direct-current relay operated in series with the plate of an electron tube.

plate conductance Symbol, g_P. Unit, siemens. Conductance of the internal plate circuit of an electron tube. The value of static g_P is equal to the plate current divided by the plate voltage (I_P/E_P). The value of dynamic g_P is equal to the derivative of the static g_P: d_{IP}/d_{EP}. Plate conductance is the reciprocal of PLATE RESISTANCE.

plate current Symbol, I_P. Direct current flowing in the plate circuit of an electron tube.

plate-current shift A change in the plate current of a radio-frequency power amplifier during amplitude modulation. The action discloses faulty operation because the average plate current should remain constant during modulation.

plate dissipation Abbreviation, *PD.* Unit, watt. Power expended in the plate of an electron tube. For an unloaded tube, PD = $E_P I_P$, where E_P is the direct-current (dc) plate voltage in volts, and I_P is the dc plate current in amperes. For a loaded tube, $PD = P_o - P_i$, where P_o is the alternating-current (ac) power output of an amplifier or oscillator in which the tube operates, and P_i is the dc plate power input.

plated magnetic wire A wire with a ferromagnetic outer coating on a core that is not magnetic.

plated-wire memory See WIRE MEMORY.

plate-grid capacitance Symbol, C_{PG} or C_{GP}. Unit, pF. The internal capacitance between the plate and control grid of an electron tube. Also called INTERELECTRODE CAPACITANCE and FEEDBACK CAPACITANCE.

plate load The power-consuming load into which the plate circuit of an electron tube operates. In an intermediate stage of a multistage amplifier, this load is the grid circuit of the following tube.

plate load impedance Symbol, Z_{LP}. Unit, ohm. In a tube circuit, the (output) impedance that is ac-connected between the plate and ground, or dc-connected between the plate electrode and dc plate power supply.

plate meter A direct-current ammeter or milliammeter that indicates the plate current of an electron tube.

plate modulation A method of AMPLITUDE MODULATION in which a modulating voltage is superimposed on the direct-current plate voltage of a higher-frequency amplifier or oscillator.

platen The "roller" in a teletypewriter or impact printer. It supports the paper against impact by the print head; it also helps to move the paper through the machine.

plate-neutralized amplifier A vacuum-tube radio-frequency power amplifier in which a neutralizing capacitor is connected between the control grid and the free end of a center-tapped plate-tank coil.

plate power Symbol, P_P. Unit, watt. Power in the plate circuit of an electron tube; $P_P = E_P I_P$, where E_P is the plate voltage in volts and I_P is the plate current in amperes.

plate power input See PLATE POWER.

plate power output The output signal power delivered by the plate circuit of an electron tube. Compare PLATE POWER INPUT.

plate power supply The (usually direct current) power supply that furnishes energy to the plate of an electron tube.

plate pulse modulation A method of obtaining pulse modulation by injecting high-voltage pulses into the plate circuit of a vacuum-tube amplifier.

plate relay A relay operated in series with the plate of an electron tube.

plate resistance Symbol, r_P. Unit, ohm. Resistance of the internal plate circuit of an electron tube. The static value of r_P is equal to E_P/I_P, where E_P is the plate voltage in volts, and I_P is the plate current in amperes. The dynamic value is dE_P/dI_P.

plate saturation In an electron tube, the point at which, while plate voltage is increasing, the plate attracts all the electrons emitted by the cathode (i.e., the point beyond which no further significant increase in plate current results from a further increase in plate voltage).

plate-screen capacitance Symbol, C_{PS}. Unit, pF. The internal capacitance between the plate and screen grid of an electron tube.

plate-screen modulation A method of AMPLITUDE MODULATION in which the modulating voltage is superimposed simultaneously on the direct-current plate and screen voltages of a higher-frequency amplifier or oscillator.

plate series compensation In an audio amplifier, the use of a plate decoupling circuit to obtain a fixed amount of bass boost.

plate shunt compensation The addition of a network to the plate-output circuit of a tube to boost the bass response of an amplifier.

plate spacing **1.** The distance between plates in a fixed capacitor. This dimension is usually the same as dielectric thickness. **2.** The distance between plates in a variable capacitor. Also called *capacitor air gap.*

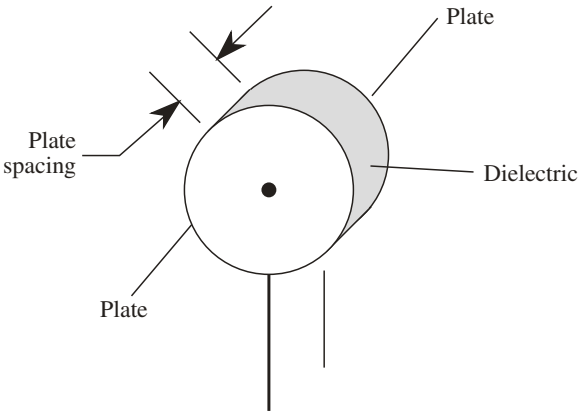


plate spacing, 1

plate supply voltage Symbol, E_{BB}. The output voltage of a plate power supply.

plate tank A resonant inductance-capacitance (LC) circuit operated from the plate of an electron tube.

plate tank capacitance The capacitance required to tune a PLATE TANK to resonance.

plate tank inductance The inductance of the coil in a PLATE TANK.

plate tank *Q* Figure of merit (see *Q*) of a plate tank, a function of the load resistance and the tank inductance-to-capacitance (L/C) ratio.

plate tank voltage The audio-frequency or radio-frequency voltage developed across the plate tank of an electron-tube circuit.

plate tuning Tuning an electron-tube circuit by varying the capacitance, inductance, or both in the plate tank.

plate tuning capacitance See PLATE TANK CAPACITANCE.

plate tuning inductance See PLATE TANK INDUCTANCE.

plate-type capacitor A capacitor having flat metal plates, rather than concentric cylinders, a cylinder and rod, etc.

plate voltage Symbol, E_P. The direct-current voltage applied to the plate of an electron tube.

plate winding **1.** An inductor connected in series between the plate of a vacuum tube and the positive power-supply voltage. **2.** The primary winding of a plate-circuit output transformer.

platiniridium A natural alloy of PLATINUM and IRIDIUM.

platinotron A form of traveling-wave vacuum tube used as an amplifier at ultra-high and microwave frequencies. There are two output connections.

platinum Symbol, Pt. A precious metallic element. Atomic number, 78. Atomic weight, 195.08. It is sometimes used for plating of relay and switch contacts, and for certain parts of vacuum tubes.

platinum metals The rare metals IRIDIUM, OSMIUM, PALLADIUM, PLATINUM, RHODIUM, and RUTHENIUM. They do not react readily with other elements.

platinum-tellurium thermocouple A thermocouple using the junction between platinum and tellurium wires; it is used in thermocouple-type meters.

platter **1.** One of the individual disks in a computer HARD DISK drive. **2.** The rotating turntable in a PHONOGRAPH.

playback The reproduction of recorded material in audio-tape, audio-disc, video-tape, or video-disc systems.

playback computer system A personal computer and associated peripherals, equipped for reproducing multimedia that has been recorded on CD-ROM.

playback head In a magnetic recorder/reproducer, the head that picks up the signal from the tape or disc for reproduction. Also called *read head* and *play head.*

playback loss In disc recording, the difference (at a particular point on the disc) between the recorded level and the reproduced level.

player A semiconductor layer that is doped to provide current carriers that are predominantly holes. Compare N LAYER.

player A device or system that reproduces (plays back) data from a tape or disc, but cannot be used to record data onto the tape or disc.

play head See PLAYBACK HEAD.

playthrough The condition in which an amplifier delivers a small output signal when the gain control is set to zero.

PLC Abbreviation of POWER-LINE COMMUNICATION.

PLCC Abbreviation of PLASTIC-LEADED CHIP CARRIER.

plethysmograph A medical-electronic device that allows the monitoring of the amount of blood in different parts of the body.

PLL Abbreviation of PHASE-LOCKED LOOP.

PLM Abbreviation of *pulse-length modulation* (see PULSE-DURATION MODULATION).

PLO Abbreviation of PHASE-LOCKED OSCILLATOR.

plot **1.** A curve depicting the variations of one quantity, with respect to another. **2.** To generate, print, or display a curve of the type defined in **1**.

plotter A machine that plots (see PLOT, **2**) automatically, often by the direction of a computer.

PL tone encoder An audio oscillator and modulator that cause a subaudible-tone modulation of a signal for use in restricted communications systems.

plug A usually male quick-connect device that can be inserted into a JACK to make a circuit connection, or be pulled out of the jack to break the connection. See, for example, MALE PLUG, PHONE PLUG, POWER PLUG, and POLARIZED POWER PLUG.

plug-and-jack connection A connection made by inserting a PLUG into a JACK.

plug fuse A fuse provided with an Edison base for screwing into a socket.

pluggable Capable of being completely removed from the rest of the system without the need for removing any wiring. Pluggable components and circuit boards simplify the servicing of electronic equipment.

plug-in See PLUG-IN COMPONENT and PLUG-IN UNIT.

plug-in capacitor A capacitor with pins or ferrules that can be quickly inserted into, or removed from, a socket.

plug-in coil A coil wound on a form having pins that can be quickly inserted into, or removed from, a socket.

plug-in coil form An insulating form with base pins that mate with socket terminals so that a coil wound on the form can be quickly inserted into, or removed from, a circuit.

plug-in component A component or module, such as a transistor, capacitor, coil, lamp, etc., provided with pins, clips, or contacts for easy insertion into, or removal from, a circuit. See, for example, PLUG-IN CAPACITOR, PLUG-IN COIL, PLUG-IN FUSE, PLUG-IN LAMP, PLUG-IN METER, PLUG-IN RESISTOR, PLUG-IN TRANSFORMER, and PLUG-IN UNIT.

plug-in fuse A cartridge fuse having a metal ferrule on each end for insertion into a matching clip for easy installation and removal.

plug-in fuse

plug-in lamp A lamp with base pins for quick insertion into, or removal from, a socket.

plug-in meter A meter with pins or banana plugs for quick insertion into, or removal from, a circuit.

plug-in resistor A resistor with pins or ferrules for quick insertion into, or removal from, a socket.

plug-in transformer A small transformer with pins for quick insertion into, or removal from, a socket.

plug-in unit A unit, such as a tuned circuit, amplifier, or meter, that has pins or contacts for easy insertion into, or removal from, a larger piece of equipment.

plumber's delight An antenna whose construction, including that of the mast, is entirely of metal rods or tubing, with no insulating parts. Short circuits and grounds are prevented by making all attachments and joints at points that are at zero voltage, with respect to the standing-wave pattern.

Plumbicon A television camera tube, similar to the VIDICON, with a lead-oxide target. It is noted for high sensitivity. The image lag time is shorter than in the conventional vidicon.

plumbing Collectively, the waveguides, tees, elbows, and similar pipelike devices and fixtures used in microwave setups.

plunger-type meter A meter in which an iron or steel plunger is pulled into a coil by the magnetism produced by a current flowing in the coil. The plunger is attached to a pointer that moves over the scale.

plutonium Symbol, Pu. A radioactive metallic element that is artificially produced. Atomic number, 94. Atomic weight, approximately 244.

PM **1.** Abbreviation of PERMANENT MAGNET. **2.** Abbreviation of PULSE(D) MODULATOR. **3.** Abbreviation of *post meridian.* **4.** Abbreviation of PHASE MODULATION.

Pm **1.** Symbol for PROMETHIUM. **2.** Abbreviation of PETAMETER.

Pm Symbol for MAXIMUM POWER.

PME Abbreviation of *photomagnetoelectric.*

PMG Abbreviation of PERMANENT-MAGNET GENERATOR.

PMM Abbreviation of PERMANENT-MAGNET MAGNETIZER.

PMOS Abbreviation of P-CHANNEL METAL-OXIDE SEMICONDUCTOR.

PMU Abbreviation of *portable memory unit.*

PN **1.** Abbreviation of POLISH NOTATION. **2.** Abbreviation of POSITIVE-NEGATIVE (often lowercase).

pn Abbreviation of POSITIVE-NEGATIVE.

pn boundary See PN JUNCTION.

pnip transistor A junction transistor having an intrinsic layer between an n-type semiconductor base and one of the p-type semiconductor layers.

pneumatic computer A computer that uses fluid logic [i.e., one in which information is stored and transferred by the flow of a fluid (gas or liquid) and pressure variations therein].

pn junction The boundary between p-type and n-type semiconductor materials in a single block or wafer of the materials. The junction cannot be duplicated by merely touching two pieces of material (one n-type and one p-type) together, however smooth their mating faces.

pn-junction diode A diode consisting of the junction between p-type and n-type regions in the same wafer of semiconductor material.

PNM Abbreviation of PULSE-NUMBERS MODULATION.

pnpn device See NPNP DEVICE.

pnp transistor A bipolar junction transistor in which the emitter and collector layers are p-type semiconductor material, and the base layer is n-type semiconductor material. Compare NPN TRANSISTOR.

Po Symbol for POLONIUM.

Po Symbol for OUTPUT POWER or POWER OUTPUT.

POGO Abbreviation of *polar orbiting geophysical observatory.*

point **1.** A dot indicating the place of separation between the integral and fractional parts of a number (e.g., *decimal point*). Also called RADIX POINT. **2.** A precisely defined location in three-dimensional space that has theoretically zero length, zero width, and zero depth (e.g., *focal point*). **3.** The place on a graph in any number of dimensions, at which two or more curves or coordinates intersect. **4.** A set of operating conditions for a component, device, or system (e.g., *cutoff point, operating point*). **5.** A defined condition at which some specific physical phenomenon occurs (e.g., *melting point*).

point charge An electric charge imagined to occupy a single point in space; thus, it has neither area nor volume.

point contact The point at which the sharply pointed tip of a wire or rod conductor touches a second conductor (e.g., the contact between a "cat whisker" and a semiconductor wafer).

point-contact diode A semiconductor diode having a fine wire ("cat whisker"), whose point is in permanent contact with the surface of a wafer of semiconductor material, such as germanium or silicon.

point-contact junction The pn junction electroformed under the point at which the "cat whisker" touches the semiconductor wafer in a point-contact diode or transistor.

point-contact transistor A transistor having two fine wires ("cat whiskers") that serve as the emitter and collector electrodes. The pointed tips of the wires are nearly in contact with (a few mils apart from) the surface of a wafer of semiconductor material, such as germanium. The semiconductor serves as the base electrode. This device was a predecessor of the JUNCTION TRANSISTOR.

point counter A Geiger counter tube in which the central electrode is a pointed, fine wire. Also see PROPORTIONAL COUNTER.

point defect **1.** In a semiconductor substance or piezoelectric crystal, the absence of an atom from

its place in the lattice structure. **2.** The presence of an extra atom in the lattice structure.

point effect The tendency of an electrical discharge to occur more readily at a sharp point than at a blunt surface (as of an electrode).

pointer A pointed blade, stiff wire, or inscribed line on a transparent blade; it moves over a scale to indicate a setting or the value of a quantity. Also called NEEDLE.

pointer-type meter An analog meter in which a pointer moves over a calibrated scale.

point impedance **1.** The impedance observed at a given point in a circuit. **2.** In a transmission line, the intensity of the electric field divided by the intensity of the magnetic field at a given point.

points of saturation For a magnetic core, saturation as evidenced by a leveling-off of the positive and negative halves of the magnetization curve.

point source A source from which electromagnetic radiation emanates, and that appears as a geometric point from a great distance.

point mode Descriptive of cathode-ray-tube display operation (in a computer system), in which data is portrayed as plotted dots.

point-to-point communication Communication between two stations whose location can be precisely specified.

point-to-point motion A method of robot arm movement in which the device can attain only certain positions. The coordinates of each stopping point are stored in the robot controller (computer) memory.

point-to-point station A radio station that provides POINT-TO-POINT COMMUNICATION.

point-to-point wiring A method of wiring an electronic circuit in which wires are run directly between the terminals or components, usually by the shortest practicable route. It is used mainly in high-voltage circuits, such as power amplifiers. Compare CABLED WIRING.

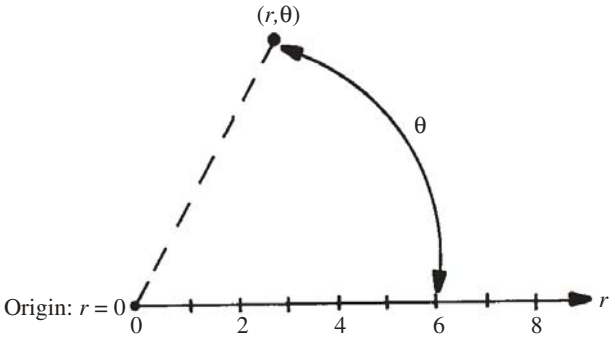
poise The cgs unit of absolute viscosity; 1 poise is the absolute viscosity of a fluid that requires a shearing force of 1 dyne to move a 1-sq-cm area of one of two parallel layers of the fluid (1 cm apart) with a velocity of 1 cm per second, with respect to the other layer. The comparable SI unit is the *newton-second per meter squared* ($N \cdot s/m^2$); 1 poise = 0.1 $N \cdot s/m^2$.

polar axis **1.** In a crystal, the axis of rotation not perpendicular to a reflection plane. **2.** The straight line connecting epicenters of electric, magnetic, or gravitational poles in a system. **3.** The axis about which the earth or another planet rotates.

polar coordinate conversion See POLAR COORDINATE TRANSFORMATION.

polar-coordinate geometry A two-dimensional system for movement of industrial-robot arms. It is based on a system of POLAR COORDINATES, in which a radius and a direction angle are assigned to each point in the working plane.

polar coordinates The magnitude and direction of a vector in a defined plane, listed as a radius (magnitude) in combination with an angle (direction) between the vector and the polar axis.



polar coordinates

polarimeter An instrument for measuring the amount of polarized light in a ray that is only partially polarized.

polariscope An instrument used in the observation or testing of materials under POLARIZED LIGHT.

polarity **1.** The condition of being electrically positive or negative. **2.** The condition of being magnetically north or south. **3.** The orientation of the positive and negative poles in a battery or power supply relative to a circuit. **4.** The orientation of a magnetic field, relative to the surrounding environment.

polarity blanking See POLARITY INHIBIT.

polarity inhibit In some instruments, especially those having automatic polarity, the automatic blanking of the polarity sign.

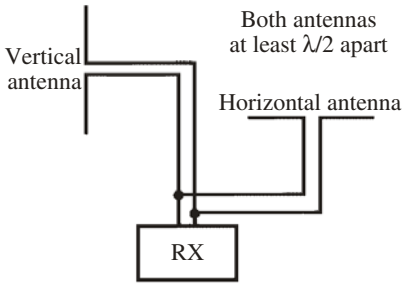
polarity-sensitive relay A direct-current relay actuated only when coil current flows in one direction. One of the simplest versions is a relay having a semiconductor diode connected in series with its coil.

polarity shifter A potentiometer connected to two direct-current sources so that a pair of output terminals has plus and minus polarities at one extreme of potentiometer adjustment, and minus and plus at the other extreme. At the center of the range, the output voltage is zero.

polarity switch A double-pole, double-throw switch connected between a pair of direct-current input terminals so that the polarity of a pair of output terminals can be interchanged.

polarization **1.** In a radio wave, the orientation of the electric lines of flux, with respect to the surrounding environment (e.g., *horizontal polarization* and *vertical polarization*). **2.** The disabling of a battery cell by the formation of insulating gas on one of the plates. **3.** The condition in which transverse waves of light are confined to a specific (e.g., horizontal or vertical) plane.

polarization diversity A form of reception in which two separate receivers, tuned to the same signal, are connected to independent antennas. One antenna is vertically polarized and the other is horizontally polarized. The result is a reduction in fading caused by ionospheric effects on the polarization of the incoming signal.



polarization diversity

polarization error In the operation of a loop antenna (e.g., that of a direction finder), null error caused by waves arriving with polarization opposite that of the loop (thus, vertically polarized waves at a horizontal-plane loop, and vice versa).

polarization fading In radio reception, a form of fading that results from changes in the polarization of the arriving signal with respect to the receiving antenna. When the polarization of the arriving signal coincides with that of the receiving antenna, the received signal strength is maximum. When the received-signal polarization is at right angles to the receiving antenna, the signal strength is minimum.

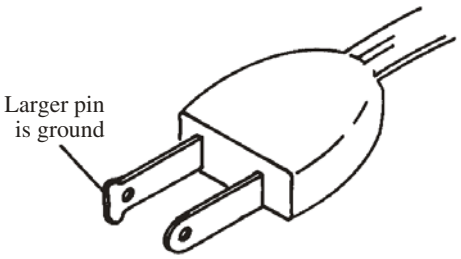
polarization modulation A method of impressing information on a signal by changing the polarization of the radiated electromagnetic field.

polarization selectivity For a photoemissive surface, the condition in which the ratio of photocurrents for two different angles of plane polarization of the light incident to the surface differs from the ratio of the corresponding amounts of light absorbed by the surface. Also see PHOTOEMISSION; PHOTOEMISSIVE MATERIAL; and POLARIZATION, **3**.

polarized capacitor A conventional electrolytic capacitor, so called because one particular terminal must be connected to the more positive of the two connection points. Compare NONPOLARIZED ELECTROLYTIC CAPACITOR.

polarized light Visible light waves whose electric lines of flux are confined more or less to a single plane. This effect can be obtained via filtering; it also occurs naturally under certain conditions. Scattered sunlight is polarized to some extent by the atmosphere. Light is polarized to some extent when it reflects from a plane surface. Also see POLARIZING FILTER.

polarized plug A plug that can be inserted into a socket or receptacle in only one way to ensure safe and foolproof operation.

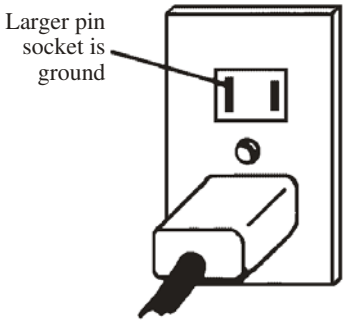


polarized plug

polarized power plug A polarized plug for connection of equipment to an alternating-current utility power source.

polarized reactor A saturable reactor in which the lines of flux produced in the three-leg core by the coils on the two outer legs are added in the center leg. Consequently, the flux can reinforce or oppose the controlling current in the coil on the center leg, depending on the direction of the current. Compare NONPOLARIZED REACTOR.

polarized receptacle A receptacle constructed so that it can receive a plug in only one way, thus preventing incorrect connections.



polarized receptacle

polarized relay A relay actuated by one polarity of direct current, or by one particular phase of alternating current. Such a relay sometimes contains an armature-centering permanent magnet.

polarized socket See POLARIZED RECEPTACLE.

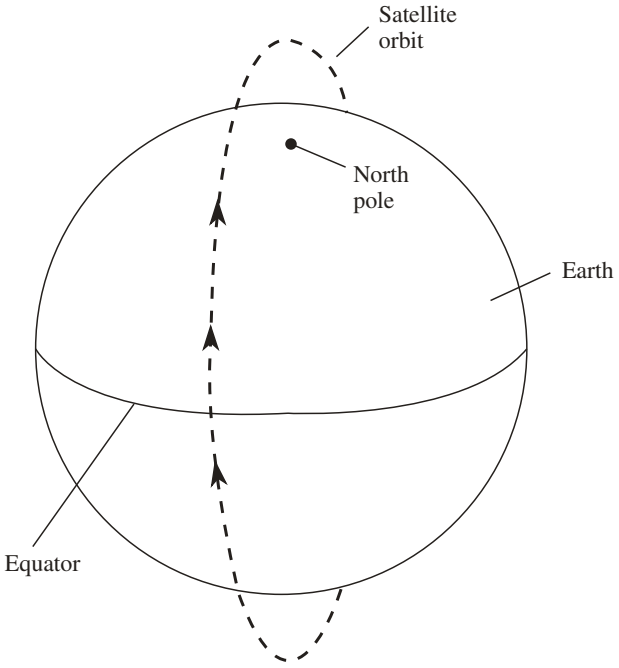
polarized X rays X-ray waves whose electric lines of flux are more or less oriented in a specific plane, as when they are scattered by carbon blocks. See, for illustration, POLARIZATION, **3** and POLARIZED LIGHT.

polarizing filter A light filter that consists essentially of microscopic heraphathite plastic plate. The plate can be rotated to cause light passing

through it to be polarized in any particular plane between horizontal and vertical, depending on the degree of rotation. Also see POLARIZED LIGHT.

polarography In chemistry, a form of qualitative or quantitative analysis utilizing IE curves obtained when the voltage is gradually increased across a solution in ELECTROLYSIS.

polar orbit An orbit that carries a satellite over the geographic polar regions of the earth. This type of orbit is oriented at, or nearly at, 90 degrees with respect to the equator, and can have a period ranging from about 90 minutes to several weeks or even months. Low-earth-orbit (LEO) satellites generally have such orbits.



polar orbit

polar-orbiting satellite Any satellite in a POLAR ORBIT.

polar planimeter See PLANIMETER.

polar relay See POLARIZED RELAY.

polar response The horizontal-plane directional response of an antenna or other transducer.

pole **1.** An extremity or terminus that possesses POLARITY. Examples: *magnetic pole* and *electric pole*. **2.** The movable member of a switch. **3.** One of the frequencies at which a transfer function becomes infinite.

pole face The smooth end surface of a pole piece.

pole piece **1.** A section of specially shaped iron or steel that is attached to a magnetic core. **2.** Half of a two-piece magnetic core that terminates in a pole.

pole shoe In an electric motor, the section of the field pole nearest the armature.

poles of impedance For a reactive network, the frequencies at which the impedance is infinite. Compare ZEROS OF IMPEDANCE.

poles of network function The values at which a network function is infinite. Compare ZEROS OF NETWORK FUNCTION.

poles of transfer function The frequencies at which a transfer function becomes infinite. Compare ZEROS OF TRANSFER FUNCTION.

police robot A proposed robotic machine, either autonomous or remotely controlled (teleoperated), that would be used to assist in law enforcement, particularly in dangerous operations.

poling The deliberate adjustment of electromagnetic-field polarity.

Polish notation In Boolean algebra, a form of notation wherein the variables in a statement are preceded by the operators.

polling In data transmission, a technique in which channels being shared by more than one terminal are tested to find one over which data is coming in, or to ascertain which is free for transmission.

polonium Symbol, Po. A radioactive metallic element. Atomic number, 84. Atomic weight, approximately 209.

polychromatic radiation **1.** Visible-light radiation having more than one wavelength; in particular, covering a broad range of wavelengths. **2.** Electromagnetic radiation over a broad band of wavelengths.

polycrystalline material A substance, such as a semiconductor, of which even a very small sample consists of a number of separate crystals bound tightly together. Compare SINGLE-CRYSTAL MATERIAL.

polydirectional microphone See OMNIDIRECTIONAL MICROPHONE.

polyelectrolyte An ELECTROLYTE having high molecular weight.

polyester A resin made by reacting a dihydroxy alcohol with a dibasic acid.

polyester backing A polyester tape on the surface of which iron oxide is deposited to yield a magnetic recording tape.

polyethylene A plastic insulating material. Dielectric constant, 2.2. Dielectric strength, 585 V/mil.

polyethylene disc A phonograph disc made of polyethylene.

polygonal coil A coil wound on a form having a polygonal, rather than circular cross section. Some polygonal forms have as many as 12 sides in cross section.

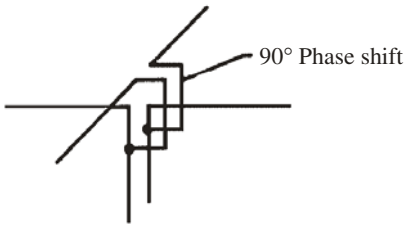
polygraph An instrument for measuring and recording electrical signals proportional to blood pressure, skin resistance, breathing rate, and other reactions that vary under emotional stress. Also called LIE DETECTOR. Compare PATHOMETER.

polymer A compound that is the product of *polymerization*, resulting from the chemical union of monomers. Also see POLYMERIZE.

polymerize To unite monomers or polymers of the same kind to form a molecule having a higher molecular weight.

polyphase In alternating-current circuits, pertaining to the existence or generation of two or more specific electrical phases. Compare SINGLE PHASE.

polyphase antenna An antenna consisting of two dipole radiators mounted perpendicular to each other at their midpoint and excited 90 degrees out of phase. The radiation pattern is approximately circular in the plane of the elements. Also called TURNSTILE ANTENNA.



polyphase antenna

polyphase generator **1.** A dynamo-type generator of polyphase power (two-phase, three-phase, etc.). **2.** See POLYPHASE OSCILLATOR.

polyphase oscillator An oscillator circuit that generates polyphase alternating current. The circuit contains separate oscillators for each phase. A three-phase circuit, for example, has three symmetrical oscillators with matched inductance and capacitance values.

polyphase power **1.** The total dissipated power in a polyphase alternating-current circuit. **2.** Polyphase alternating current provided for utility purposes.

polyphase rectifier A rectifier of polyphase alternating current generally obtained from a three-phase power line through a transformer. The several common circuits usually contain a diode for each phase. Such rectifiers offer the advantage of higher ripple frequency than is obtainable by single-phase operation. For a three-phase rectifier, for example, the ripple frequency is three times the line frequency; for a six-phase rectifier, it is six times the line frequency.

polyphase system An alternating-current circuit in which voltages or currents are normally out of phase with each other by some fixed amount. Familiar types are two-phase and three-phase.

polyphase transformer An alternating-current transformer specifically designed for use in circuits that have two or more simultaneous current phases.

polypropylene A plastic material commonly used as an electrical insulator. Dielectric constant, 2.0. Dielectric strength, 600 V/mil.

polyrod antenna A tapered dielectric antenna, usually made of polystyrene, for directional microwave transmission.

polysilicon A polycrystalline form of silicon (see POLYCRYSTALLINE MATERIAL).

polystyrene A clear, colorless thermosetting-type plastic. It is widely used as an insulating material in radio-frequency circuits and, to some extent, as a dielectric film in fixed capacitors. Dielectric constant, 2.4 to 2.9. Dielectric strength, 20 to 28 kV/mm.

polystyrene capacitor A high-Q capacitor in which the dielectric film is polystyrene.

polyvinyl chloride Abbreviation, PVC. A plastic insulating material. Dielectric constant, 3.6 to 4.0. Dielectric strength, 800 V/mil.

pool cathode In an industrial electron tube, a cathode consisting of a pool of mercury.

pool-cathode tube An industrial electron tube using a pool cathode. Examples: excitron, ignitron, and mercury-arc rectifier.

popcorn noise A temperature-dependent, random-shot electrical noise. In a radio receiver or audio circuit, this noise resembles the sound of popping corn. It occurs in some operational amplifiers.

population In statistical analysis, the total group of items, quantities, or values under consideration. Sometimes called *universe.*

porcelain A hard, white, usually glazed ceramic used as a dielectric and insulant. Dielectric constant, 6 to 7.5. Dielectric strength, 40 to 100 V/mil. Also called *china.*

porcelain capacitor A ceramic-dielectric capacitor in which the dielectric is composed of porcelain or a related substance.

porcelain insulator An electric insulator fabricated from porcelain.

porch See BACK PORCH and FRONT PORCH.

port **1.** In a circuit, device, or system, a point at which energy or signals can be introduced or extracted in a particular manner (e.g., *two-port circulator* and *I/O port*). **2.** An aperture in a loudspeaker enclosure.

portable-mobile station See MOBILE STATION.

portable station A communications station that can be carried from one location to another. A portable station differs from a mobile station in that a portable station does not usually operate while in motion, whereas a mobile station does.

ported reflex enclosure A loudspeaker cabinet with openings that facilitate bass (low-frequency) sound reproduction.

pos **1.** Abbreviation of POSITIVE. **2.** Abbreviation of POSITION.

position **1.** The location of a point or object with respect to one or more (usually fixed) references. **2.** The setting of an adjustable device, such as a potentiometer, rotary switch, or variable capacitor.

positional notation A method of representing numbers in which the number is indicated by the positions and value of the component digits. The decimal number system belongs in this category (e.g., the decimal number 1284.67 is equal to $1 \times 10^3 + 2 \times 10^2 + 8 \times 10^1 + 4 \times 10^0 + 6 \times 10^{-1} + 7 \times 10^{-2}$).

positional number system See POSITIONAL NOTATION.

positional representation See POSITIONAL NOTATION.

position-control potentiometers In an oscilloscope, potentiometers used to control the voltage applied to the horizontal and vertical deflecting plates to position the spot on the screen. Also see CENTERING CONTROL.

position controls See POSITION-CONTROL POTENTIOMETERS.

position feedback In a servo or other control system, feedback current, or voltage that is proportional to the position assumed by a member.

position fixing The determination of a position from the intersection on a map of two lines derived from the direction-finding pickups of two transmitting stations. Also see DIRECTION FINDER.

position indicator In a tape recorder, a counter whose numbered wheels revolve when the reels do, thus aiding in locating a desired spot on the tape. Also called *tape counter.*

positioning circuit The circuit associated with a horizontal or vertical centering control (see CENTERING CONTROL).

position sensing **1.** In robotics and navigation systems, a method of determining location, relative to the surrounding environment. **2.** Any method via which a robot can accurately determine the location(s) of its end effector(s).

position sensor An electronic circuit that detects physical displacement, and transmits a signal proportional to the displacement.

positioning control See CENTERING CONTROL.

positive **1.** Possessing positive (plus) direct-current electrical polarity. **2.** Pertaining to real numbers greater than zero. **3.** A photographic image whose shadings are the same as those in the scene.

positive angle **1.** In a system of rectangular coordinates, an angle in the first or second quadrant. **2.** In rectangular coordinates, an angle measured counterclockwise from the positive *x*-axis. Compare NEGATIVE ANGLE.

positive bias A positive voltage or current applied continuously to an electrode of a device (as to a transistor base) to maintain the device's operating point. Compare NEGATIVE BIAS.

positive bus See POSITIVE CONDUCTOR.

positive charge An electrical charge characterized by having relatively fewer electrons than a negative charge. Also see CHARGE, **1**; ELECTRIC CHARGE; and UNIT ELECTROSTATIC CHARGE. Compare NEGATIVE CHARGE.

positive conductor The conductor or line connected to the positive terminal of a current, voltage, or power source. Compare NEGATIVE CONDUCTOR.

positive electricity See POSITIVE CHARGE and POSITIVE ELECTRIFICATION.

positive electrification Electrification characterized by a deficiency of electrons. For example, when a glass rod is rubbed with a silk cloth, the rod becomes positively charged because electrons are rubbed off the glass onto the silk. Similarly, when an atom loses an electron, it becomes electrified positively because it has a deficiency of electrons. Compare NEGATIVE ELECTRIFICATION.

positive electrode **1.** An electrode connected to the positive terminal of a current, voltage, or power source. **2.** The positive terminal of a current, voltage, or power source, such as a battery or generator.

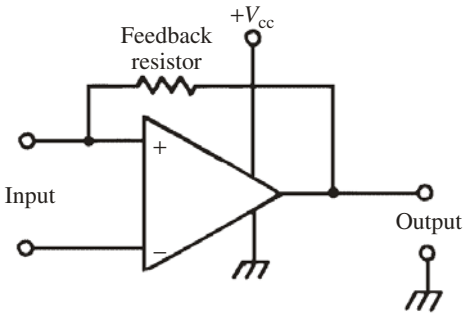
positive electron See POSITRON.

positive element See POSITIVE ELECTRODE, **1**.

positive error of measurement An error of measurement in which the difference between a measured value and the true or most probable value is positive. Compare NEGATIVE ERROR OF MEASUREMENT.

positive exponent A positive superscript indicating that a number (x) is to be raised to the positive nth power. Thus, in the expression xn, the value of n is greater than zero. Compare NEGATIVE EXPONENT.

positive feedback Feedback that is in phase with an input signal. Also called REGENERATION and REGENERATIVE FEEDBACK. Compare NEGATIVE FEEDBACK.



positive feedback

positive function A function having the positive sign. In the rectangular coordinate system, the trigonometric sine function is positive in the first and second quadrants, the cosine in the first and fourth, and the tangent in the first and third. Compare NEGATIVE FUNCTION.

positive ghost In a television picture, a ghost with positive shading (see POSITIVE, **3**). Also see GHOST.

positive-going Pertaining to a signal whose value is changing in a positive direction. This is not restricted to signals of actual positive polarity; a decreasing negative voltage, for example, is positive-going as it falls in the direction of zero—even if it never crosses the zero line.

positive grid In an electron tube, a control grid whose bias or signal voltage is positive, with respect to the cathode.

positive-grid oscillator A microwave oscillator circuit in which the control grid of a triode tube is operated at a positive direct-current potential, and the plate at a negative potential. Electrons move back and forth between cathode and plate, through the grid, and thus give rise to an oscillating current.

positive ground A direct-current electrical system in which the positive power-supply terminal is connected to the common ground. It is not generally used in North America.

positive half-alternation See POSITIVE HALF-CYCLE.

positive half-cycle That half of an alternating-current cycle in which the current or voltage increases from zero to maximum positive and returns to zero.

positive image **1.** A picture in which the blacks, whites, and grays correspond to those in the actual scene (see POSITIVE, **3**). **2.** A normal television picture (i.e., one that has the shading described in **1**).

positive ion An atom that has a deficiency of electrons and, consequently, exhibits a net positive charge. Also called CATION.

positive lead See POSITIVE CONDUCTOR.

positive light modulation In television transmission, the condition in which transmitted power increases as the light intensity increases. Compare NEGATIVE LIGHT MODULATION.

positive line See POSITIVE CONDUCTOR.

positive logic **1.** Binary logic in which a low positive state represents logic 0, and a high positive state represents logic 1. **2.** Binary logic in which a high negative state represents logic 0, and a low negative state represents logic 1. Compare NEGATIVE LOGIC.

positive magnetostriction A form of MAGNETOSTRICTION in which the physical size of a substance is directly proportional to the intensity of the surrounding magnetic field.

positive measurement error See POSITIVE ERROR OF MEASUREMENT.

positive modulation In amplitude-modulated television transmission, the increase in transmitted power when the brightness of the scene increases. Compare NEGATIVE MODULATION.

positive modulation factor For an amplitude-modulated wave having unequal positive and negative peaks, a ratio expressing the maximum positive deviation (increase) from the average value of the envelope. Compare NEGATIVE MODULATION FACTOR.

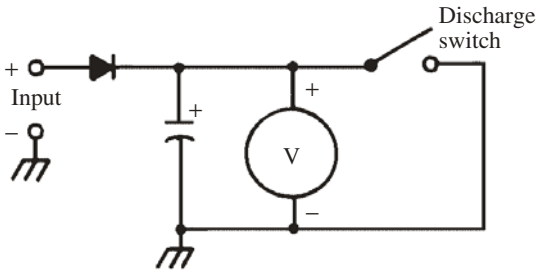
positive number A real number, whose value is greater than zero. Compare NEGATIVE NUMBER.

positive peak The maximum amplitude of a positive half-cycle or positive pulse.

positive-peak clipper A peak clipper that levels off the positive half-cycle of an alternating-current wave to a predetermined level.

positive-peak modulation Amplitude modulation of the positive peaks of a carrier wave.

positive-peak voltmeter An electronic voltmeter for measuring the amplitude of the positive peak of an alternating-current (ac) wave. In its simplest form, it consists essentially of a direct-current (dc) microammeter with a diode oriented to pass the positive half-cycle. A series capacitor in the circuit is charged to approximately the peak value of the applied ac voltage. Compare NEGATIVE-PEAK VOLTMETER.



positive-peak voltmeter

positive phase-sequence relay A phase-sequence relay that responds to the positive phase sequence in a polyphase circuit. Compare NEGATIVE PHASE-SEQUENCE RELAY.

positive picture modulation See POSITIVE MODULATION.

positive picture phase In a television signal, the swinging of the picture-signal voltage from zero to positive, in response to an increase in brightness in the scene. Compare NEGATIVE PICTURE PHASE.

positive plate **1.** The positive member of an electrochemical cell or battery. Electrons flow to this plate from the negative plate, through the external circuit. **2.** A vacuum-tube plate that is biased positively, as in a conventional tube circuit.

positive pole See POSITIVE ELECTRODE, **1**, **2**.

positive potential **1.** The voltage at a positive electrode (with respect to the negative electrode). **2.** Voltage greater than that at ground as a reference.

positive power See POSITIVE EXPONENT.

positive resistance Ohmic resistance (see OHMIC RESPONSE). Compare NEGATIVE RESISTANCE.

positive resistor A resistor whose value does not change with current or voltage changes. Compare NEGATIVE RESISTOR.

positive temperature coefficient Abbreviation, PTC. A number expressing the amount by which a quantity (such as the value of a component) increases when temperature is increased. The coefficient is stated as a percentage of the rated value per degree, or in parts per million per degree. Compare NEGATIVE TEMPERATURE COEFFICIENT and ZERO TEMPERATURE COEFFICIENT.

positive transmission In facsimile or television, a form of amplitude modulation in which the picture brightness is directly proportional to the signal strength at any given instant of time.

positive valence The valence of a positive ion.

positron A positively charged particle having the same mass as that of the electron, and the same magnitude of electric charge, but positive (instead of negative). Sometimes called *positive electron.*

post See BINDING POST.

post- Prefix meaning "following," "subsequent to," or "behind."

post-accelerating electrode In a cathode-ray tube, the high-voltage electrode that produces POST-DEFLECTION ACCELERATION of the electron beam. Also called INTENSIFIER ELECTRODE.

postacceleration See POST-DEFLECTION ACCELERATION.

post-alloy-diffused transistor Abbreviation, PADT. A transistor in which electrodes are diffused into the semiconductor wafer after other electrodes have been alloyed.

post-conversion bandwidth The bandwidth of a signal after it has been converted from one frequency to another.

post-deflection accelerating electrode See POST-ACCELERATING ELECTRODE.

post-deflection acceleration In a cathode-ray tube, the intensification of the electron beam following beam deflection. Also see POST-DEFLECTION CRT.

post-deflection CRT An oscilloscope tube provided with a high-voltage intensifier electrode in the form of a ring encircling the inside flare of the tube, between the deflecting plates and the screen. The deflected electron beam is accelerated by this electrode. This arrangement allows the beam to be deflected at low velocity and high sensitivity, then to be accelerated for a brighter image.

post edit The editing of data in a computer output.

postemphasis See DEEMPHASIS.

post-equalization **1.** In sound recording and reproduction, equalization during playback. Compare PREEQUALIZATION. **2.** See DEEMPHASIS.

postmortem An investigation into the cause of failure of a circuit, device, or system.

postmortem dump At the end of a computer program run, a dump to supply information for debugging purposes.

post office box A type of wheatstone bridge that contains resistance coils in a special box. The coils are connected so that they can be replaced by shorting connectors.

pot **1.** See POTENTIOMETER. **2.** See DASHPOT. **3.** Abbreviation of POTENTIAL. **4.** To encapsulate a circuit in a potting compound, such as epoxy resin.

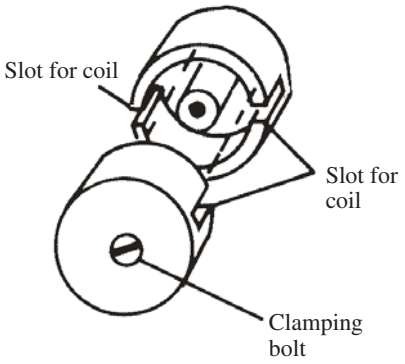
potassium Symbol, K. A metallic element of the alkali-metal group. Atomic number, 19. Atomic weight, 39.098.

potassium chloride Formula, KCl. A compound used as a phosphor coating on the screen of a nearly permanent-persistence cathode-ray tube. The fluorescence is magenta or white, as is the phosphorescence.

potassium cyanide Formula, KCN. A highly toxic salt that is an electrolyte in some forms of electroplating.

potassium dihydrogen phosphate Abbreviation, KDP. An inorganic ferroelectric material.

pot core A magnetic core for a coil, made of ferrite or of powdered iron, consisting of a central rod, a surrounding potlike enclosure, and a lid. The rod passes through the center of the coil, and the pot and lid completely enclose the coil. This arrangement provides a completely closed magnetic circuit and coil shield.



pot core

potential See ELECTROMOTIVE FORCE.

potential barrier The electric field produced on each side of a semiconductor junction by minority carriers (i.e., by holes in the n-layer and electrons in the p-layer) that face each other across the junction, but cannot diffuse across the junction and recombine.

potential coil The shunt coil in a conventional wattmeter.

potential difference See ELECTROMOTIVE FORCE and VOLTAGE.

potential divider See VOLTAGE DIVIDER.

potential drop **1.** A voltage difference between two points in a circuit. **2.** The voltage across a resistor in a direct-current circuit.

potential energy Energy resulting from the position of a body or particle (e.g., the energy stored

in something lifted against gravity and held in its new position) or from the position of charges (e.g., the energy stored in a charged capacitor). Compare KINETIC ENERGY.

potential gradient See VOLTAGE GRADIENT.

potential profile A rectangular-coordinate display of the VOLTAGE GRADIENT across a body (e.g., the cross section of a transistor).

potential transformer A small step-up transformer for increasing the range of an alternating-current voltmeter.

potentiometer **1.** A variable resistor used as a voltage divider. The input voltage is applied across the entire resistance element and the output voltage is taken from the wiper, relative to one end of the element. One end is usually grounded (at zero potential). **2.** A null device whose operation is based on a variable resistor, and is used for precise voltage measurements. The unknown voltage is applied to the input of a variable resistor whose settings are known with great accuracy; the resistance is adjusted for an output voltage that exactly equals the voltage of a standard cell (as indicated by a null between the two voltages). The unknown voltage is then determined from the resistance and the standard-cell voltage.

potentiometer noise In a current-carrying potentiometer, electrical noise generated when the wiper blade rubs against the resistance element, or by contact between the blade and element.

potentiometric recorder A type of graphic recorder. It consists essentially of a resistance-calibrated potentiometer, a standard cell, and a galvanometer. When an unknown voltage (E_x) is applied to the input terminals of the potentiometer and the potentiometer is set for null, $E_x = E_s (R_2/R_1)$, where *Es* is the voltage of the standard cell, *R1* is the input resistance of the potentiometer, and *R2* is the output resistance of the potentiometer.

Potier diagram An illustration of the phase relationship between current and voltage in an alternating-current circuit that contains reactance.

POTS Acronym for *plain old telephone service*, meaning basic service without optional features (such as call waiting, conference calling, call forwarding, etc.).

potted circuit A circuit embedded in plastic or wax to protect it against the environment, and/or to minimize the effects of physical vibration (see POTTING).

potted component An electronic part embedded in a suitable plastic or wax to protect it against the environment, and/or to minimize the effects of physical vibration (see POTTING).

potting A process of embedding a component or circuit in a solid mass of plastic or wax held in a container. The process is similar to encapsulation, except that in potting, the container (envelope) remains as part of the assembly. Compare ENCAPSULATION.

potting material A substance, such as a resin or wax, used for potting electronic gear. Also called *potting compound.*

pound **1.** Abbreviations, lb, p. A unit of weight equal to 16 avoirdupois ounces. **2.** Abbreviation, lbf. A unit of force approximately equal to 4.448 newtons. **3.** Abbreviation, lbm. A unit of mass approximately equal to 0.4536 kilogram.

poundal A unit of force equal to approximately 13825.5 dynes or 0.138255 newton. One poundal is the force that, when acting for one second, will impart a speed of one foot per second to a one-pound mass.

pound-foot Abbreviation, lb-ft. A unit of torque equal to the product of a force of one pound and a moment arm of one foot. Compare OUNCE-INCH.

pounds per square inch absolute Abbreviation, psia. Absolute pressure (i.e., the sum of atmospheric pressure and the pressure indicated by a gauge). Compare POUNDS PER SQUARE INCH GAUGE.

pounds per square inch gauge Abbreviation, PSIG. The value of pressure indicated by a gauge, without correction for atmospheric pressure. Compare POUNDS PER SQUARE INCH ABSOLUTE.

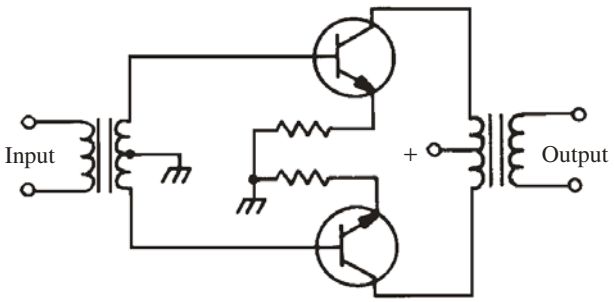
powdered-iron core A magnetic core consisting of minute particles of iron, each coated with a film to insulate it from others, molded into a solid mass. Because of its low eddy-current loss, this type of core is usable in radio-frequency transformers and coils, where it increases the inductance of the winding.

power **1.** Symbol, *P.* Unit, watt. The rate of doing work, or producing or transmitting energy. In direct-current circuits, and in alternating-current circuits containing no reactance, power is the product of the root-mean-square current and voltage. See, for example, AC POWER, APPARENT POWER, DC POWER, KILOVOLT-AMPERE, POWER FACTOR, REACTIVE KILOVOLT-AMPERE, REACTIVE VOLT-AMPERE, TRUE POWER, VOLT-AMPERE, WATT, and WATTLESS POWER. **2.** The product obtained by multiplying a quantity *x* by itself *n* times, written *xn.* For example, $2^4 = 2 \times 2 \times 2 \times 2 = 8$; here, 8 is the *fourth power* of 2. Compare ROOT, **1**. **3.** The exponent in an expression, as defined in **2**.

power amplification **1.** The amplification of a signal having a certain power (wattage) to produce a signal having greater power. **2.** The signal power increase, expressed as a ratio or as a figure in decibels, resulting from the process defined in **1**. Also called POWER GAIN.

power amplification ratio See POWER AMPLIFICATION, **2** and POWER GAIN.

power amplifier An amplifier that delivers useful amounts of power to a load, such as one or more speakers. Compare CURRENT AMPLIFIER and VOLTAGE AMPLIFIER.



power amplifier

power-amplifier device A high-current tube or transistor designed especially for high power output. Such a device does not always provide significant voltage amplification, but always provides power amplification. Compare VOLTAGE-AMPLIFIER DEVICE.

power at peak torque Symbol, *Pp*. For a torque motor, the input power in watts needed for peak torque at stall at a winding temperature of 25 degrees Celsius.

power attenuation **1.** A reduction of power level. **2.** See POWER LOSS.

power bandwidth For a high-fidelity audio amplifier, the difference between the maximum and minimum frequencies at which the amplifier can produce at least 50 percent of its maximum power output, with less than a certain amount of total harmonic distortion (usually 10 percent).

power blackout A situation in which all electric power is lost to utility subscribers in a defined region.

power consumption **1.** For a direct-current device, the normal operating voltage multiplied by the normal drawn current. **2.** For an alternating-current circuit, the root-mean-square voltage multiplied by the root-mean-square current.

power control The adjustment of the output voltage of a power supply, usually by means of a variable autotransformer, silicon-controlled rectifier, thyratron, or similar device.

power cutoff frequency Symbol, f_{co}. The frequency at which the power gain of a transistor drops 3 dB below its low-frequency value.

power derating For a temperature higher than the specified ambient temperature, a deliberate reduction of the power dissipated by a component or device. This is done to prevent failure of the component or device. Also see DERATING, DERATING CURVE, and DERATING FACTOR.

power difference An expression of the power lost in a circuit when power is absorbed by a dielectric material.

power diode A heavy-duty diode that is usually used in power-supply service. Also called *rectifier diode.*

power dissipation Abbreviation, PD. The power consumed by a device during normal operation. This power is not available in the electrical output of the device. An example is the direct-current power dissipated in the collector circuit of a high-fidelity audio amplifier.

power divider A circuit that distributes power, in a predetermined manner, among various loads.

power drain The amount of power drawn by a device. It can be operating power or standby power.

power dump See DUMP, **2**.

power equations Variations of the basic power equation: $P = EI = E^2/R = I^2R$, where P is the power in watts, E is the voltage in volts, I is the current in amperes, and R is the resistance in ohms.

power factor Abbreviation, PF. In an alternating-current circuit, the ratio (expressed either as a decimal or a percentage) of true power (power actually consumed) to apparent power (simple product of voltage and current). The power factor is equal to the cosine of the phase angle. Also see AC POWER.

power-factor balance In a capacitance bridge, a separate null adjustment for the internal resistance component of a capacitor under measurement. The dial of the variable component for this adjustment reads directly in percent power factor in some bridges.

power-factor correction To raise the power factor of an inductive circuit by inserting a parallel capacitance. In power circuits, this affords improved economy of operation because the current drain is brought more in line with that of a resistive circuit.

power-factor meter An instrument that gives direct readings of power factor (lead or lag). One such meter uses a dynamometer-type movement (see ELECTRODYNAMOMETER) in which the rotating element consists of two coils fastened together at right angles.

power-factor regulator A device that regulates the power factor of an alternating-current line.

power-factor relay An alternating-current relay actuated by a rise or fall in power factor, with respect to a predetermined value.

power frequency **1.** See POWER-LINE FREQUENCY. **2.** The frequency of an alternating-current generator. **3.** The output frequency of a power inverter (see INVERTER, **1**).

power-frequency meter An instrument for measuring power-line frequency. It can use electromechanical devices, or can directly count the number of alternations per second.

power gain Abbreviations, PG or PG_{dB}. The extent to which power is increased by a power amplifier. It can be expressed as the ratio of power output to power input as $PG = P_o/P_i$, or in decibels as $PG_{dB} = 10 \log_{10}(P_o/P_i)$.

power grid An aggregation of power-generating stations, transmission lines, and associated

equipment, usually extending over hundreds of miles and embracing several communities, so operated that individual members can deliver power to the system or draw power from it, according to local demand.

power ground The power-supply ground for a circuit or system.

power-handling capacity **1.** The amount of power that a device can dissipate, either continuously or intermittently, without suffering damage. **2.** The maximum input power that can be tolerated by an amplifier transistor or tube without overheating.

power hyperbola For a semiconductor device or vacuum tube, a curve plotted from the device's current and voltage values, which provide the power value when multiplied (e.g., a 2-watt curve for the direct-current collector input of a power transistor).

power input See INPUT POWER.

power-input control The adjustment of the output of a power supply by varying the alternating-current input to the power transformer. Usually, a variable autotransformer is operated ahead of the power transformer. See, for example, VARIABLE TRANSFORMER and VARIAC.

power inverter See CHOPPER POWER SUPPLY.

power-level indicator **1.** See DB METER. **2.** See OUTPUT POWER METER.

power line The line through which electrical energy is received by a subscriber.

power-line communication Abbreviation, PLC. Carrier-current telephony or telegraphy over power lines that are common to transmitting and receiving stations. Also see WIRED WIRELESS.

power-line filter **1.** A heavy-duty radio-frequency (RF) filter inserted in the power line close to a device that generates RF energy, such as a radio transmitter. It prevents transmission of RF energy via the power line. **2.** An RF filter inserted in the power line, where it enters the power supply of a sensitive electronic device, such as a computer or high-fidelity audio amplifier. It prevents RF energy on the power line from entering the device via the power supply.

power-line frequency The frequency of the alternating current and voltage available over commercial power lines. In the United States, it is 60 Hz; in some countries, it is 50 Hz.

power-line monitor An expanded-scale alternating-current voltmeter for the continuous monitoring of power-line voltage.

power-line pickup The interception of radio-frequency energy by utility power lines acting as receiving antennas. This energy can enter a sensitive electronic device, such as a computer or a high-fidelity audio amplifier, via the power supply.

power loss The power dissipated in a component. It generates heat while doing no useful work. Represents energy loss, except when the generation of heat is the end purpose.

power-loss factor Symbol, F_p. In interstage coupling, the ratio of available power (with the coupling network in place) to the available power when the network is disconnected.

power meter See WATTMETER.

power modulation factor In amplitude modulation, the ratio of the peak power to the average power.

power oscillator A heavy-duty oscillator delivering useful power output.

power output See OUTPUT POWER.

power-output meter See OUTPUT POWER METER.

power pack An external power-line-operated unit supplying alternating or direct current for the operation of electronic equipment.

power pentode A heavy-duty pentode vacuum tube designed to deliver relatively high output power.

power plug A plug for insertion into a power-line outlet.

power programmer A device that adjusts radar output power, in accordance with the target distance.

power rating **1.** The specified power required by an equipment for normal operation. **2.** The specified power output of a generator or amplifier.

power reactive See REACTIVE VOLT-AMPERE.

power rectifier A heavy-duty semiconductor diode used to rectify alternating current for power-supply purposes.

power relay A heavy-duty relay designed to switch significant amounts of power. The heavy contacts and armature require high actuating current; this necessitates a larger coil than is used in lighter-duty relays.

power resistor A heavy-duty resistor (i.e., one designed to carry large currents without overheating).

power stack A selenium rectifier consisting of a number of rectifier plates stacked in series for higher voltage handling.

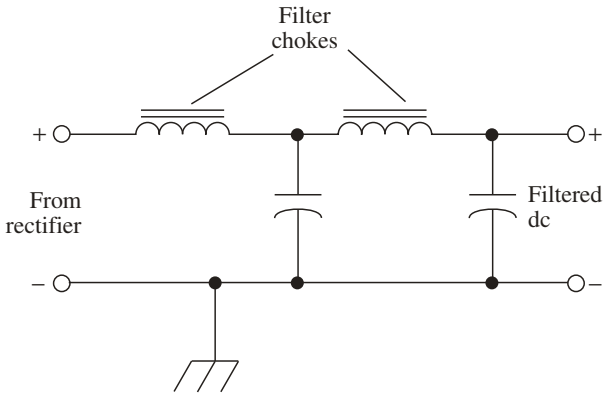
power supply **1.** A device, such as a generator or a transformer-rectifier-filter arrangement, that produces the power needed to operate an electronic equipment. **2.** A reserve of available power (e.g., the power line, an installation of batteries, etc.).

power-supply filter A low-pass filter that is used to remove the ripple from the output of a power-supply rectifier. See, for example, BRUTE-FORCE FILTER.

power-supply rejection ratio The ratio of the output-voltage change for an amplifier, oscillator, or other circuit, to the change in power-supply voltage. It is determined on an instantaneous basis.

power-supply sensitivity In an operational amplifier, sensitivity of the offset to variations in the power-supply voltage.

power surge **1.** A momentary increase in the voltage on a utility line. **2.** An abnormally high voltage that sometimes exists for the first several milliseconds after utility power is restored following a blackout.



power-supply filter

power switch The switch for controlling power to a piece of equipment. Also see ON-OFF SWITCH.

power switching Switching operating power on and off. There are two principal methods: One involves making and breaking the connections between equipment and the power line; the other involves making and breaking the output of a line-operated or battery-type power supply.

power tetrode A heavy-duty tetrode vacuum tube designed to deliver relatively high output power.

power-to-decibel conversion Abbreviation, P_{dB}. Power expressed in decibels, with respect to a reference power level. Determined by the formula $P_{dB} = 10 \log_{10}(P_x/P_{ref})$, where P_x is the given power level and P_{ref} is the reference power level.

power transfer **1.** The passage of power from a generator to a load. **2.** The passage of power from one circuit to another.

power transfer theorem See MAXIMUM POWER TRANSFER THEOREM.

power transformer A transformer designed solely to supply operating power to electronic equipment—either directly or through a rectifier-filter circuit. Because a power transformer is used at low (power-line) frequencies, its core does not require the high-grade iron used in audio transformers, nor are special winding techniques needed to reduce the leakage inductance and interwinding capacitance.

power transistor A heavy-duty transistor designed for power-amplifier and power-control service.

power triode A heavy-duty triode vacuum tube designed to deliver relatively high output power.

power tube A heavy-duty electron tube designed to deliver useful amounts of power. See, for example, POWER PENTODE, POWER TETRODE, and POWER TRIODE.

power unit **1.** A power supply (see POWER SUPPLY, **1**). **2.** A unit of power measurement. See, for example, KILOWATT, MEGAWATT, MICROWATT, MILLIWATT, PICOWATT, and WATT.

power user In personal or business computing, a serious user who has extensive, up-to-date knowledge of hardware and software.

power winding In a magnetic amplifier or saturable reactor, the output winding (i.e., the winding through which the controlled current flows).

Poynting vector In an electromagnetic wave, the vector product of instantaneous electric intensity and magnetic intensity.

PP Abbreviation of *peripheral processor.*

PP **1.** Symbol for PLATE POWER. **2.** Symbol for PEAK POWER.

ppb Abbreviation of *parts per billion.*

PPI Abbreviation of PLAN POSITION INDICATOR.

pp junction In a semiconductor wafer, the boundary between two p-type regions that have somewhat different properties.

PPM Abbreviation of PULSE-POSITION MODULATION.

ppm **1.** Abbreviation of *parts per million.* **2.** Abbreviation of *pulses per minute.*

pps Abbreviation of *pulses per second.*

ppt Abbreviation of *parts per thousand.*

PPV Abbreviation of PAY PER VIEW.

Pr Symbol for PRASEODYMIUM.

practical component A circuit component considered in proper combination with the stray components inherent in it. Thus, a resistor has residual inductance and capacitance, an inductor has residual capacitance and resistance. Compare IDEAL COMPONENT.

practical units A set of physical/electrical units especially suited to a particular application. For example, in direct-current electrical applications, practical units are the AMPERE, OHM, VOLT, and WATT.

praetersonics See ACOUSTOELECTRONICS; ACOUSTIC DELAY LINE; SURFACE-WAVE AMPLIFIER; SURFACE-WAVE FILTER.

pragilbert The unit of MAGNETOMOTIVE FORCE in the absolute mks (Giorgi) system.

pragilbert per weber The unit of RELUCTANCE in the absolute mks (Giorgi) system.

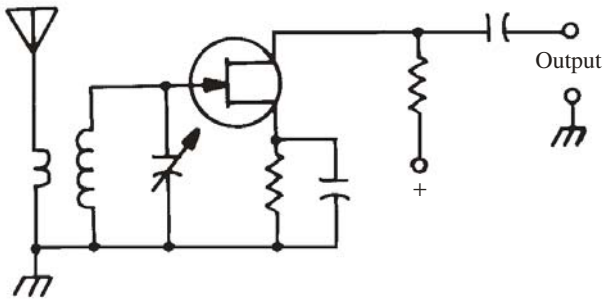
praoersted The unit of MAGNETIZING FORCE in the absolute mks (Giorgi) system.

praseodymium Symbol, Pr. A metallic element of the rare-earth group. Atomic number, 59. Atomic weight, 140.908.

preaccelerating electrode In the electron gun of a cathode-ray tube, the high-voltage electrode that provides initial acceleration to the electron beam.

pre-alarm signal An audio and/or visual indicator that an alarm will sound if an area is not cleared within a short time. An example is a voice recording in a car alarm system (e.g., "Stand back!").

preamplifier **1.** A high-sensitivity, low-noise amplifier that usually uses a high-gain field-effect transistor (FET) and is used to enhance the sensitivity of a radio communications receiver. They are especially used at frequencies above



preamplifier

approximately 15 MHz, where most of the noise comes from the receiver, rather than from outside sources. **2.** A low-noise amplifier used for boosting weak signals for television reception. **3.** A low-noise, low-level amplifier used for boosting signal levels from transducers, such as microphones or photocells.

prebiased relay A relay through which is maintained a steady current that is just lower than that needed to close the relay. The actuating signal, then, need only be a small amount of additional current.

precedence effect See FUSION, **1**.

precipitation **1.** Water falling from the atmosphere in some form (rain, snow, hail, or sleet). See PRECIPITATION STATIC. **2.** The amount of precipitation occurring in a given period of time at a specific location. **3.** Separation of a solid material from a solution, as a result of a chemical or physical action.

precipitation static **1.** Radio noise that sometimes occurs when it rains or snows. It can be mistaken for artificially generated noise. **2.** Radio noise caused by atmospheric electricity arising from rain, snow, ice crystals, hail, or dust clouds, through which an aircraft carrying the radio flies.

precipitator See DUST PRECIPITATOR.

precipitron See DUST PRECIPITATOR.

precision **1.** Pertaining to electronic hardware, especially test instruments and measuring devices, designed and built to function with a high degree of accuracy. **2.** The relative accuracy of a meter or other indicating device. **3.** The accuracy of the results of an experiment, test, or measurement.

precision approach radar A radar aimed along the approach path to guide an aircraft during approach.

precision instrument An instrument possessing high accuracy and stability (i.e., one capable of reproducing readings or settings for various trials under set circumstances).

precision potentiometer **1.** A POTENTIOMETER possessing highly accurate resistance calibration, linearity, and repeatability of settings. **2.** A potentiometer-type voltage-measuring instrument.

preconduction current **1.** The cutoff current in a transistor. **2.** In a thyratron, the small (anode) current flowing before the tube is fired.

predetermined counter A counter programmed to count to a desired number and stop.

predistortion See PREEMPHASIS.

pre-Dolby **1.** To record a tape with DOLBY compression. **2.** A tape that has been recorded with Dolby compression.

preemphasis In frequency modulation, the introduction of a rising-response characteristic (response rises as modulation frequency increases). Compare DEEMPHASIS.

preequalization **1.** In sound recording and reproduction, equalization during recording. **2.** See PREEMPHASIS.

preferred values of components A number system used by the Electronics Industries Association (EIA) for establishing the values of composition resistors and small fixed capacitors.

prefix multiplier See MULTIPLIER PREFIX.

prefix notation As used with complex expressions involving many operators and operands, a type of notation in which the expressions, rather than containing brackets, are given a value, according to the relative positions of operators and operands.

preform **1.** A small wafer, usually dry-pressed from powdered plastic, from which the body of a component, such as a capacitor or resistor, is heat-molded. Also called a *pill* or *biscuit.* **2.** The preformed slab used in molding a phonograph disc. **3.** To shape a moldable circuit before fixing the final configuration or package.

preliminary information For manufactured electronic components, data that is released prior to the actual availability of the device. Subject to change when units are produced.

premix A molding compound of reinforced plastic.

prerecorded disc A phonograph disc on which a recording has been made (i.e., a recorded disc).

prerecorded tape Magnetic tape on which a program or data has been recorded. Also called RECORDED TAPE.

p region See P LAYER.

prescaler A device operated ahead of a counter to establish a new, usually higher-frequency, range over which frequency measurements can be made.

preselector A tuned or untuned radio-frequency amplifier operated ahead of a radio or television receiver to boost the sensitivity of the receiver.

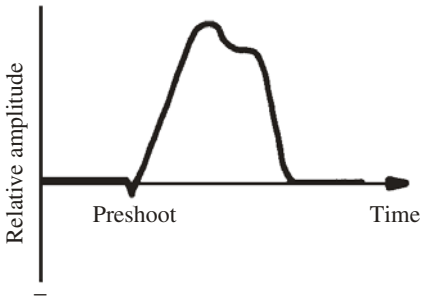
presence **1.** In sound reproduction, the quality of being true to life. **2.** The effect of boosted upper-midrange frequencies in music.

preset counter A pulse counter that delivers one output pulse for a number of successive input pulses, determined by the settings of counter-circuit controls. Thus, a preset counter might give an output pulse for each train of 125 input pulses.

preset element In automation and control, an element that can be preset to a given level or value, and to which other elements can then be referred.

preset switch In the circuit of a PRESET COUNTER, a multiposition rotary switch that can be set to determine the number of input pulses that must be received for the circuit to deliver one output pulse.

preshoot A downward-moving transient pip that sometimes precedes the rise of a pulse.



preshoot

preshoot amplitude The peak voltage of a PRESHOOT, measured from the zero line to the valley of the preshoot.

preshoot time The width of a PRESHOOT, measured along the horizontal base line (time axis).

pressing **1.** A process by which phonographic discs are fabricated from plastic. **2.** A disc pressed from plastic.

press-to-talk microphone A microphone that uses a PRESS-TO-TALK SWITCH for actuation.

press-to-talk switch A switch in a microphone or on the end of a control cord. It is used to actuate a transmitter, telephone, or recorder when the operator wishes to speak.

pressure Abbreviation, P or p. **1.** Force per unit area. It can be expressed in any appropriate units of force and area (e.g., newtons per square meter, pounds per square inch, grams per square centimeter, etc.). **2.** The application of force over part or all of a surface. **3.** Compression. **4.** See TENSION, **1**.

pressure amplitude The pressure caused by an acoustic disturbance. It is usually measured in dynes per square centimeter.

pressure capacitor An enclosed fixed or variable capacitor, whose breakdown voltage increases when the air pressure rises inside the container.

pressure contact **1.** Electrical contact made by pressing two conducting surfaces together (to complete a circuit). **2.** A contact for obtaining the condition described in **1**.

pressure-gradient microphone See PRESSURE MICROPHONE.

pressure microphone A microphone that receives sound waves at only one side of its diaphragm. This one-sided exposure results in the displacement of the diaphragm by an amount proportional to the instantaneous pressure of the sound waves.

pressure pad In a tape recorder, a small pad that holds the tape against one of the heads.

pressure pickup See PRESSURE TRANSDUCER.

pressure roller In a tape recorder, a rubber-tired roller that presses the tape against the capstan.

pressure sensor A device that detects the presence of, and/or measures, physical force within a specific area. One simple device uses two metal plates separated by electrically resistive foam. Pressure compresses the foam and reduces the resistance between the plates. This resistance change can be detected and measured.

pressure switch A switch that is opened or closed by a change in pressure within a system.

pressure transducer A sensor for converting pressure into proportionate current or voltage. Some use strain gauges; others use piezoelectric crystals, potentiometers, and other variable elements.

pressure zone A region of high air pressure that is immediately adjacent to a surface reflecting an acoustic (sound) wave.

pressure-zone microphone A microphone equipped with a deflector that helps to guide acoustic energy toward the diaphragm.

prestore To place data in memory before it is intended for use.

pretuned stage A stage, such as one in an intermediate-frequency amplifier or single-frequency receiver, that is preset to a frequency, rather than being continuously tuned.

prf Abbreviation of PULSE REPETITION FREQUENCY.

pri Abbreviation of PRIMARY.

primaries See PRIMARY COLORS.

primary **1.** See PRIMARY WINDING. **2.** See PRIMARY STANDARD.

primary battery A battery composed of primary cells.

primary block A fundamental group of channels in pulse-code modulation, combined by means of time-division multiplexing.

primary capacitance **1.** The distributed capacitance of the primary winding of a transformer whose secondary winding is unloaded. Compare SECONDARY CAPACITANCE, **1**. **2.** A series or shunt capacitance used to tune the primary coil of a radio-frequency transformer. Compare SECONDARY CAPACITANCE, **2**.

primary cell An electrochemical cell that does not require, and generally will not accept, an electrical charge in order to function. Once it has been discharged, the cell must usually be thrown away. Compare STORAGE CELL. Also see CELL, DRY CELL, and STANDARD CELL.

primary circuit **1.** The circuit associated with the primary winding of a transformer. **2.** The circuitry associated with the input to a device or system.

primary coil See PRIMARY WINDING.

primary colors See COLOR PRIMARY.

primary current The current flowing in the primary winding of a transformer. Also called TRANSFORMER INPUT CURRENT. Compare SECONDARY CURRENT.

primary electron The electron possessing the greater energy after a collision between two electrons. Compare SECONDARY ELECTRON.

primary emission Emission arising directly from a source, such as the cathode of an electron tube. Compare SECONDARY EMISSION.

primary frequency standard A device that generates unmodulated signals at precise frequencies. It generally uses a highly stable crystal oscillator that can be referred to a time standard and periodically corrected. A string of multivibrators, together with harmonic amplifiers and buffers, divide, and multiply the fundamental crystal frequency. The resulting signals provide markers for calibrating receivers and test equipment. Compare SECONDARY FREQUENCY STANDARD. Also see PRIMARY STANDARD.

primary impedance **1.** The impedance of the primary winding of a transformer whose secondary winding is unloaded. Compare SECONDARY IMPEDANCE, **1**. **2.** An external impedance presented to the primary winding of a transformer. Compare SECONDARY IMPEDANCE, **2**.

primary inductance The inductance of the primary winding of a transformer whose secondary winding is unloaded. Compare SECONDARY INDUCTANCE.

primary kVA The kilovolt-amperes in the primary circuit of a transformer. Compare SECONDARY KVA.

primary measuring element A detector, sensor, or transducer that performs the initial conversion in a measurement or control system. Such an element converts a phenomenon into a signal that can be transmitted to appropriate instruments for translation and evaluation.

primary power Power in the primary circuit of a transformer. Also see PRIMARY KVA and PRIMARY VA. Compare SECONDARY POWER.

primary radiator **1.** The driven element of a directive antenna system that incorporates parasitic elements. **2.** The driven element of a directive antenna that uses a reflector, such as a screen or dish.

primary resistance The direct-current resistance of the primary winding of a transformer. Compare SECONDARY RESISTANCE.

primary standard A usually stationary source of a quantity (e.g., capacitance, frequency, time, inductance, resistance, etc.). This source is so precise, and is maintained with such care, that it can be used as a universal reference. Compare SECONDARY STANDARD.

primary turns Symbol, N_p. The number of turns in the primary winding of a transformer. Compare SECONDARY TURNS.

primary utilization factor Abbreviation, UF_p. For a transformer in a rectifier circuit, the ratio of direct-current power output to primary volt-amperes. Numerically, the primary utilization factor is higher than the secondary utilization factor, but is less than 1. Also see SECONDARY UTILIZATION FACTOR and UTILITY FACTOR.

primary VA The volt-amperes in the input circuit of a transformer. Compare SECONDARY VA.

primary voltage The voltage across the primary winding of a transformer. Also called *transformer input voltage*. Compare SECONDARY VOLTAGE.

primary winding The normal or usual input winding of a transformer. Also called *primary coil*. Compare SECONDARY WINDING.

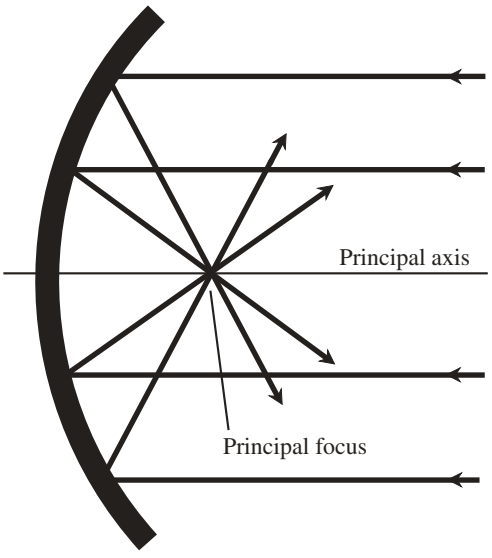
prime meridian See ZERO MERIDIAN.

prime mover A machine, such as a gas engine, steam engine, or water turbine, that converts a natural force or material into mechanical power.

primitive oscillation period In a complex oscillation waveform, the shortest period for which a definite repetition occurs; the highest fundamental frequency.

principal axis The line passing through the center of the spherical part of a lens, mirror, or dish reflector.

principal focus The focal point of rays arriving parallel to the principal axis of a lens, mirror, or dish reflector.



principal focus

principal mode See DOMINANT MODE.

principal ray The path described by an electron entering an electron lens parallel to the lens' axis, or by an electron leaving this lens parallel to the axis.

print **1.** The material transferred from a typewriter onto paper. **2.** The command, in a computer sys-

tem, that causes data to be placed on paper or onto the output screen. **3.** The alphanumeric output of a computer or data terminal.

printed capacitor A two-plate capacitor formed on a printed circuit.

printed circuit A pattern of conductors (corresponding to the wiring of an electronic circuit) formed on a board of insulating material, such as a phenolic, by photo-etching, silk-screening of metallic paint, or by the use of pressure-sensitive preforms. The leads or pins of discrete components are soldered to the printed metal lines at the proper places in the circuit, or the components can be formed along with the conductors. Also see ETCHED CIRCUIT.

printed-circuit board A usually copper-clad plastic board used to make a printed circuit.

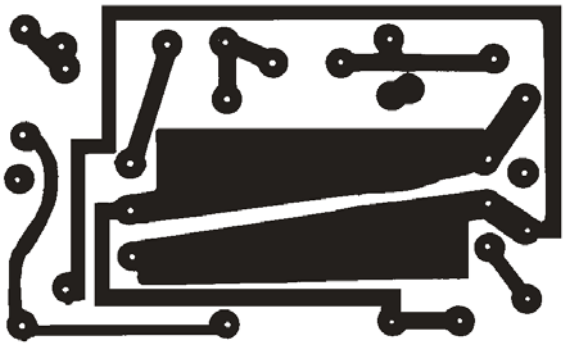
printed-circuit lamp A baseless lamp having flexible leads for easy soldering or welding to a printed circuit.

printed-circuit relay A usually small relay provided with pins or lugs for easy solder connection to a printed circuit.

printed-circuit switch A rotary switch whose contacts and contact leads are printed on a substrate.

printed-circuit template Also called *etching pattern.* A drawing for the purpose of making printed-circuit boards by photographic means.

printed coil A flat, spiral coil formed on a printed circuit.



printed-circuit template

printed component A component formed on the substrate of a printed circuit. See, for example, PRINTED CAPACITOR, PRINTED COIL, and PRINTED RESISTOR.

printed display See DATA PRINTOUT, **2**.

printed element See PRINTED COMPONENT.

printed inductor See PRINTED COIL.

printed resistor A resistor printed or painted on a printed circuit.

printed wiring The printed or etched metal lines that serve as the conductors in a printed circuit.

printer In computer and calculator operations and in measurement procedures, a readout device that prints a permanent record of output data. There are several types, including the *dot-matrix printer*, the *daisy-wheel printer*, the *inkjet printer*, and the *laser printer.* Some printers, such as the daisy-wheel type, can render only text data; others, such as the laser type, can print high-resolution graphic images, sometimes in color.

printing calculator **1.** An electronic calculator that supplies a printed record of the results of a calculation. **2.** For a programmable calculator, the results, a record of program steps, and plots of curves.

printing digital voltmeter Abbreviation, PDVM. A digital voltmeter that delivers a printed record of a voltage reading, in addition to the usual digital readout of the voltage.

printing telegraph **1.** A telegraph that prints the received message on a tape or page. **2.** See TELETYPEWRITER.

printing wheel See PRINT WHEEL.

print format The form of data transmitted by a computer program to a printer (e.g., plain text, graphics, color graphics, etc.).

printout See DATA PRINTOUT, **1**, **2**.

print-through In prerecorded magnetic tape on a reel or cassette, the transfer of magnetism between layers of the rolled-up tape.

print wheel In a daisy-wheel printer, the rotatable wheel on whose rim the letters, numbers, and other symbols are inscribed in relief.

priority indicator In data transmission, a code that specifies the order of importance of a message in a group of messages to be sent.

priority processing In multiple programming operations, a system for ascertaining the order of processing for different programs.

privacy code **1.** A subaudible tone used in cordless telephone systems to reduce the chances of interference between phones operating on the same channel in close proximity. **2.** A subaudible tone used in radio transmissions, especially in conjunction with repeaters, to allow only those stations with the proper code to be received. **3.** A tone-burst sequence at the beginning of a transmission that actuates a receiver, allowing only those stations with the proper code to be received.

privacy equipment Devices, such as speech scramblers and digital encryption programs, that provide some measure of secrecy in communications.

privacy switch In a telephone amplifier, a switch (usually a pushbutton) for muting outgoing messages.

private automatic exchange Abbreviation, PAX. A dial telephone system for use within an organization and having no connection to the central office. Compare PRIVATE BRANCH EXCHANGE.

private branch exchange Abbreviation, PBX. A telephone system, complete with a private manually operated switchboard and individual telephone sets, installed and operated on private

premises but having trunk-line connection to the central office. Compare PRIVATE AUTOMATIC EXCHANGE.

private line **1.** A communication circuit in which the use is limited, by electronic means, to certain subscribers. **2.** A subaudible-tone system used to restrict access to a communications system. The tone frequency is predetermined. For access to the system, a transmitted signal must contain the tone of the appropriate subaudible frequency, in addition to the voice or other information.

probability **1.** The branch of mathematics concerned with the likelihood of an event's occurrence. It has many applications in quality control and physics. **2.** The mathematical likelihood that an event will occur.

probable error Abbreviation, PE. The value of error above and below which all other error values are equally likely to occur.

probe **1.** A usually slender pencil-like implement with a pointed metal tip and a flexible, insulated lead. It is used to contact live points in a circuit under test (e.g., *voltmeter probe* and *oscilloscope probe*). **2.** A device used to sample a radio-frequency voltage or current at a desired point (e.g., WAVEGUIDE PROBE). **3.** A pickup device shaped like a probe for insertion into close quarters (e.g., PROBE THERMISTOR).

probe meter See PROBE-TYPE VOLTMETER.

probe thermistor A thermistor of slender construction for insertion into an area in which the temperature is to be monitored or controlled.

probe thermocouple A thermocouple in the form of a slender probe for insertion into close quarters for temperature sensing or temperature control.

probe tip See PROD.

probe-type voltmeter A voltmeter installed in a long probe or wand. Kilovoltmeters are sometimes constructed in this fashion, with a long multiplier resistor housed in the probe.

probing A process for locating, or determining the existence of, external artificial interference (e.g., power-line noise) in a radio communications circuit.

problem-oriented language Any high-level computer programming language that allows the user to write programs as statements in terms applicable to the field of interest (e.g., COBOL's statements in English for problems relating to business).

problem reduction In artificial intelligence, a process in which problems are made easier by breaking them down into smaller logical parts.

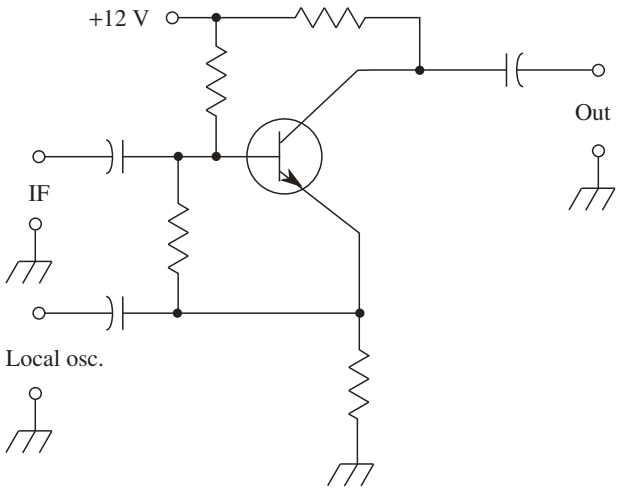
process control The control of a process, such as one of manufacturing, by means of computers.

processor **1.** A circuit or device used to modify a signal in response to certain requirements (e.g., *clipper* and *waveshaper*). **2.** See DATA-PROCESSING MACHINE. **3.** See CENTRAL PROCESSING UNIT. **4.** See MICROPROCESSOR.

prod The metal tip of a probe (see PROBE, **1**).

product **1.** The result of mixing or heterodyning of two or more signals. **2.** The result of modulating one signal with another. **3.** The result of combining or processing a signal or signals in a specified manner. **4.** The saleable end result of a manufacturing process. **5.** The result obtained when two or more quantities are multiplied by each other.

product detector A detector circuit whose output is the product of two signals applied simultaneously to the circuit. In a single-sideband receiver, for example, one of the signals is the incoming signal; the other, the signal from the local beat-frequency oscillator.



product detector

production lot A manufactured set of components, circuits, or systems, intended for sale. All of the units in the lot are identical. The finished product is suitable (presumably) for consumer use.

production unit One unit in a production lot; a finished unit, ready for use by a consumer.

product modulator A modulator whose output is equal or proportional to the product of carrier voltage and modulating voltage.

product of sine waves The result of multiplying one sine wave by another with attention being paid to the power factor. In the case of a resistive circuit, where the power factor is equal to 1, all voltage-current (*EI*) products are positive, and are equal to the true power. A product wave has negative half-cycles when the circuit contains reactance.

professional engineer A person licensed by a state board of examiners to work independently as an engineering. Also see PE and REGISTERED PROFESSIONAL ENGINEER.

program **1.** In computer operations, a detailed sequence of instructions representing an algorithm

(the necessary steps in solving a problem) that can be implemented by a computer. **2.** The content of a radio or television broadcast during a specified period of time. **3.** In audio recording, the composite output from the mixer, used to make the master tape or disc.

program address counter See INSTRUCTION REGISTER.

program amplifier A broadcast preamplifier used at the studio or a remote location.

programatics The study of computer programming.

program circuit In wire telephony, a circuit capable of handling music and other audio data that covers a wide band of frequencies.

program compatibility The condition in which a program written for one computer can be used with another computer having a different architecture.

program controller In a central processor, a unit that controls the sequence and execution of program instructions.

program counter See CONTROL REGISTER.

program file A flexible reference system for software library maintenance.

program flowchart A representation of a computer program in the form of a flowchart. Each function and transition point is indicated by a box in the chart. A user can follow the flowchart and determine the outcome of the program for any given set of input parameters.

program library A collection of computer or programmable-calculator programs. Usually, it means the collection of programs used in a given computer system, often a software package supplied by the hardware vendor. It might also be a catalog of programs with instructions for their use.

programmable calculator A calculator that can be programmed to perform a chain of operations in a given order repetitively.

programmable read-only memory In a computer, a read-only memory (ROM) that can store a program.

program maintenance The ongoing correcting, updating, and modification of computer programs belonging to a system.

programmed dump A dump that occurs during a program run, according to a program instruction.

programmed halt During a computer program run, a temporary cessation resulting from an interrupt or halt instruction.

programmed instruction See MACRO INSTRUCTION.

programmed timer See CYCLE TIMER.

programmer A person who writes computer programs.

program modification **1.** In computer programming operations, a change in the effect of instructions and addresses during a program run by performing arithmetic and logical operations on them. **2.** Rewriting, or adding a patch to, a computer program. Also see PATCH, **3**.

program register See CONTROL REGISTER.

program segment A unit within a computer program that is stored with others in memory at the time of the program's execution, or sometimes, as overlays loaded individually when the entire program exceeds memory capacity.

program specification A description of the steps involved in the solution of a problem, from which a programmer devises a computer program.

program step An instruction in a computer program.

program tape In computer operations, a magnetic or paper tape that contains programs for a system or application.

program timer **1.** A programmed timer (see CYCLE TIMER). **2.** A timing unit that controls the duration of a program.

progressive scanning Non-interlaced television raster scanning, in which the lines are traced from top to bottom in succession. Conventional television broadcasting uses INTERLACED SCANNING.

progressive wave A wave disturbance that travels through a theoretically perfect homogeneous medium. This can be a compression (longitudinal) wave, a transverse wave, or an electromagnetic wave.

projected cutoff For an amplifier circuit, the operating point at which crossover distortion vanishes. The direct-current bias voltage (grid or gate) required for projected cutoff is somewhat lower than the value corresponding to conventional cutoff of plate or drain current.

project engineering A field of engineering dealing with the coordination of a complete project.

projection television Large-screen television for viewing by a relatively large group, usually accomplished via a projection tube and optical system.

projection tube A cathode-ray tube, especially a television picture tube, capable of producing a bright image that can be projected onto a large screen by means of a lens system.

projector **1.** A device that transmits a visible image onto a surface for reproduction. **2.** In general, any device that transmits a signal into space.

PROLOG Acronym for *programming in logic.* A high-level computer programming language, similar to LISP, used in artificial intelligence. The operator inputs facts and rules; the computer, in effect, derives theorems from the facts by following the logical rules.

PROM Abbreviation of PROGRAMMABLE READ-ONLY MEMORY.

promethium Symbol, Pm. A metallic element of the rare-earth group, produced artificially. Atomic number, 61. Atomic weight, approximately 145. Formerly called *illinium.*

promethium cell A radioactive battery cell using an isotope of promethium. Radioactive particles from this substance strike a phosphor, causing it

to glow. Self-generating photocells then convert this light into electricity.

PROM programmer An electronic device that can store a computer program in a PROGRAMMABLE READ-ONLY MEMORY (PROM). It uses a built-in keyboard.

prompt In computer operations, a message received by an operator from an operating system or an individual program. For example, in disk operating system (DOS), it could be the statement "Bad command or file name."

prompting In computer or programmed-calculator operations, the entry of a special, required variable when the machine halts and awaits such entry.

prong See PIN.

prony brake An arrangement for measuring the mechanical power output of a rotating machine. It is a special form of friction brake consisting of a band passed around a pulley on the rotating shaft of the machine under test and held at each end by a spring balance.

propagation **1.** The extension of energy into and through space. Thus, radiant energy is *propagated* from and by its source. **2.** A phenomenon resulting from the extension of energy into and through space. Thus, radio waves can be spoken of as a *propagation.*

propagation constant For waves transmitted along a line, a number showing the effect the line has on the wave. This is a complex figure [i.e., one containing a real-number component (the attenuation constant) and an imaginary-number component (the phase constant)].

propagation delay **1.** Symbol, t_{pd}. In an integrated-circuit logic gate, the time taken for a logic signal to be propagated across the gate. **2.** In digital-circuit operation, the time required for a logic-level change to be transmitted through one or more elements.

propagation delay-power product See DELAY-POWER PRODUCT.

propagation factor The ratio E/E_o, where E is the complex electric-field strength at a point to which a wave has been propagated, and E_o is the complex electric-field strength at the point of origin. Also called *propagation ratio.*

propagation loss The path loss of an electromagnetic disturbance between the transmitting and receiving antennas.

propagation mode See WAVEGUIDE MODE.

propagation ratio See PROPAGATION FACTOR.

propagation time In digital-circuit operation, the time required for a binary bit to be transferred from one point to another in the system.

propagation velocity See VELOCITY OF PROPAGATION.

proportional action An action, such as amplification or conversion, that produces an output signal proportional to the input signal.

proportional amplifier An amplifier in which the instantaneous output amplitude is proportional to the instantaneous input amplitude.

proportional control A voltage-regulation system in which the feedback correction voltage is proportional to the output-voltage error.

proportional counter A Geiger tube having a pointed-wire (or ball-tipped-wire) anode. The voltage developed across the load resistor is proportional to the number of ions created by the radioactive particles entering the tube.

proprioceptor A set of transducers and associated circuitry that allows a computerized robot to constantly sense the positions of its end effectors, and use this data in carrying out programmed tasks.

prosodic features Variations in voice tone and emphasis that lend meaning and implication to spoken statements. It is important in advanced computer speech recognition and speech synthesis systems. Two sentences with identical wording can have greatly different meanings, depending on these factors (e.g., "*You* are!" versus "You *are?*").

prosthesis An electromechanical artificial human limb or body part. Examples: artificial legs, artificial hands, and artificial respirators. Some such devices are computer-controlled; others can be manipulated by nerve impulses.

protactinium Symbol, Pa. A relatively short-lived radioactive metallic element. Atomic number, 91. Atomic weight, 231.04 Formerly called *protoactinium.*

protected area A region to which access is restricted, and that is secured by an alarm system, surveillance cameras, or other intrusion-prevention systems.

protected location In computer storage, a location whose contents are protected from mutilation or erasure by making the location usable only by following a special procedure (e.g., using a password).

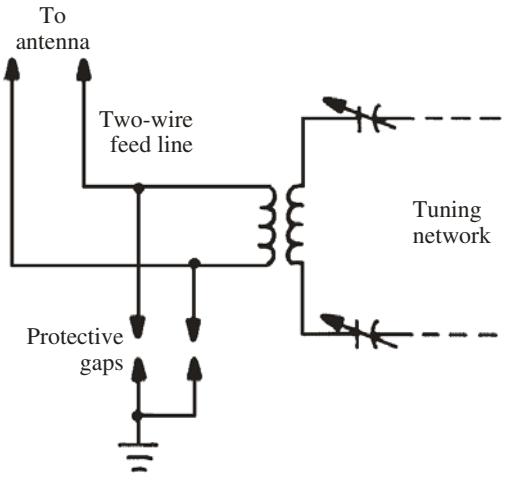
protection In a multiple processing computer system, preventing interference between data or programs.

protective bias In the final power amplifier of a radio transmitter, external direct-current bias applied to the base, gate, or grid. Prevents runaway in collector, drain, or plate current when the bias caused by the driving signal is lost.

protective capacitor A power-line bypass capacitor.

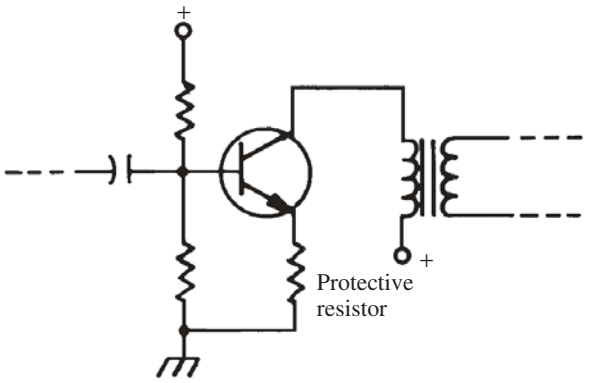
protective device **1.** A component that breaks a circuit in the event of excessive voltage or current from the power supply. **2.** A device that prevents excessive power from being delivered to a load by a driving circuit.

protective gap **1.** A spark gap connected in parallel with a component, or between a line and ground as protection against high-voltage transients and surges. **2.** A spark-gap-type lightning arrester.



protective gap

protective resistor **1.** A bleeder resistor connected in parallel with a filter capacitor in a high-voltage direct-current power supply to discharge the capacitor automatically, thus preventing electric shock. **2.** A series resistor that limits the current going through a device.



protective resistor, 2.

protector **1.** A fast-acting power-disconnect device, such as a circuit breaker or fuse, that acts to protect electronic equipment. **2.** A device or connection, such as a safety ground or ground-fault interrupter, that protects an operator from electric shock. **3.** See CONTACT PROTECTOR.

protium The light isotope of hydrogen, having an atomic mass of 1.

protoactinium See PROTACTINIUM.

protocol **1.** A set of parameters for a digital communications signal. **2.** The method by which a procedure is followed; a uniform set of governing regulations. It ensures proper operation of a system or network.

proton A positively charged particle in the nucleus of an atom. The mass of a proton is approximately 1840 times the mass of an electron.

proton rest mass See MASS OF PROTON AT REST.

proton-synchrotron A synchrotron that uses frequency modulation of the radio-frequency accelerating voltage. It can accelerate protons to energies of several billion electronvolts.

prototype The preliminary design or model of a device or system. It is often modified numerous times before the final design is attained. Compare PILOT MODEL.

proustite Crystalline silver arsenide trisulfide. Artificial crystals of this compound are used in tunable infrared-ray instruments.

proximity alarm A capacitance relay used to actuate an alerting-signal device when an area is intruded upon or a person is too close to a protected object. Also called INTRUSION ALARM.

proximity detector See PROXIMITY SENSOR.

proximity effect **1.** The influence of high-frequency current flowing in one conductor on the distribution of current flowing in an adjacent conductor. **2.** In an audio system, the result of placing a microphone too close to a person's mouth. Under these conditions, some spoken consonants (e.g., B, F, P, and T) produce clapping or booming sounds.

proximity fuse An electronic device situated in the nose of a missile. When the missile is near the target, the fuse transmits a signal that is reflected back from the target; this reflected signal detonates the missile.

proximity relay See CAPACITANCE RELAY.

proximity sensing The ability of a machine, especially a robot, to detect when an object is near. This is an aid in robot navigation because it prevents collisions. Some devices can measure the distance from a robot, or from a robotic end effector, to a nearby object.

proximity sensor A device that indicates the presence of a nearby body. Such a device uses some form of circuit, such as that of a CAPACITANCE RELAY, that changes its operating characteristics when an object enters its field.

proximity switch See CAPACITANCE RELAY.

PRR Abbreviation of PULSE REPETITION RATE.

PRV Abbreviation of PEAK REVERSE VOLTAGE.

PS Abbreviation of POWER SUPPLY.

ps Abbreviation of PICOSECOND. (Also, psec.)

PSD Abbreviation of PHASE-SENSITIVE DETECTOR.

psec Abbreviation of PICOSECOND. (Also, ps.)

pseudocode In a computer system, an instruction or code symbol that affects the operation of the programming in an indirect manner.

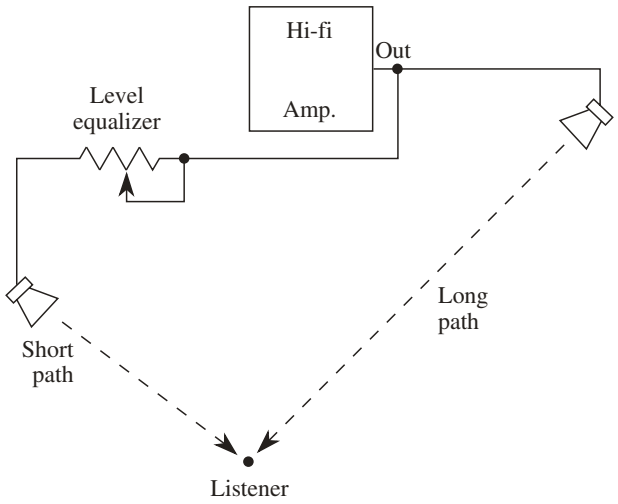
pseudo-instruction In computer programming operations, data representing an instruction and requiring translation by a compiler or assembler.

pseudo-offlining During input/output operations in a computer system, maximizing hardware by disconnecting slow devices from the process in question.

pseudo-operation In computer operations, an operation that, rather than being performed by hardware, is carried out by special software or by macroinstruction.

pseudo-random numbers Numbers that, although produced by a computer operating on an algorithm for their generation, are useful for an application requiring random numbers.

pseudo-stereophonic effect A somewhat heightened binaural effect obtained when two loudspeakers are situated, relative to the listener, so that a transit-time difference of 1 to 30 milliseconds results.



pseudo-stereophonic effect

psf Abbreviation of *pounds per square foot.* (Also, lb per sq ft, lb/ft^2.)

psi **1.** Abbreviation of *pounds per square inch.* (Also, lb per sq in, lb/in^2.)

psia Abbreviation of POUNDS PER SQUARE INCH ABSOLUTE.

psig Abbreviation of POUNDS PER SQUARE INCH GAUGE.

psi particle A massive elementary particle that represents a resonance in an electron-positron interaction.

PSK Abbreviation of PHASE-SHIFT KEYING.

PSM Abbreviation of *pulse-spacing modulation,* more commonly called PULSE-INTERVAL MODULATION.

psophometer A device used to measure noise in a wire communications system. It provides quantitative readings based on typical human observations.

psvm Abbreviation of *phase-sensitive voltmeter.*

PSWR Abbreviation of *power standing-wave ratio.*

psychoacoustics A field of acoustics, overlapping with psychology, concerned with the effects of sounds on human beings.

PT Abbreviation of *Pacific Time.*

Pt Symbol for PLATINUM.

PTC Abbreviation of POSITIVE TEMPERATURE COEFFICIENT.

PtIr Symbol for PLATINIRIDIUM.

PTM Abbreviation of PULSE-TIME MODULATION.

PTO Abbreviation of PERMEABILITY-TUNED OSCILLATOR.

PTT Abbreviation for *press-to-talk.* See PRESS-TO-TALK MICROPHONE; PRESS-TO-TALK SWITCH.

PTV Abbreviation of *public television.*

p-type conduction In a semiconductor, current flow consisting of the movement of holes. Compare N-TYPE CONDUCTION.

p-type material Semiconductor material that has been doped with an acceptor-type impurity and, consequently, conducts current mainly via hole migration. Germanium, for example, when doped with indium, becomes p-type. Compare N-TYPE MATERIAL.

p-type semiconductor An acceptor-type semiconductor (i.e., one containing an excess of holes in its crystal lattice).

PU Abbreviation of PICKUP.

Pu Symbol for PLUTONIUM.

public-address amplifier A high-gain, high-power audio amplifier designed especially for the reproduction of speech and music at large gatherings.

public-address system A system of sound reproduction especially designed for use at large gatherings indoors or outdoors. The system includes microphones, a public-address amplifier, loudspeakers, and sometimes recorders and playback devices. Also called *PA system.*

puck drive In a tape recorder, a speed-reduction system for driving the flywheel from the shaft of the (high-speed) motor. In some machines, a rubber tire mounted on the flywheel is driven, through friction, by the motor shaft. In others, an intermediate rubber-tired wheel is placed between the motor shaft and the rim of the flywheel.

puffer A meter or bridge for measuring small values of capacitance. The name comes from the spoken sound of *pF,* the abbreviation of PICOFARAD.

pulldown Descriptive of a circuit, device, or individual component used to lower the value (e.g., impedance) of a circuit to which it is connected.

pull-in current The current required to close a relay.

pulling **1.** The abnormal tendency of one circuit to cause another to slip into tune with it. This often results from coupling (intended or accidental) that is too tight. Thus, when two oscillators feed a common circuit, such as a mixer, one might pull the other into tune with itself. **2.** Lowering of a crystal frequency by an external reactance.

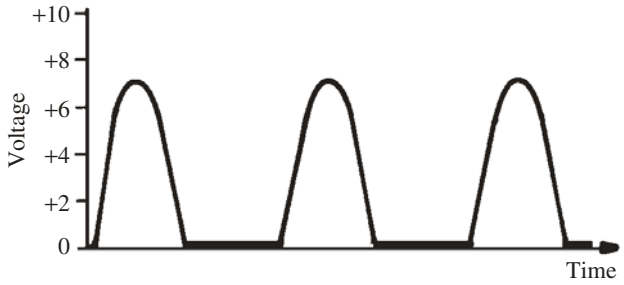
pull-in voltage The voltage required to close a relay.

pull switch A mechanical switch actuated by a pulling action.

pullup Descriptive of a circuit or component used to raise the value (e.g., impedance) of a circuit to which it is connected.

pulsar An extremely dense, rapidly rotating collapsed star that produces radio signals at regular intervals. The pulse frequency varies from less than one hertz to several tens or hundreds of hertz.

pulsating direct current A direct current that periodically rises and falls between zero and a maximum value (or between two positive or negative values) without changing polarity. Thus, it is possible to have either a pulsating positive current or a pulsating negative current. Also see DIRECT CURRENT.



pulsating direct current

pulsating wave See PULSATING DIRECT CURRENT.

pulse A transient signal that is usually of short duration, constant amplitude, and one polarity. A typical example is a narrow positive or negative spike.

pulse amplifier An amplifier having wide frequency response and low distortion, used for amplifying steep-sided pulses of short duration.

pulse-amplitude modulation Abbreviation, PAM. A method of conveying information in wireless communications. A train of pulses is transmitted. The strength of each individual pulse varies according to the modulating waveform. Normally, the pulse amplitude increases as the instantaneous modulating-signal level increases (positive modulation). However, this can be reversed so that higher audio levels cause the pulse amplitude to go down (negative modulation).

pulse bandwidth For an amplitude pulse, the minimum bandwidth occupied. The faster the rise and/or decay times of a pulse, the greater the bandwidth. The greater the pulse frequency, the greater the bandwidth.

pulse code A code in which groups of pulses represent digits.

pulse-code modulation Abbreviation, PCM. A method of conveying information in wireless communications. A train of pulses is transmitted. The intelligence-carrying signal is sampled periodically and the amplitude is converted into binary code. The code might allow for eight levels (000 to 111), 16 levels (0000 to 1111), 32 levels (00000 to 11111), or 64 levels (000000 to 111111).

pulse-code-modulation binary code A pulse code used in communications not in the form of line transmission. Individual values are denoted by binary numbers.

pulse-code modulation multiplex equipment A multiplexer/demultiplexer for signal conversion between a single signal and multiple-channel signals. It uses both pulse-code modulation and time-division multiplexing.

pulse-count divider A circuit or device that receives an input of a certain number of pulses (or pulses per second) and delivers an output that is a function of that quantity. See, for example, DIVIDE-BY-SEVEN CIRCUIT and DIVIDE-BY-TWO CIRCUIT.

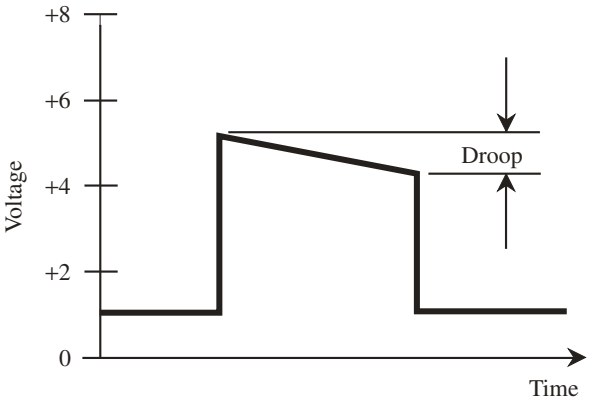
pulse counter A circuit or device that indicates the number of pulses presented to it in a given time interval.

pulse counting Counting pulses in a sequence. At low speed (pulse repetition rate), this can be done with an electromechanical dial-type counter. At high speed, a fully electronic circuit is required.

pulse delay circuit A monostable multivibrator adapted to deliver its single output pulse a predetermined time after the input pulse has been applied.

pulse dialing A form of telephone dialing in which each digit is formed by a series of pulses, usually at 10 to 20 Hz. The pulses are the equivalent of disconnecting the line for a few milliseconds. Each digit has the corresponding number of pulses, except digit 0, which is formed by 10 pulses.

pulse droop Distortion observable as a downward-sloping top on the oscilloscope trace of a pulse. It can be quantified in volts, millivolts, microvolts, amperes, milliamperes, or microamperes.



pulse droop

pulsed laser A laser in which flashes (pulses) of high-intensity light excite the lasing medium.

pulse duration The time period during which a pulse exists (i.e., its width on an oscilloscope display).

pulse-duration modulation Abbreviation, PDM. See PULSE WIDTH MODULATION.

pulse equalizer A MONOSTABLE MULTIVIBRATOR adapted to deliver pulses of equal amplitude, shape, and width—even when it receives trigger pulses of different kinds.

pulse fall time The time required for the trailing edge of a pulse to fall from 90 to 10 percent of its peak amplitude. Compare PULSE RISE TIME.

pulse-forming line A circuit used in radar for producing high-intensity pulses. Inductances and capacitances are combined in a long string, and the effect is to generate high-amplitude radio-frequency pulses.

pulse-frequency modulation Abbreviation, PFM. See PULSE-INTERVAL MODULATION.

pulse generator A signal generator that produces pulses. A general-purpose generator of this sort will produce pulses of adjustable amplitude, duration, shape, and repetition rate.

pulse-height discriminator A circuit or device that passes only pulses whose amplitudes exceed a predetermined level.

pulse interval The interval between successive pulses.

pulse-interval modulation Abbreviation, PIM. Also called *pulse-frequency modulation* (PFM) or *pulse-numbers modulation* (PNM). A method of conveying information in wireless communications. A train of pulses is transmitted. Every pulse has the same amplitude and the same duration, but their rate fluctuates with the modulating waveform. When there is no modulation, the pulses are evenly spaced with respect to time. An increase in the instantaneous data amplitude might cause pulses to be sent more often (positive modulation) or less often (negative modulation).

pulse inverter A single-stage, wideband, low-distortion, common-emitter, or common-source amplifier. The output-pulse waveforms are therefore inverted, with respect to the input-pulse waveforms.

pulse jitter In a pulse train, a disturbance characterized by random changes in the spacing between pulses.

pulse-length modulation See PULSE-DURATION MODULATION.

pulse load The load impedance for a pulse generator.

pulse mode See PULSE MODULATION.

pulse modulation See PULSE-AMPLITUDE MODULATION, PULSE-CODE MODULATION, PULSE-INTERVAL MODULATION, PULSE-POSITION MODULATION, PULSE-WIDTH MODULATION.

pulse modulator **1.** A modulator that delivers power or voltage pulses for modulating a carrier. **2.** A device that modulates pulses (see PULSE MODULATION, **2**).

pulse narrower A circuit or device that reduces the duration (width) of a pulse.

pulse-numbers modulation Abbreviation, PNM. See PULSE-INTERVAL MODULATION.

pulse operation Intermittent operation of a circuit, in the form of discrete pulses.

pulse oscillator Any oscillator with an output that consists of a series of pulses.

pulse-position modulation Abbreviation, PPM. A method of conveying information in wireless communications. A train of pulses is transmitted. The timing of each individual pulse varies according to the modulating waveform. The pulses occur earlier or later than the nominal (zero-modulation) time, depending on the instantaneous amplitude of the modulating signal.

pulse rate See PULSE REPETITION RATE.

pulse ratio The ratio of pulse height (amplitude) to pulse width (duration).

pulse regeneration Restoration of the original waveform and frequency to a pulse. It eliminates distortion caused by circuits or propagation conditions.

pulse repetition frequency Abbreviation, PRF. See PULSE-REPETITION RATE.

pulse-repetition rate Abbreviation, PRR. The number of pulses per unit time; usually pulses per second (pps).

pulse rise time The time required for the leading edge of a pulse to rise from 10 to 90 percent of its maximum amplitude. Compare PULSE FALL TIME.

pulse scaler A circuit actuated by the reception of a definite, predetermined number of input pulses.

pulse-shaping circuit **1.** A circuit for producing a pulse from a wave of some other shape (e.g., sine wave). **2.** A circuit for tailoring a pulse to desired shape, amplitude, and duration.

pulse spacing The interval between successive pulses.

pulse-spacing modulation Abbreviation, PSM. See PULSE-INTERVAL MODULATION.

pulse-steering diode In a flip-flop circuit, a diode through which the trigger pulse must pass to switch the circuit. Because of the unidirectional conductivity of a diode, pulses of only one polarity are passed.

pulse stretcher **1.** A shaping circuit that widens a pulse (i.e., increases its duration). **2.** A circuit, such as a special monostable multivibrator, that generates a pulse that is wider than the trigger pulse.

pulse stuffing See JUSTIFICATION, **2**.

pulse tilt The sloping of the normally flat top of a pulse either up or down. Also see PULSE DROOP.

pulse time See PULSE DURATION.

pulse-time modulation See PULSE-POSITION MODULATION.

pulse train A series of successive pulses of usually one kind.

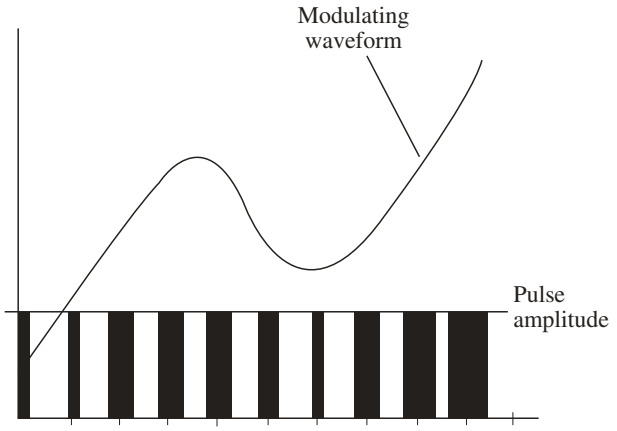
pulse transformer A transformer designed to accommodate the fast rise and fall times of pulses and similar nonsinusoidal waveforms. Such transformers often use special core materials and are made using special winding techniques.

pulse transmitter **1.** A device that transmits a series of pulses. **2.** A pulse-modulated transmitter. **3.** See PULSE MODULATOR.

pulse waveform The general shape of a pulse as it appears on an oscilloscope display. The various forms range from positive or negative half-sinusoids, through rectangles, to thin-line spikes.

pulse width The horizontal dimension of a pulse (i.e., its duration).

pulse-width modulation Abbreviation, PWM. Also called *pulse-duration modulation* (PDM). A method of conveying information in wireless communications. A train of pulses is transmitted. The width (duration) of each individual pulse varies according to the modulating waveform. Normally, the pulse width increases as the instantaneous modulating-signal level increases (positive modulation). However, this can be reversed so that higher audio levels cause the pulse width to decrease (negative modulation).



pulse-width modulation

pump **1.** In a parametric amplifier, the oscillator that supplies the signal that periodically varies the reactance of the varactor. **2.** The pumping signal in **1**. **3.** To perform the operation (pumping) described in **1**. **4.** To increase the energy level of an atom or molecule (by exposing it to electromagnetic radiation) to such an extent that oscillation or amplification occurs. A ruby laser, for example, produces its intense, coherent beam as a result of pumping. **5.** The radiation used to pump an atom or molecule. **6.** The device producing the radiation required to pump an atom or molecule.

pump frequency The frequency of a PUMP voltage.

pumping A method of laser actuation. A series of pulses, at the resonant frequency of the lasing material, is injected to cause laser output.

pump oscillator An oscillator for producing a pump voltage.

pump voltage The voltage of a pumping signal. Also see PARAMETRIC AMPLIFIER and PUMP, **1**, **2**.

punch **1.** A tool for cutting holes in metal chassis, panels, and boxes for electronic equipment. **2.** High signal strength.

punch-in editing In audio recording, a feature that allows convenient insertion of new material on a tape. The tape recorder can be switched instantly from Play to Record, and back again, whenever the operator wants to add material.

punchthrough In a bipolar transistor, the potentially damaging condition resulting when the reverse bias of the collector is increased to a voltage high enough to spread the depletion layer entirely through the base. This tends to effectively connect the emitter to the collector.

punchthrough region The conduction region associated with higher-than-punchthrough voltage, in which bipolar-transistor current is excessive. Also see PUNCHTHROUGH.

punchthrough voltage The voltage that causes PUNCHTHROUGH in a given bipolar transistor.

puncture voltage See BREAKDOWN VOLTAGE, **1**.

Pupin coil One of several loading coils that can be inserted at intervals in series with a telephone line to cancel line-capacitance effects and, thus, improve the clarity of speech.

pure tone An audio-frequency (AF) tone having essentially no harmonic content; a sine-wave AF tone.

pure wave A wave containing no distortion products.

purging The removal of an undesired gas or other substance from a system by introducing a material to displace it.

purifier A power-line operated alternating-current electromagnet that can be manually rotated in front of a color-television picture tube to demagnetize the tube. Also called a DEGAUSSER.

purity **1.** In color television, complete saturation of a hue. **2.** In a waveform, complete freedom from distortion. **3.** The extent to which spurious signals are attenuated in the output of a radio or television transmitter. Also called *spectral purity*.

purity adjustment In a color-television picture tube, adjustment of each purity control for pure color.

purity coil A variable-current coil around the neck of a color-television picture tube that is used to adjust color purity.

purity control For a purity coil, the variable resistor that controls the current for color correction.

purity magnet A ring-magnet collar around the neck of a color-television picture tube to adjust, by rotation, color purity.

purple plague Corrosion that occurs when aluminum and gold are placed in contact.

pushbutton tuner A radio or television tuner utilizing pushbutton tuning.

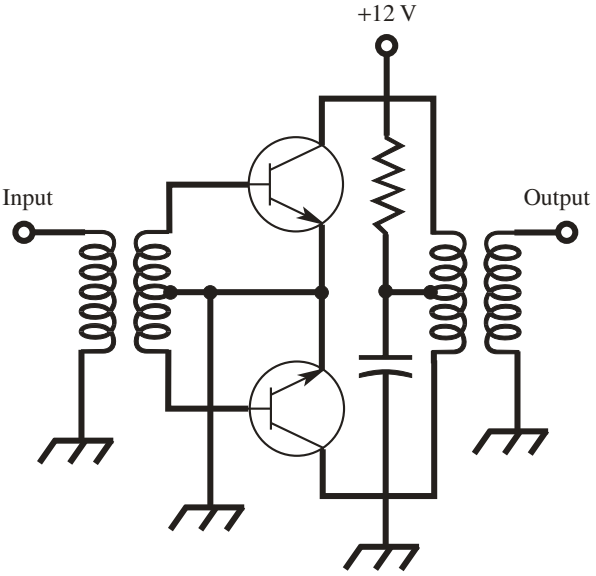
pushbutton tuning The tuning of a circuit to various frequencies in single steps by means of pushbutton switches.

pushdown list In data processing, a method of amending a list. A new item entered at the top moves each existing item one position down.

pushdown stack Also called *first-in/last-out.* A digital read-write memory in which data bits emerge in reverse sequence from the order they go in. If data bit *x* enters the pushdown stack before data bit *y*, then *x* will come out after *y.* Compare FIRST-IN/FIRST-OUT.

push-in terminal A circuit contact or tie point, usually of thin, springy material, that can be inserted into a hole in a perforated board.

push-pull Pertaining to a circuit in which two active devices are used, with the inputs and outputs both placed in phase opposition. In the output circuit, even harmonics are canceled, and odd harmonics are reinforced.



push-pull

push-pull amplifier An amplifier stage in which, for increased power output, two active devices are operated 180 degrees out of phase with each other in opposite halves of a symmetrical circuit. Also see PUSH-PULL CIRCUIT.

push-pull circuit A symmetrical circuit in which two active devices operate on separate halves of the input-signal cycle and deliver a combined output signal.

push-pull deflection In an oscilloscope, the application of deflection voltage to a pair of deflecting plates 180 degrees out of phase with each other. For this purpose, the output amplifier in the horizontal or vertical deflection channel is a push-pull stage.

push-pull doubler See PUSH-PULL MULTIPLIER.

push-pull microphone A set of two microphones, in which the audio-frequency outputs are in phase opposition.

push-pull multiplier A push-pull amplifier with its output circuit tuned to an odd-numbered multiple of the input frequency. This circuit is unsuitable for even-harmonic operation, but has some merit as an odd-harmonic multiplier (e.g., a *tripler* or *quintupler*). Also see PUSH-PUSH MULTIPLIER.

push-pull oscillator An oscillator stage in which, for increased power output, two active devices are operated 180 degrees out of phase with each other in opposite halves of a symmetrical circuit. Also see PUSH-PULL CIRCUIT.

push-pull/parallel amplifier An amplifier stage in which tubes or transistors are connected in push-pull/parallel for increased power output. Also see PARALLEL-COMPONENT AMPLIFIER, PUSH-PULL AMPLIFIER, and PUSH-PULL/PARALLEL CIRCUIT.

push-pull/parallel circuit A push-pull circuit in which two or more active devices are connected in parallel on each side of the circuit. This arrangement gives increased power output over that of the conventional push-pull circuit. See, for example, PUSH-PULL/PARALLEL AMPLIFIER and PUSH-PULL/PARALLEL OSCILLATOR.

push-pull/parallel oscillator An oscillator stage in which active devices are connected in push-pull/parallel for increased power output. Also see PARALLEL-COMPONENT OSCILLATOR, PUSH-PULL OSCILLATOR, and PUSH-PULL/PARALLEL CIRCUIT.

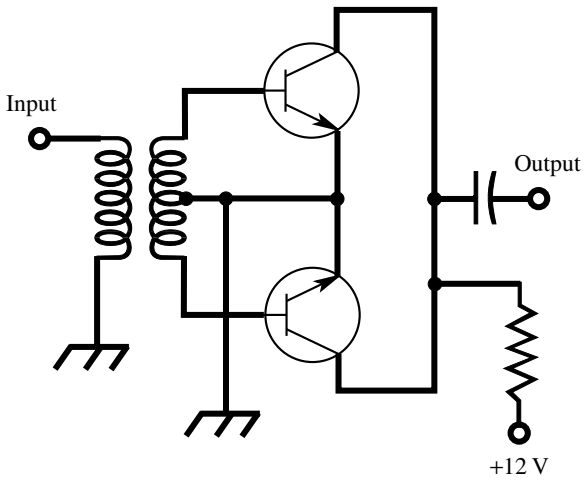
push-pull recording A type of film sound track consisting of two side-by-side images 180 degrees out of phase with each other.

push-pull transformer A transformer having a center-tapped winding for operation in a push-pull circuit.

push-push Pertaining to a circuit in which two active devices are used, with the inputs connected in phase opposition, and the outputs connected in parallel. The result is reinforcement of the even harmonics, and cancellation of the fundamental frequency and all odd harmonics.

push-push circuit See PUSH-PUSH MULTIPLIER.

push-push multiplier An amplifier circuit containing two active devices with their inputs connected in phase opposition and their outputs connected in parallel. This circuit is unsuitable for fundamental-frequency and odd-harmonic operation,



push-push

but has some merit as an even-harmonic multiplier (e.g., a *doubler* or *quadrupler*). Also see PUSH-PULL MULTIPLIER.

push-to-talk switch See PRESS-TO-TALK SWITCH.

pushup list In data processing, a method of amending a list, whereby new items are added at the end of the list; all other items retain their original positions. Compare PUSHDOWN LIST.

pV Abbreviation of PICOVOLT.

PVC Abbreviation of POLYVINYL CHLORIDE.

pW Abbreviation of PICOWATT.

PWM **1.** Abbreviation of PULSE-WIDTH MODULATION. **2.** Abbreviation of PLATED-WIRE MEMORY.

pwr Abbreviation of POWER.

Pyralin See CELLULOSE NITRATE.

pyramidal horn antenna A rectangular horn antenna that is flared in two dimensions. The horn width and height both increase linearly with increasing distance (in the direction of maximum radiation/response) from the feed point.

pyramidal wave See BACK-TO-BACK SAWTOOTH.

Pyrex A heat-resistant glass having numerous applications in electronics and chemistry.

pyrheliometer An instrument used to measure infrared radiation.

pyroelectricity In certain crystals, electricity generated by temperature change, and in particular, by the application of heat.

pyroelectric lamp See NERNST LAMP.

pyroelectric material A crystalline material that generates an output voltage when it is heated.

pyrolysis The process whereby heat changes a substance into one of several different substances by rearranging its atoms.

pyromagnetic effect In a material or circuit, the combined effect of heat and magnetism.

pyrometer An instrument, other than a thermometer, used for the measurement of temperature. See, for example, OPTICAL PYROMETER.

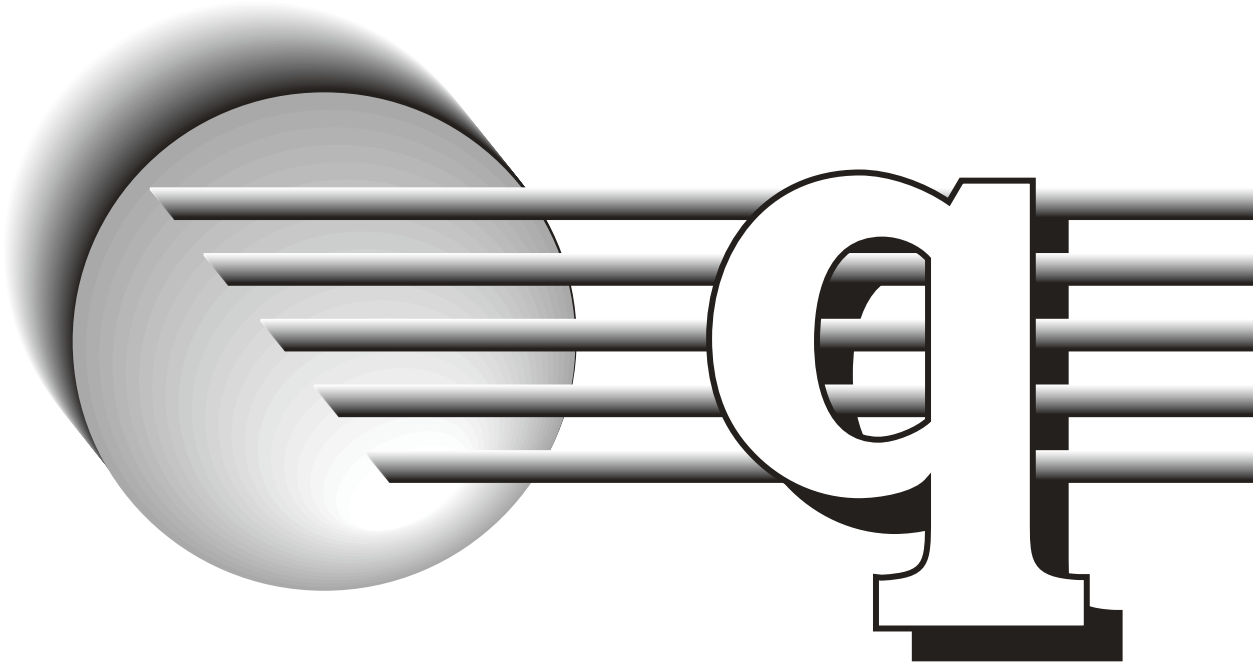
Pythagorean scale A sound scale defining a specific type of relationship among audio tones. If x and y are related by the Pythagorean scale and are adjacent in frequency, then a specific frequency (f) exists, so $x = f^2$ and $y = f^3$.

Pythagorean theorem A theorem of plane geometry. For a right triangle, with sides of lengths a, b, and c, where c is the side opposite the right angle, it is always true that $a^2 + b^2 = c^2$.

p-zone See P LAYER.

PZM Abbreviation of PRESSURE-ZONE MICROPHONE.

PZT Abbreviation of LEAD ZIRCONATE TITANATE.



Q **1.** The figure of merit of a capacitor, inductor, or inductance-capacitance (LC) circuit, equal to the reactance divided by the resistance. **2.** Symbol for electrical charge. **3.** Occasional symbol for SELECTIVITY. **4.** See Q BAND. **5.** See *Q* OUTPUT.

q **1.** Symbol for quantity of electricity (in coulombs). **2.** Symbol for the charge carried by an electron (the charge carried by a hole is represented by –q). **3.** Symbol for the value of a quantum.

QA Abbreviation of QUALITY ASSURANCE.

Q **adjustment** The separate null adjustment for the *Q* value of a component being tested in an impedance bridge having separate resistive and reactive balances.

Q**-antenna** An antenna in which the transmission line (feeder) is matched in impedance to the center of the radiator by means of a *Q*-matching section.

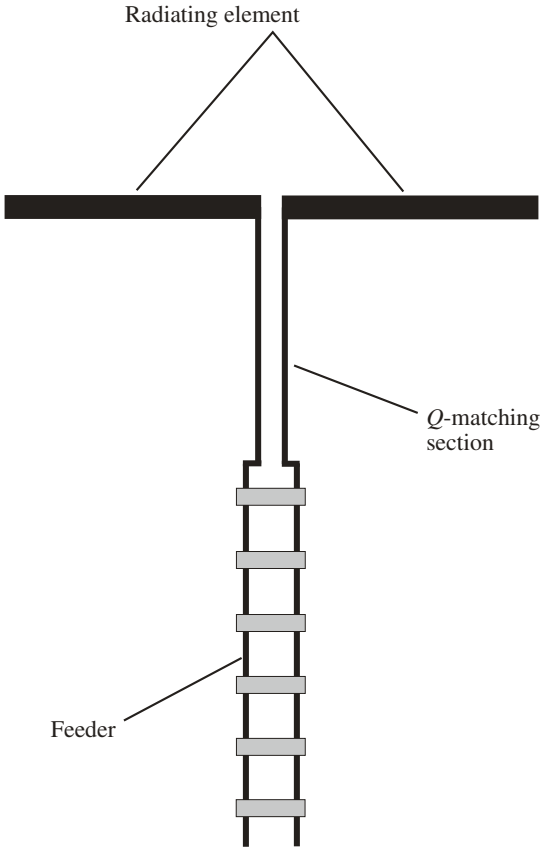
QAVC Abbreviation of QUIET AUTOMATIC VOLUME CONTROL.

Q band The radio-frequency band 36 to 46 GHz. It is subdivided as follows: Q_a, 36 to 38 GHz; Q_b, 38 to 40 GHz; Q_c, 40 to 42 GHz, Q_d, 42 to 44 GHz; and Q_e, 44 to 46 GHz.

Q **bar** One of the parallel metal tubes in a *Q*-matching section. Also see *Q* ANTENNA.

Q **booster** See *Q* MULTIPLIER.

Q **bridge** An alternating-current bridge used principally to determine the *Q* of capacitors and inductors. Bridges are usually used for audio-frequency *Q* determinations; resonant-type *Q* meters are generally used for measurement of radio-frequency *Q*.



Q**-antenna**

QC Abbreviation of QUALITY CONTROL.

QCE Abbreviation of QUALITY-CONTROL ENGINEERING or QUALITY-CONTROL ENGINEER.

Q channel In American (NTSC) color television, the 508-kHz-wide green-magenta color information transmission band.

QCT Abbreviation of QUALITY-CONTROL TECHNICIAN.

QCW In the local oscillator and associated circuitry of a color television receiver, a 3.85-MHz CW signal of Q PHASE.

QCW signal In a color television receiver, the component of the chrominance signal that is 90 degrees out of phase with the in-phase component.

Q demodulator In a color television receiver, the demodulator that combines the chrominance signal and the color-burst oscillator signal to recover the Q signal (see Q SIGNAL, **2**).

QED **1.** Abbreviation of QUANTUM ELECTRODYNAMICS. **2.** Abbreviation of *quod erat demonstrandum*, Latin for "which was to be demonstrated." Also, Q.E.D. Often written at the conclusions of valid logical proofs and derivations.

***Q* factor** See *Q*.

QFM Abbreviation of QUADRATURE MODULATION.

QM Abbreviation of QUADRATURE MODULATION.

***Q*-matching section** A linear radio-frequency impedance-matching transformer consisting of two straight, rigid, parallel metal conductors that are used to match a feeder to an antenna. The section is ¼ wavelength long at the operating frequency. The diameters and center-to-center spacing of the conductors are such that the characteristic impedance of the matching section is equal to the geometric mean of the feeder characteristic impedance and the radiation resistance of the radiator. Also see *Q* ANTENNA and QUARTER-WAVELENGTH MATCHING STUB.

***Q* meter** A usually direct-reading instrument for determining the *Q* of a capacitor, inductor, or inductance-capacitance (LC) circuit. Most *Q* meters are operated at radio frequencies, but audio-frequency instruments are available.

***Q* modulation** Amplitude modulation obtained by varying the effective *Q* of a radio-frequency tank circuit in step with a modulating component. See ABSORPTION MODULATION.

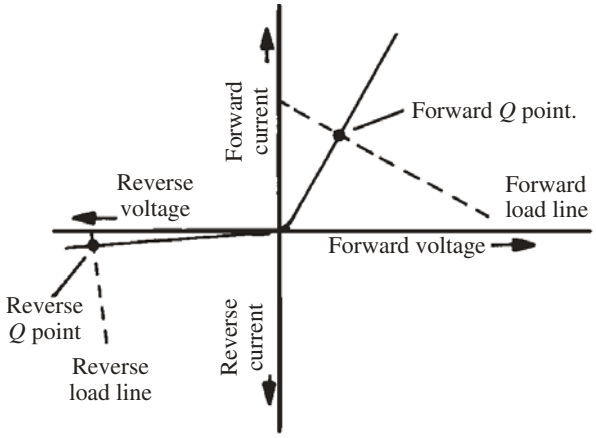
QMQB Abbreviation of *quick make/quick break.*

***Q* multiplier** A positive-feedback (regenerative) amplifier that increases the effective *Q* of a tuned circuit, and thereby sharpens its response, when its input is connected across the tuned circuit.

Q output The reference output of a flip-flop.

Q phase A color-television carrier signal that is 147 degrees out of phase with the color subcarrier.

Q point The point or points at which a load line intersects a device characteristic (such as the collector curve of a transistor or plate curve of a tube) and that identifies the quiescent operating point.



***Q* points on diode characteristic**

QRD Abbreviation of QUADRATIC RESIDUE DIFFUSOR.

***Q*-section transformer** See *Q*-MATCHING SECTION.

Q signal In color television, the quadrature component of the chrominance signal, equal to +0.48(R-Y) and to +0.41(B-Y), where B is the blue camera signal, R is the red camera signal, and Y is the luminance signal.

Q signals A set of three-letter groups, each beginning with the letter Q, used for simplified telegraph and radiotelegraph communication, and sometimes rapid voice communication (in radiotelephony). Each signal represents a commonly used phrase or message.

QSL card A card verifying communication with, or the reception of signals from, the station sending the card. Such verification is common in the amateur radio service and with some shortwave broadcast and CB stations.

QSO Amateur radiotelegraph abbreviation for TWO-WAY COMMUNICATION.

Q spoiler A device or circuit that produces Q SPOILING in a laser.

Q spoiling The technique of inhibiting laser action during an interval when an ion population excess is pumped up. When the laser is subsequently triggered by Q switching, a more powerful pulse of light results than would be otherwise obtained.

Q switching A laser-switching action obtainable with Kerr cells or rotating reflecting prisms, which consists of holding the Q of the laser cavity to a low value during an ion-population buildup, then abruptly switching the Q to a higher value.

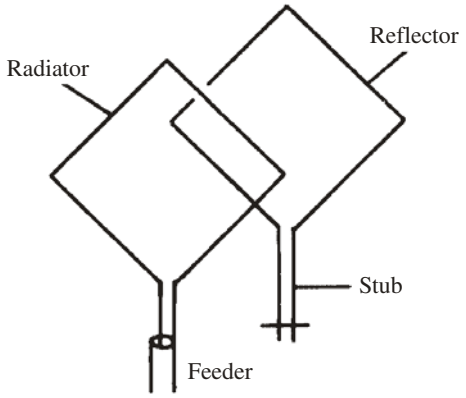
***Q* transformer** See *Q*-MATCHING SECTION.

qty Abbreviation of QUANTITY.

quad **1.** A combination of four components, such as diodes, transistors, etc., in a single housing. The components are usually carefully matched. **2.** In a cable, a combination of four separately insulated conductors (sometimes, two twisted pairs) twisted

together. **3.** Abbreviation of QUADRANT. **4.** See QUAD ANTENNA. **5.** See QUADROPHONIC.

quad antenna A directional antenna similar to the Yagi, except that full-wavelength loops are used instead of straight elements. A two-element array can consist of a driven element and a reflector, or it can have a driven element and a director. A three-element system has one driven element, one director, and one reflector. The director has a perimeter of about 0.97 electrical wavelength, the driven element measures exactly 1 electrical wavelength around, and the reflector has a perimeter of about 1.03 electrical wavelength. Additional director elements can be added to the basic three-element quad design to form arrays having any desired numbers of elements. The gain and directivity increase as the number of elements increases. Compare YAGI ANTENNA.



quad antenna

quadded cable See QUAD, **2**.

quadding Redundancy obtained by connecting components in series-parallel for enhanced reliability and/or increased power-handling capacity.

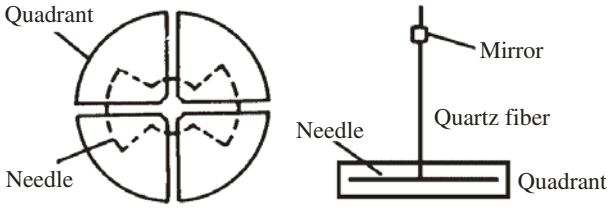
quad latch A set of four interconnected flip-flops that is used for digital data storage.

quadrant **1.** A specific 90-degree arc of a circle. **2.** One of the four parts formed on a plane surface by rectangular coordinates and designated I, II, III, and IV in a counterclockwise direction, starting with the upper-right quadrant. **3.** An altitude-measuring instrument.

quadrantal deviation The part of magnetic-compass deviation caused by the induction of transient magnetism into the horizontal soft iron of a vessel by the horizontal component of terrestrial magnetism.

quadrantal error See QUADRANTAL DEVIATION.

quadrant electrometer An electrometer whose principal parts are quadrants (a pillbox-shaped brass chamber split into four parts) and a needle (a flat, bowtie-shaped aluminum vane) suspended by a platinized quartz fiber between the quadrants.



quadrant electrometer

quadraphonic sound Sound recording and reproduction involving four channels.

quadraphony Music recording or playback in which four distinct information channels are used. Also called *four-channel stereo.*

quadratic equation A second-degree equation [i.e., one in which the highest exponent is 2 (the square of an unknown) (e.g., $ax2 + bx + c = 0$)].

quadratic residue diffusor Abbreviation, QRD. In acoustics, a sound-reflection grating that scatters (diffuses) sound waves almost uniformly in all directions. The depths of the indentations in the grating are determined according to a QUADRATIC EQUATION.

quadrature The state of (cyclic events or points) being 90 degrees out of phase.

quadrature amplifier An amplifier circuit that introduces a 90-degree phase shift. Such amplifiers are used in control devices, test instruments, transmitters, and color television receivers.

quadrature axes The vertical axes in the complex-number plane (i.e., the $+j$ and $-j$ axes).

quadrature carrier See Q PHASE.

quadrature component **1.** The reactive component of an alternating current or voltage. **2.** A vector perpendicular to a reference vector. **3.** The imaginary-number component in a complex-number expression.

quadrature current Reactive current in an alternating-current circuit.

quadrature modulation In-phase modulation of two carrier components having a 90-degree phase difference.

quadrature number See IMAGINARY NUMBER.

quadrature-phase subcarrier signal See QCW SIGNAL.

quadrature portion In color television, the portion of the chrominance signal having the same (or opposite) phase as that of the Q-signal-modulated subcarrier, and that is 90 degrees out of phase with the in-phase portion.

quadrature sensitivity The sensitivity of a transducer to motions in a direction that is perpendicular to the normal axis of response.

quadrature voltage A voltage 90 degrees out of phase with another (reference) voltage.

quadrilateral **1.** Pertaining to an object having four sides. **2.** A four-sided plane polygon.

quadrillion The number 1,000,000,000,000,000 (10^{15}).

quadripartite Having four parts.

quadripole network A four-terminal network, usually with input- and output-terminal pairs.

quadrivalent Having a valence of 4. Tin, for example, is quadrivalent. Also called TETRAVALENT.

quadruped robot A robot with four legs that can move independently. It offers better stability than three-legged designs. Functions well in mobile machines that must navigate irregular terrain.

quadrupler **1.** A rectifier circuit that delivers a direct-current output voltage approximately equal to four times the peak value of the alternating-current input voltage. **2.** An amplifier or other circuit that delivers an output signal of four times the frequency of the input signal.

quadruplex circuit A data circuit in which two messages are carried in each direction simultaneously.

quadrupole **1.** A combination of two dipoles, producing a force that varies inversely with the fourth power of distance. **2.** A four-pole magnet used in some synchrotrons and linear accelerators to focus and bend a particle beam. **3.** A system consisting of two dipoles of equal and opposite direct moment.

qualification The quality-control or quality-assurance scheme used in the production of components, circuits, or systems. Certain minimum requirements must be met for a device to obtain qualification.

qualitative test A test performed to determine the general mode of operation or the presence of certain factors, without regard to numerical values. Compare QUANTITATIVE TEST.

quality **1.** In audio-frequency applications, fidelity of transmission or reproduction. **2.** The degree of conformity of a product to specifications.

quality assurance The outcome of measures taken to bring performance into conformity with specifications. See QUALITY, **2**.

quality control The surveillance of selection, manufacturing, and testing operations to ensure conformity of a product to specifications.

quality-control engineering The branch of engineering concerned principally with the technical methods of quality control and statistical methods of assessing quality (see QUALITY, **2**).

quality-control technician A technician whose principal duty is the performance of operations in the areas of incoming inspection, manufacturing support, and product testing. Sometimes statistical evaluations are required.

quality engineering A field of engineering that deals with quality assurance and quality control in the production of components, circuits, and systems.

quality factor See *Q*.

quality-factor bridge See *Q* BRIDGE.

quality-factor meter See *Q* METER.

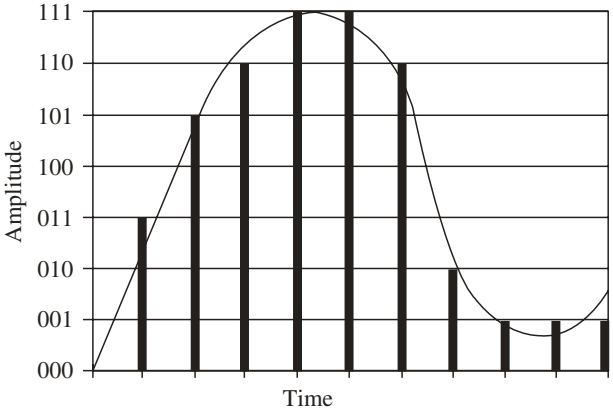
quanta Plural of QUANTUM.

quantimeter An instrument used to measure the quantity of X rays to which a body has been exposed.

quantitative test A test performed to determine the numerical values (and their relationships) connected with observable phenomena. Compare QUALITATIVE TEST.

quantity **1.** A parameter (e.g., collector current, grid voltage, etc.). **2.** In calculations, a positive or negative real number. **3.** Electrical charge, usually specified or measured in coulombs (see COULOMB). Also called *electrical quantity.*

quantization The conversion of a quantity having infinitely many possible values or levels (such as an analog signal) into one that can attain only a finite number of defined values or levels (such as a digital signal). The number of levels is usually some integral power of 2 (i.e., 2, 4, 8, 16, 32, etc.). This allows the levels to be represented as binary numbers.



quantization

quantization distortion Distortion introduced by the process of QUANTIZATION in a communications or broadcast signal.

quantization distortion power The level of the distortion in a signal resulting from QUANTIZATION. It is expressed in microwatts, milliwatts, or watts. It can also be expressed as a percentage, or as a level in decibels, relative to the power level of the input signal.

quantization error The difference between the actual values of quantities and their quantized values.

quantization noise Noise introduced by the process of QUANTIZATION in a communications or broadcast signal.

quantize **1.** To perform the process of QUANTIZATION. **2.** To split a quantitative commodity, such as energy into its smallest measurable incremental units.

quantized pulse modulation Pulse modulation involving QUANTIZATION. Examples are PULSE-CODE MODULATION and PULSE-NUMBERS MODULATION.

quantizer A circuit or device that selects the digital subdivision into which an analog quantity is placed (e.g., an analog-to-digital converter).

quantizing See QUANTIZATION.

quantometer An instrument for measuring magnetic flux.

quantum **1.** Abbreviation, Q. Plural, *quanta.* In physics, the elemental unit or particle of electromagnetic energy. The energy contained in one such particle is directly proportional to the frequency, and inversely proportional to the wavelength. **2.** See PHOTON. **3.** Any discrete unit derived by QUANTIZATION.

quantum chromodynamics A term coined by Professor Murray Gell-Mann for the theory of *quarks* and *gluons.*

quantum counter A radiation-counter tube with a window for the admission of light to the cathode.

quantum efficiency See QUANTUM YIELD.

quantum electrodynamics A branch of quantum mechanics that involves the motions of electrons, photons, and muons caused by electromagnetic action. Quantum electrodynamics takes relativistic effects into account.

quantum electronics The branch of electronics concerned with energy states in matter.

quantum equivalence The principle that one electron is emitted for each photon absorbed by a material (when the photon has the necessary energy).

quantum jump The abrupt movement of a particle from one discrete energy state to another.

quantum level The orbit or ring occupied by an electron in an atom.

quantum mechanics A branch of physics concerned with the behavior of matter and energy, on the basis of observable data.

quantum noise A noise signal arising from random variations in the average rate at which quanta impinge upon a detector.

quantum number A number that describes the energy level, or change in energy level, for a particle.

quantum statistics A branch of QUANTUM MECHANICS concerned with the distribution of elementary particles through various quantized energy levels.

quantum theory The theory that the emission or absorption of energy by atoms or molecules occurs in discrete packages or units, rather than continuously. Each unit is the emission or absorption of an energy packet called a QUANTUM. Thus, radiant energy is thought to be divided into *quanta.*

quantum transition The movement of an electron from one energy level to another within an atom.

quantum yield The photoelectric efficiency of a light-sensitive surface in terms of the number of electrons emitted for each absorbed quantum of light.

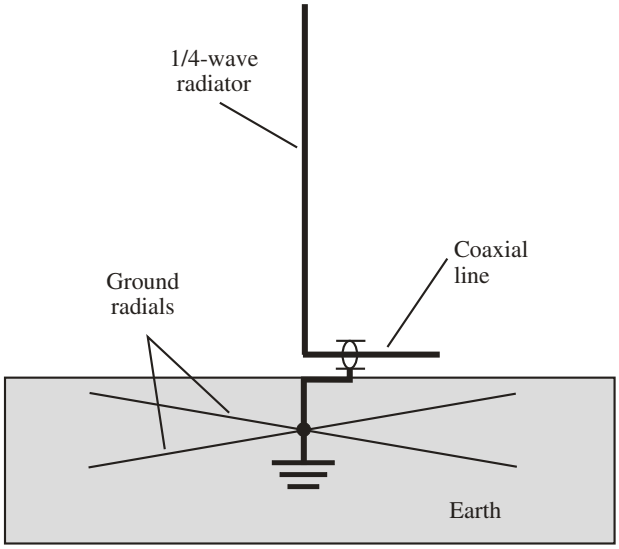
quark A hypothetical particle having a fractional electrical charge; quarks are thought to be constituents of other subatomic particles.

quarter-deflection method A method of measuring high-frequency resistance, involving the use of a sine-wave signal source, a standard noninductive variable resistor, and a square-law radio-frequency ammeter.

quarter-phase See TWO-PHASE.

quarter wave **1.** The length of time corresponding to 90 electrical degrees in a wave disturbance. **2.** The distance in space, or along a wire or feed line that corresponds to 90 electrical degrees in a wave disturbance.

quarter-wave antenna An antenna in which the radiator is an electrical quarter-wavelength long at the operating frequency.



quarter-wave antenna

quarter-wave attenuator In a transmission line or waveguide, two energy-absorbing structures separated by an odd number of quarter wavelengths so that the reflection from one structure is canceled by that from the other.

quarter-wave balun A balun using quarter-wave elements. One form of this device consists of a grounded quarter-wavelength-long cylinder closed at one end and open at the other, for matching an unbalanced low-impedance line to a balanced high-impedance line.

quarter wavelength Symbol, $\lambda/4$. The distance that corresponds to 90 degrees of phase as an electromagnetic (EM) field is propagated. In free space, it is related to the frequency by a simple equation

$$L_{ft} = 246/f$$

where L_{ft} represents $\lambda/4$ in feet, and f represents the frequency in megahertz. If $\lambda/4$ is expressed in meters, then the formula is

$$L_m = 75/f$$

where L_m represents the displacement in meters. In general, if v is the velocity factor (expressed as a ratio) in a given medium, then:

$$L_{ft} = 246v/f$$

and

$$L_m = 75v/f$$

Compare FULL WAVELENGTH, HALF WAVELENGTH.

quarter-wavelength line A transmission line or feeder that is a quarter-wavelength long at the operating frequency. Also called *quarter-wave line.*

quarter-wavelength matching stub An arrangement consisting of a quarter-wavelength-long parallel-wire section of transmission line, used for matching the impedance of a nonresonant feeder to that of an antenna. It is similar to a *Q*-MATCHING SECTION, except that flexible transmission line (e.g., ladder line) is used, rather than rigid metal rods or tubing.

quarter-wave monopole A nondirectional UHF vertical antenna requiring no ground. The radiator is ¼ wavelength long, and is an enlarged-diameter outer sleeve connected to the outer conductor of the coaxial feeder. The two sections simulate a half-wave antenna.

quarter-wave plate A plate of double-refracting crystalline material whose thickness allows the introduction of a quarter-cycle phase difference between the ordinary and extraordinary components of light transmitted by it.

quarter-wave radiator An antenna consisting of a single, usually straight, active element that measures an electrical quarter wavelength from end to end. When operated against electrical ground, the element exhibits resonance. A simple quarter-wavelength ($\lambda/4$) conductor with a high length-to-diameter ratio measures approximately 95 percent of $\lambda/4$ in free space. The element can be much shorter than free-space $\lambda/4$ yet remain resonant when operated against electrical ground if inductance is inserted in series with the radiator. The element can be much longer than free-space $\lambda/4$ yet remain resonant when operated against electrical ground if distributed capacitances are inserted in series with the radiator.

quarter-wave resonance Resonance at the operating frequency in a quarter-wave antenna.

quarter-wave resonant line A section of transmission line (such as open-wire line or coaxial cable) that is a quarter-wavelength long at the operating frequency. Such a section is useful in impedance matching and in various radio-frequency tests and measurements.

quarter-wave stub See QUARTER-WAVE TRANSFORMER.

quarter-wave support In a coaxial line, a quarter-wave metal stub that can be used, instead of an insulator, to separate the inner and outer conductors.

quarter-wave termination In a waveguide, a set of two metal barriers separated by 90 electrical degrees. One barrier totally reflects the energy striking it. The other barrier allows some energy to pass through. Resonance occurs in the space between the barriers.

quarter-wave transformer A quarter-wave resonant line short-circuited at one end by an adjustable slider. This arrangement is useful for radio-frequency impedance matching.

quarter-wave transmission line See QUARTER-WAVE LINE.

quartic equation A fourth-degree equation of the form $ax^4 + bx^3 + cx^2 + dx + e = 0$, where a, b, c, d, and e are constants. Also called BIQUADRATIC EQUATION.

quartz A mineral that is a variety of natural silicon dioxide, or an artificially grown material of the same sort. In the natural state, quartz occurs in hexagonal crystals having pyramidal ends. It has various uses in electronics; one of the most common is the manufacture of piezoelectric crystals.

quartz bar A comparatively large, thick piezoelectric quartz plate used in standard-frequency oscillators and in sharply tuned low-frequency filters. Common resonant frequencies are 50 kHz, 100 kHz, and 1000 kHz.

quartz crystal A natural or artificial piece of quartz cut to specific dimensions, usually self-contained in a solder-in or plug-in enclosure. The device acts as a highly stable selective circuit. It exhibits a sharp resonance at the frequency for which it is cut, and at harmonics of this frequency. It is used as the frequency-determining element in precision oscillators.

quartz-crystal oscillator See CRYSTAL OSCILLATOR.

quartz-crystal resonator See CRYSTAL RESONATOR.

quartz delay line An acoustic delay line using quartz to transmit the sound waves.

quartz-fiber electroscope An electroscope using a gold-plated quartz fiber, instead of gold leaves.

quartz-halogen lamp An incandescent, usually low-voltage lamp used in automotive headlights, and in some home and office lighting appliances. It provides greater efficiency than conventional incandescent lamps.

quartz lamp A mercury-vapor lamp with a transparent quartz (instead of glass) envelope. Unlike glass, quartz readily passes the ultraviolet rays generated by the mercury discharge.

quartz lock A circuit that uses a CRYSTAL OSCILLATOR to regulate frequency, timing, or speed. It is used in electronic clocks and watches, television receivers, synthesized radio receivers, transmitters, transceivers, high-fidelity turntables, etc.

quartz oscillator See CRYSTAL OSCILLATOR.

quartz plate A piezoelectric plate cut from a quartz crystal. The plate is itself often called a *crystal.* Also see CRYSTAL AXES and CRYSTAL CUTS.

quartz resonator See CRYSTAL RESONATOR.

quartz timepiece A watch or clock having as its control element a time-determining quartz crystal.

quasi- A prefix meaning "to some extent" or "similar to," as in *quasi-optical radio wave* (a radio wave that behaves like a light ray).

quasi-bistable circuit A trigger-operated multivibrator. It operates as a flip-flop when the trigger frequency is sufficiently high.

quasi-instruction In a computer program, a data item appearing as an encoded instruction, but that is not acted upon.

quasi-linear feedback system A system in which the feedback elements are nearly linear, but not entirely linear.

quasi-negative Pertaining to a voltage that is negative, with respect to some other voltage, but whose absolute polarity is positive. For example, +0.5 volt is quasi-negative, with respect to +5.5 volts.

quasi-optical Behaving like light. The term is used to describe certain extremely short radio waves or other radiations that, like light rays, follow line-of-sight paths and can be directed, reflected, refracted, or diffused.

quasi-optical path A line-of-sight path followed by very short radio waves, such as microwaves.

quasi-positive Pertaining to a voltage that is positive, with respect to some other voltage, but whose absolute polarity is negative. For example, –0.5 volt is quasi-positive, with respect to –5.5 volts.

quasi-random A set of numbers considered to be random, but chosen according to an algorithm.

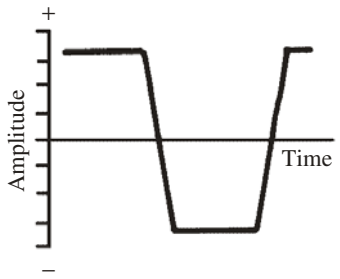
quasi-rectangular wave A wave whose shape approaches that of a rectangular wave, but that possesses a small amount of tilt and/or curvature.

quasi-scientific A term that is sometimes applied to the design of electronic systems or to the appraisal of circuit behavior, using an intuitive, rather than analytical approach.

quasi-sine wave A waveform that is not a perfect sine curve, but is close enough to be considered sinusoidal, for all practical purposes.

quasi-single sideband A modulated waveform that somewhat resembles single sideband, in which parts of both sidebands are present.

quasi-square wave A waveform that is not a perfect square, but is close enough to be considered square for all practical purposes. It is sometimes applied to a rectangular wave when a square wave is desired.



quasi square wave

quasi-technical A term sometimes applied to qualitative tests, as opposed to quantitative tests.

quaternary **1.** Pertaining to a base-4 number system. **2.** Of an atom, joined to carbon atoms for four bonds. **3.** The fourth member of a 4-unit set.

Quebec Phonetic alphabet code word for the letter Q.

quench **1.** To suddenly bring to an end (e.g., to quench an oscillation). **2.** To cool quickly, as in the quenching of a heated metal object. **3.** To extinguish the discharge in a gas tube.

quench capacitor A capacitor that prevents a spark from arcing across an inductor when current flow abruptly stops.

quench frequency See QUENCHING FREQUENCY.

quenching action Typical operation of a superregenerative circuit, in which regeneration is increased to nearly the point of oscillation and then reduced; this action is repeated at an ultrasonic frequency and results in very high sensitivity. Also see QUENCHING FREQUENCY, QUENCH OSCILLATOR, and SUPERREGENERATIVE CIRCUIT.

quenching frequency The frequency at which regeneration in a superregenerative circuit is increased and decreased.

quench oscillator In some superregenerative circuits, the separate ultrasonic oscillator that produces the required quenching action.

quench resistor A resistor in a quenching network that prevents a spark from occurring across an inductor when current flow stops.

queue A list of data, steps in a process, or commands awaiting execution in a specific order.

queuing theory A branch of mathematical electronics, dealing with the optimum order in which steps should be executed to obtain a particular end result.

quibinary code In computer operations, a binary-coded decimal system in which each decimal digit is represented by seven bits occupying places whose values are 8, 6, 4, 2, 0, 1, and 0.

quibinary decade circuit A decade counter consisting of a ring-of-5, followed by a single binary stage.

quick break An operating characteristic of a switch, relay, or circuit breaker whereby the contacts open rapidly—even when the actuating current or mechanical force is slow-acting.

quick-break fuse A fuse in which the wire melts and breaks almost instantly when the current rating is exceeded. Also called *quick-blow fuse.* Compare SLOW-BLOW FUSE.

quick-break switch A switch that opens rapidly—even if its handle or lever is moved slowly by the operator. This action minimizes arcing and prevents chatter. Compare QUICK-MAKE SWITCH.

quick charge The process of charging a battery, such as a nickel-cadmium (NICAD) or nickel-metal-hydride (NiMH) type, at a relatively rapid rate, at high charging current. It is sometimes used to charge a battery from a state of almost total discharge. Compare TRICKLE CHARGE.

quick-disconnect The characteristic of a connector that enables its mating halves to be separated quickly and simply, to break the circuit in which it is situated.

quickening liquid A solution of mercuric cyanide or mercuric nitrate, into which objects can be dipped prior to electroplating with silver. The process ensures good adhesion of the silver to the object.

quick make An operating characteristic of a switch, relay, or circuit breaker, whereby the contacts close rapidly—even when the actuating current or mechanical force is slow acting.

quick-make switch A switch that closes rapidly—even if its handle or lever is moved slowly by the operator. Compare QUICK-BREAK SWITCH.

quick printer A high-speed printer, used with a data terminal or computer. A relative term, depending on the user and the application.

quicksilver See MERCURY.

quick-stop control A control on tape recorders and some dictating machines that allows the operator to stop the tape, but keep the machine in the play or record mode. Also called *pause control.*

QuickTime Trade name (Apple Computer, Inc.) for system software commonly used in MULTIMEDIA applications with personal computers.

QUICKTRAN For multiaccess computer systems, a computer programming language based on FORTRAN and offering facilities, through the use of remote terminals, for running, testing, debugging, and compiling programs.

quiescent carrier operation A modulation system in which the carrier is present only during modulation (i.e., it is suppressed at all other times). Also called *controlled-carrier transmission.*

quiescent-carrier telephony A carrier-current (wired-wireless) telephone system in which the carrier is suppressed when there is no voice or alerting signal.

quiescent component In an electronic device, a component that is momentarily nonfunctional.

quiescent current Operating current (usually a direct current) flowing in a circuit or component during zero-signal or no-drain intervals. Also called IDLING CURRENT.

quiescent operation Zero-signal operation of a device, such as a transistor, diode, magnetic amplifier, or similar component.

quiescent period The no-signal interval during which equipment is not operating—even though it is energized.

quiescent point The point on the characteristic curve of a transistor, diode, or similar device, denoting the zero-signal operating conditions.

quiescent push-pull Denoting a push-pull stage, especially an audio power-output amplifier, in which the direct-current signal is essentially zero.

quiescent state The inactive, or resting, state of an active component, such as a transistor or vacuum tube.

quiescent value The zero-signal value of current or voltage for any component supplied with operating power.

quiet AGC See DELAYED AUTOMATIC GAIN CONTROL.

quiet automatic gain control See DELAYED AUTOMATIC GAIN CONTROL.

quiet automatic volume control See DELAYED AUTOMATIC GAIN CONTROL.

quiet AVC See DELAYED AUTOMATIC GAIN CONTROL.

quiet battery A direct-current source specially designed and filtered to minimize noise components in its output.

quieting Noise-voltage reduction in the output of a frequency-modulation (FM) receiver when an unmodulated carrier is received. Also called *noise quieting.*

quieting level In a frequency-modulation (FM) receiver, the limiter threshold point.

quieting sensitivity In a frequency-modulation (FM) receiver, the lowest input-signal amplitude at which the output signal-to-noise ratio is below the specified limit.

quiet tuning A system of tuning in which the output of a receiver is muted until a station is tuned in properly.

quinary code See BIQUINARY CODE.

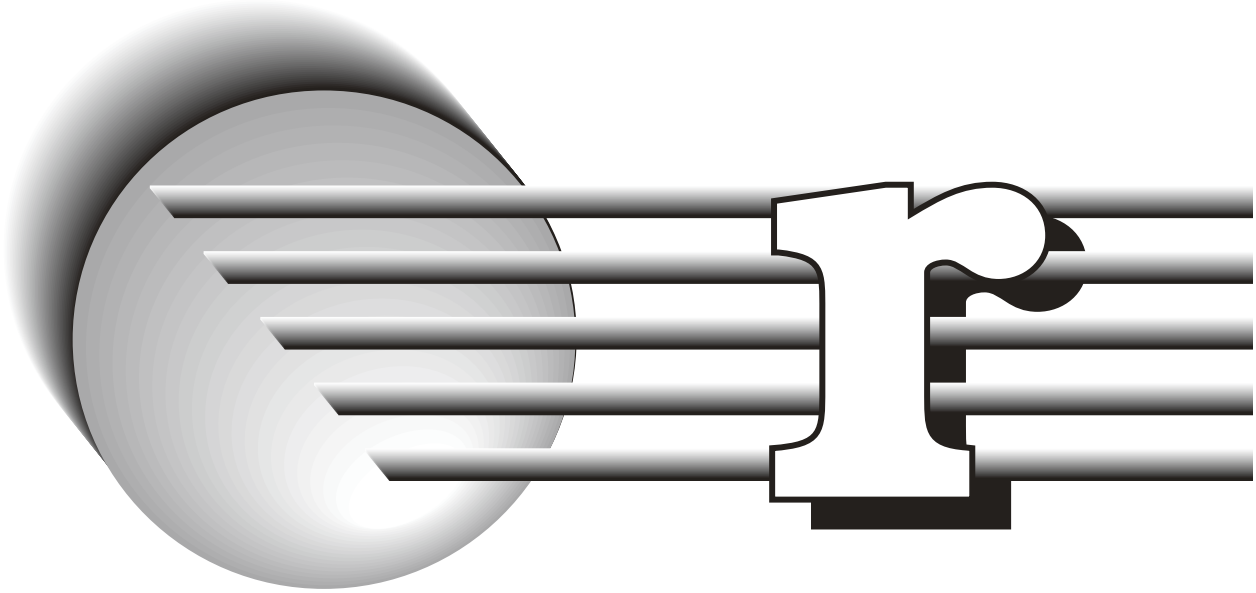
quinary counter A decade counter consisting of a five-stage ring.

quinhydrone electrode A pH meter electrode consisting of a platinum wire in a solution of quinhydrone ($C_{12}H_{10}O_4$). Also see PH METER.

quintillion The number 1,000,000,000,000,000,000 (10^{18}).

quintupler **1.** A rectifier circuit that delivers a direct-current output voltage equal to about five times the peak value of the alternating-current input voltage. **2.** A circuit that delivers an output signal at the fifth harmonic of the input signal.

QWERTY The standard typewriter and computer keyboard layout. The name is derived from the first several letters in the top letter row: Q, W, E, R, T, and Y.



R **1.** Symbol for RESISTANCE. (Also, r.) **2.** Radiotelegraph abbreviation for ROGER. **3.** Symbol for RELUCTANCE. **4.** Abbreviation of RADIUS.

r **1.** Symbol for ROENTGEN. **2.** Symbol for *correlation coefficient.* **3.** Abbreviation of RADIUS. (Also, abbreviated R.)

r_e Symbol for CLASSICAL ELECTRON RADIUS.

RA **1.** Abbreviation of *right ascension.* **2.** Abbreviation of RANDOM ACCESS.

rabbit ears An indoor antenna, sometimes used with a television receiver, consisting of two vertical whips (usually telescoping), the angle between which is adjustable.

RAC Abbreviation of RECTIFIED ALTERNATING CURRENT.

R_{ac} Symbol for AC RESISTANCE. (Also, r_{ac}.)

race Incorrect interpretation of the clock pulses by a digital circuit. Also called *racing.* The circuit improperly attempts to do many operations during one clock pulse, rather than a single operation.

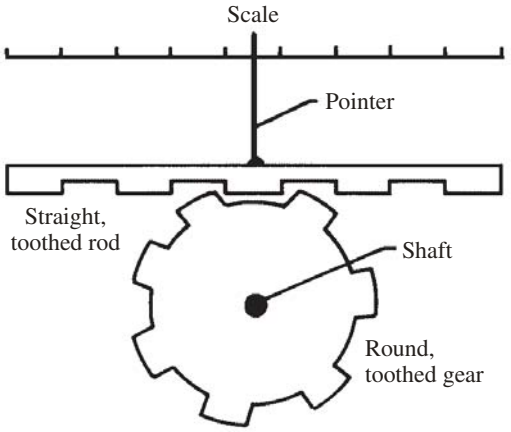
RACES Abbreviation of *Radio Amateur Civil Emergency System.*

raceway See WIRE DUCT and WIREWAYS.

rack An upright frame for holding equipment of RACK-AND-PANEL CONSTRUCTION.

rack-and-panel construction A method of building electronic equipment on a chassis attached horizontally or vertically to a vertical panel. After completion of a unit, the panel is fastened in place on a RACK. Several such panels fill the rack.

rack and pinion A device used for mechanical adjustment of a control, such as the tuning control in a radio receiver. A gear engages a serrated rod. As the gear is turned, the rod moves lengthwise.



rack and pinion

rack up In computer operations, a way of displaying data, in which a new line added to the already completely occupied screen bumps up what has forgone, thus eliminating the top line.

racon Acronym for *radar beacon.*

rad **1.** A unit of ionizing radiation received by a body (dose) equal to 0.001 J/kg. **2.** Abbreviation of RADIAC. **3.** Abbreviation of RADIAN. **4.** Abbreviation of RADIO. **5.** Abbreviation of RADIX.

radar **1.** A microwave system for detecting objects and determining their distance, direction, heading, speed, and other characteristics. Signals from the transmitter are reflected back to the transmitter site by the object, and the reflection (sometimes along with the transmission) is displayed on a cathode-ray screen. The name is an

acronym for *radio detection and ranging.* **2.** The theory and application of radio detection and ranging systems as defined in **1**.

radar altitude The distance of an aircraft above the surface of the earth, as determined by radar. This value varies with the terrain over which the aircraft passes.

radar antenna Any antenna used for transmitting and/or receiving radar signals.

radar astronomy The use of radar equipment to observe and map planets, moons, and asteroids, and to measure their distance from the earth or from a spacecraft.

radar beacon A radar transceiver that, on receipt of radar signals, transmits encoded signals from which the operator can take a bearing.

radar beam The cone-shaped main lobe of energy emitted by a radar antenna. The narrower the beam, the greater the resolution of the radar system.

radar clutter Visual interference on a radar screen caused by reflections from ground or sea.

radar countermeasures Abbreviations, RCM and rad CM. In wartime, any method of interfering with enemy radar, such as jamming or use of decoys.

radar detector **1.** A device used in automobiles and trucks to detect the proximity of police or highway-patrol radar. **2.** A device used in military applications, especially aviation, to indicate the presence of radar.

radar display The scheme via which a radar set portrays the relative positions of the objects that produce echoes. The most common is the azimuth/range display, showing compass bearings (usually in degrees clockwise from geographic north) and radius from the transmitter (usually in miles or kilometers). Altitude above mean sea level can be displayed for individual echoes.

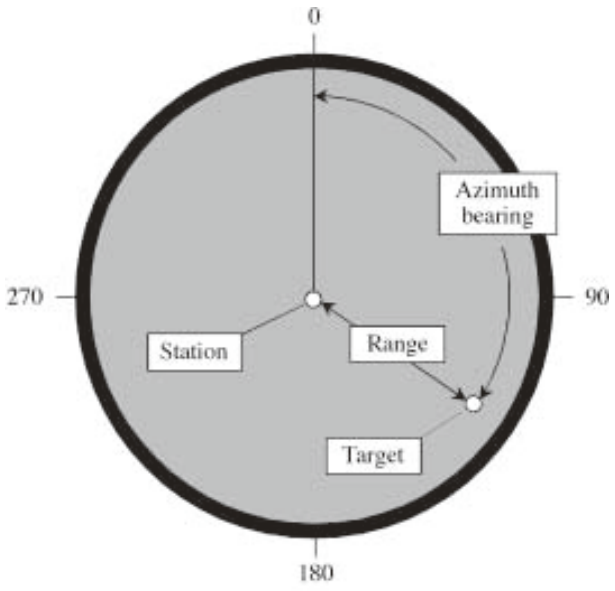
radar homing A method of missile homing in which radar is used to track a target.

radar speed trap A radar system used by traffic police to spot speeding vehicles.

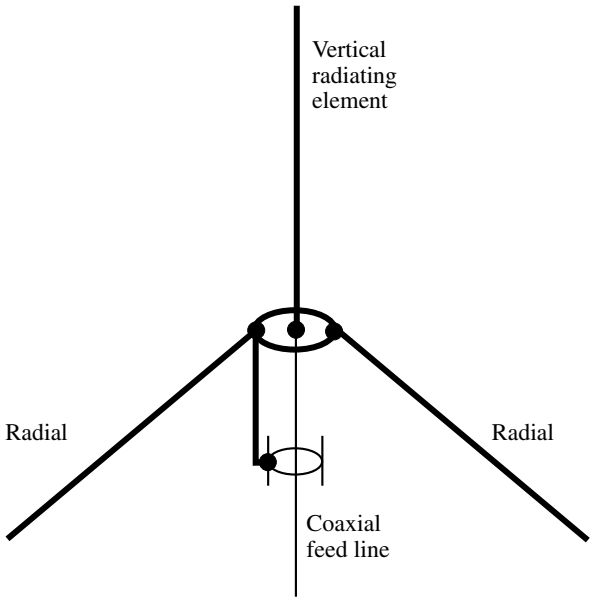
radar telescope The transmission and reception unit used in radar astronomy. Compare RADIO TELESCOPE.

RadCM Abbreviation of RADAR COUNTERMEASURES. (Also, RCM.)

radial **1.** One of several conductors used to enhance the performance of an unbalanced, vertical antenna. These can be constructed from wire or metal tubing, and generally measure one-quarter wavelength or more. When a vertical antenna is mounted at the earth's surface, the ground conductivity is improved by these conductors, which run outward from the base of the radiator, and are connected to the shield of a coaxial feed line. The greater the number of radials of a given length, the more the ground loss is reduced. Also, the longer the radials for a given number, the better. If a vertical radiator is mounted with its base more than one-quarter wavelength above the earth's surface, there need only be three or four conductors measuring exactly one-quarter wavelength. See GROUND-MOUNTED VERTICAL ANTENNA, GROUND-PLANE ANTENNA. **2.** Pertaining to the distance from the center of a circle to its periphery. **3.** Pertaining to the distance from the center of a sphere to its surface. **4.** Extending or emanating outward in a straight line from a defined point.



radar display



radials

radial ground An earth connection composed of radials buried in the ground.

radial lead A lead (pigtail) attached perpendicular to the axis of a component, such as a resistor or capacitor.

radian Abbreviation, rad. The angle at the center of a circle subtended by an arc whose length is equal to the radius. Equal to approximately 57.2958 degrees.

radiance The radiant flux emitted by an object. Radiance is measured in terms of the amount of energy contained in a unit solid angle (steradian) with the source at the apex.

radians-to-degrees conversion The conversion of radian angular measure into degrees. To change radians to degrees, multiply the number of degrees by 57.2958. Thus, 0.7854 radian = 45 degrees. Compare DEGREES-TO-RADIANS CONVERSION.

radiant efficiency The ratio of the radiant energy emitted by a source to the energy consumed by the source. The radiant energy is generally specified within a certain range of wavelengths. An example is the incandescent light bulb, which has relatively low radiant efficiency in the visible spectrum between about 750 and 390 nanometers.

radiant energy **1.** Any form of energy emitted by a source and propagated through space as an electromagnetic disturbance. Included are radio waves, infrared, visible light, ultraviolet, X rays, and gamma rays. **2.** Electromagnetic disturbances at infrared and shorter wavelengths.

radiant flux The rate at which radiant energy is emitted.

radiation **1.** The emission of energy or particles (e.g., waves from an antenna, X rays from an X-ray tube, energy from a radioactive material, heat from a body, etc.). **2.** Radio waves, infrared, visible light, ultraviolet, X rays, or gamma rays. **3.** Ionizing emissions from radioactive substances (e.g., alpha particles, beta particles, neutrons, gamma rays, etc.).

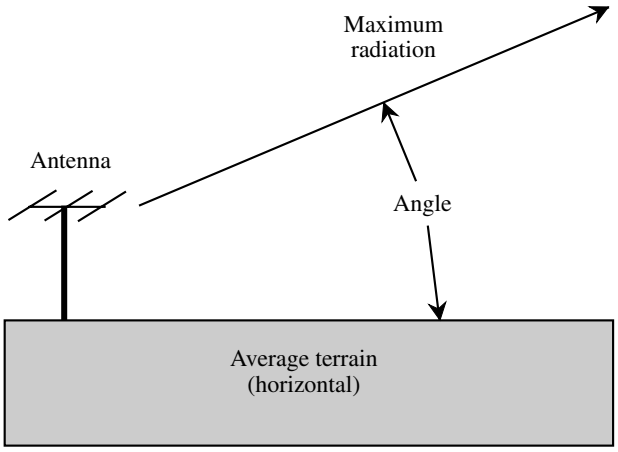
radiation angle The horizontal or vertical angle at which electromagnetic waves are radiated from an antenna. Measured between the central axis of the main lobe and the horizon, or between the central axis of the main lobe and geographic north.

radiation belts See VAN ALLEN RADIATION BELTS.

radiation counter An instrument used for determining the intensity of atomic-particle radiation, X rays, or gamma rays. It operates by means of ionization of a gas in a sealed tube.

radiation field The portion of the electromagnetic field that is propagated by a radiator, as opposed to the induction field.

radiation intensity For a directional radio transmitting antenna, the radiated power per steradian in a given direction.



radiation angle

radiation loss Loss of energy through radiation from a conductor. Also see LOSS.

radiation pattern A graphical representation of the intensity of the electromagnetic field in various directions from a radiator, such as a transmitting antenna. It is usually shown in either the horizontal plane or a specific vertical plane containing the antenna. Also see LOBE.

radiation physics The study of radiation and its effects on matter. Radiation physics is especially concerned with ionizing radiation, but it can involve any kind of particle or electromagnetic energy.

radiation pressure Pressure exerted on a surface by impinging electromagnetic radiation.

radiation resistance The inherent resistance at the feed point of a resonant radio antenna.

radiation sickness General physiological symptoms resulting from a short-term overdose of X rays, gamma rays, or atomic-particle radiation.

radiator **1.** The element of an antenna from which radio energy is directly radiated, as opposed to the transmission line, lead-in, reflector, or director. **2.** See LOUDSPEAKER.

radio **1.** Wireless electrical communication, i.e., by means of electromagnetic waves. **2.** See RADIO RECEIVER. **3.** See RADIO TRANSCEIVER. **4.** See RADIO TRANSMITTER. **5.** To communicate by radio.

radio- **1.** A prefix meaning "pertaining to wireless electrical communication." Examples: *radiotelephone* and *radiotelegraph.* **2.** A prefix meaning "using radio waves." Examples: *radiosonde*, *radiolocator*, and *radiothermics.* **3.** A prefix meaning "pertaining to using or possessing radioactivity," or "pertaining to X rays." Examples: *radiograph*, *radioisotope*, and *radiologist.*

radioactive Having the property of emitting alpha, beta, and (sometimes) gamma rays as the result of nuclear disintegration. Also see HALF-LIFE.

radioactive element A chemical element that is RADIOACTIVE (e.g., uranium). Also called *radioelement.*

radioactive isotope See RADIOISOTOPE.

radioactive tracer A quantity of radioactive material put into a system so that its path can be monitored by means of a radiation detector. An example is the introduction of radioactive barium into the large intestine. The flow and concentration of the barium gives an indication of the functioning of the lower intestine.

radioactive transducer A pickup device for detecting and measuring radioactivity (e.g., *Geiger-Mueller tube*).

radioactivity counter See GEIGER COUNTER and SCINTILLATION COUNTER.

radio altitude See RADAR ALTITUDE.

radio amateur An electronics hobbyist licensed to operate two-way wireless communications stations in various assigned frequency bands, without receiving payment for services rendered.

Radio Amateur Civil Emergency System Abbreviation, RACES. A civil-defense organization of licensed amateur radio stations. Also see RADIO AMATEUR.

radio astronomy The observation, study, and analysis of radio-frequency electromagnetic emissions from bodies or points in space, and the study of these bodies through their radiations.

radioautograph See AUTORADIOGRAPH.

radio beacon **1.** A radio transmitter of direction-finding or guidance signals. **2.** Also called *radio beam.* The signals transmitted by a radio beacon, as defined in **1**.

radio beam **1.** Antenna radiation focused in one direction. **2.** See RADIO BEACON, **2**.

radiobiology A field of biology concerned with the influence of radiant energy or radioactivity on living organisms.

radio broadcast A radio transmission directed to numerous, nonspecific receivers—especially by a station in the *broadcast service.* Also called RADIOCAST. Also see BROADCAST SERVICE, **1**, **2**.

radio car An automobile equipped with a two-way radio.

radio carbon Radioactive carbon (i.e., carbon 14).

radiocast See RADIO BROADCAST.

radio channel A single, usually narrow radio-frequency band within a larger band, in which stations are authorized to transmit signals of a specified type. Also see CHANNEL, **1**; CHANNEL SEPARATION; and CHANNEL WIDTH.

radiochemistry The chemistry of radioactive substances.

radio communication Wireless communication carried on by means of radio-frequency electromagnetic waves.

radio compass See DIRECTION FINDER.

radioconductor A substance or body whose electrical conductivity is affected by radio waves, and that can be used as a sensor of such waves.

radio control See REMOTE CONTROL.

radio direction finder See DIRECTION FINDER.

radio Doppler **1.** A change in the frequency of a radio signal emitted by a source having radial motion, with respect to the receiver. **2.** An electronic device used to measure radial speed by means of the Doppler effect at radio frequencies.

radio-electronics The branch of electronics specifically involved with wireless communications.

radioelement See RADIOACTIVE ELEMENT.

radio engineer A trained professional skilled in the physics and mathematics of radio communications, and in the theory and application of basic electronics engineering and related subjects. Also see RADIO ENGINEERING.

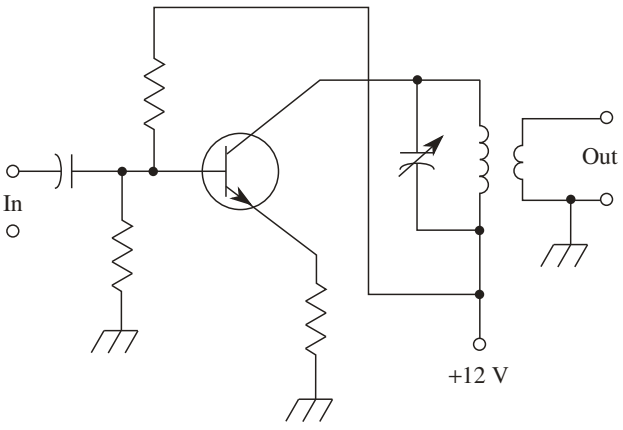
radio engineering The branch of electronics engineering devoted to the theory and operations of radio communication.

radio field strength The intensity of radio waves at a given point. Also see FIELD INTENSITY, **2** and RADIO MAP.

radio frequency Abbreviation, RF. **1.** Consisting of, or pertaining to, alternating currents at frequencies above about 9 kHz (the lowest allocated radio communications frequency). **2.** Consisting of, or pertaining to, electromagnetic fields whose wavelengths are longer than those of infrared, but shorter than about 33 kilometers (corresponding to a frequency of 9 kHz). Also see RADIO SPECTRUM.

radio-frequency amplifier **1.** In a superheterodyne circuit, the channel in which the incoming signal is amplified. Compare INTERMEDIATE-FREQUENCY AMPLIFIER. **2.** Broadly, an amplifier of radio-frequency signals.

radio-frequency choke Abbreviation, RFC. A low-inductance coil used to block radio-frequency (RF) alternating currents. Many RF chokes have air cores; some have cores of ferrite or powdered iron.



(General bipolar circuit)

radio-frequency amplifier, 2

radio-frequency current Symbol, I_{RF}. **2.** The intensity of a generated radio-frequency (RF) signal, usually expressed in microamperes. **2.** Loosely, any measurable RF signal.

radio-frequency heating The generation of heat in an object by an intense radio-frequency electromagnetic field. See, for example, DIATHERMY, **1**; DIELECTRIC HEATING; and INDUCTION HEATING.

radio-frequency interference Abbreviation, RFI. **1.** Annoying electrical noise in radio-frequency (RF) amplifiers, detectors, and instruments. **2.** Undesired RF signals that compete with desired ones in amplifiers, receivers, and instruments. **3.** The unwanted interception and demodulation of a strong RF signal by an audio-frequency (AF) device, such as a telephone set or high-fidelity stereo amplifier.

radio-frequency meter An instrument for measuring signals of RADIO FREQUENCY (9 kHz and above).

radio-frequency oscillator Abbreviation, RFO. An oscillator (self-excited or crystal-controlled) for operation at radio frequencies. In such an oscillator, stray components, efficiency, and general losses are of primary concern. Also see RADIO FREQUENCY.

radio-frequency power Symbol, P_{RF}. Alternating-current power at radio frequencies.

radio-frequency resistance The total in-phase resistance exhibited by a conductor at radio frequencies. This opposition to current includes direct-current resistance and the in-phase components caused by skin effect, shielding, and the presence of dielectrics.

radio-frequency selectivity The selectivity of a radio-frequency (RF) channel, such as the RF amplifier and first detector of a superheterodyne circuit.

radio-frequency transformer Abbreviation, RF transformer. A device used for the purpose of impedance matching, antenna tuning, or interstage coupling at frequencies above the range of human hearing (approximately 20 kHz and up). The device might consist of solenoidal windings with an air core, solenoidal windings with a powdered-iron or ferrite core, or toroidal windings with a powdered-iron or ferrite core. The windings are designed to minimize distributed capacitance and direct-current resistance. When no reactance is present, the impedance-transfer ratio is equal to the square of the turns ratio. Compare AUDIO-FREQUENCY TRANSFORMER.

radio-frequency transistor **1.** A transistor capable of providing significant amplification at radio frequencies. **2.** A transistor operable at frequencies above 100 kHz.

radiogenic Produced by radioactivity.

radiogoniometer A radio compass (see DIRECTION FINDER and GONIOMETER, **1**).

radiogram A (usually printed out) message transmitted and received via radiotelegraphy or radioteletype. The term is an acronym for *radio telegram.*

radiograph **1.** To contact by sending a RADIOGRAM. **2.** An X-ray photograph.

radio homing **1.** A method of homing that uses the tracking of a target on the basis of a radio signal emitted by that target. **2.** A method of keeping a missile on track via radio remote control.

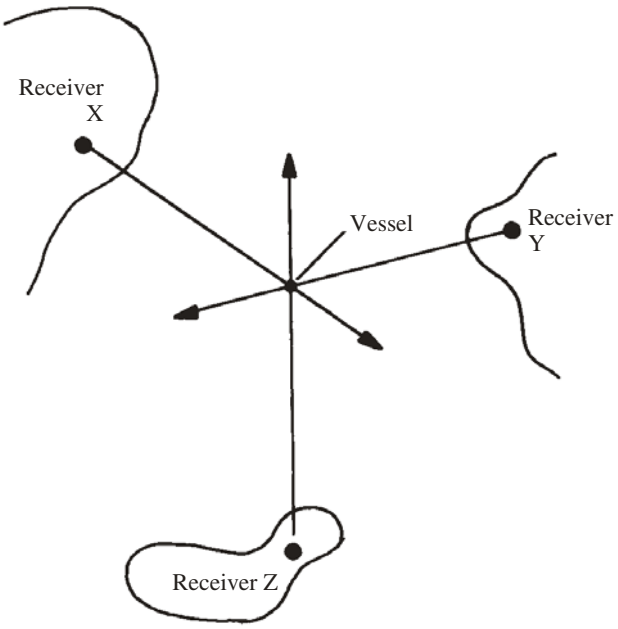
radio interference **1.** Interference to radio communication, from whatever cause. **2.** See RADIO-FREQUENCY INTERFERENCE.

radioisotope A radioactive isotope (natural or artificial) of a normally nonradioactive chemical element (e.g., radioactive carbon). Also see ISOTOPE.

radio jamming See JAMMING.

radio knife A surgical instrument consisting essentially of a needle that forms a high-frequency arc. The arc simultaneously cuts and cauterizes tissue.

radiolocation A process whereby the position of a vehicle, aircraft, or ocean-going vessel is determined. The simplest method is the directional method. Two or three fixed receiving stations are used. Radio direction-finding (RDF) equipment is employed at each station, in conjunction with a transmitter aboard the vessel, to establish the bearings of the vessel with respect to each station. Radar can also be used to locate vessels. In wartime, enemy craft can sometimes be located by visual or infrared apparatus. Satellites can locate enemy ships and missiles, in some cases with an error smaller than the length of the vessel itself. Compare RADIONAVIGATION.



radiolocation

radiolocator See RADAR.

radiological system See X-RAY THERAPY SYSTEM.

radiologist A specialist skilled in RADIOLOGY.

radiology The science embracing the theory and use of X rays and radioactive substances in the diagnosis and treatment of diseases and ailments.

radiolucency **1.** The property of a material that allows ionizing radiation to pass through it with little or no absorption. **2.** The extent to which a material transmits ionizing radiation.

radioluminescence Visible light emitted from a radioactive material. A good example is radium; it was once used on wristwatch dials so that they could be seen in the dark.

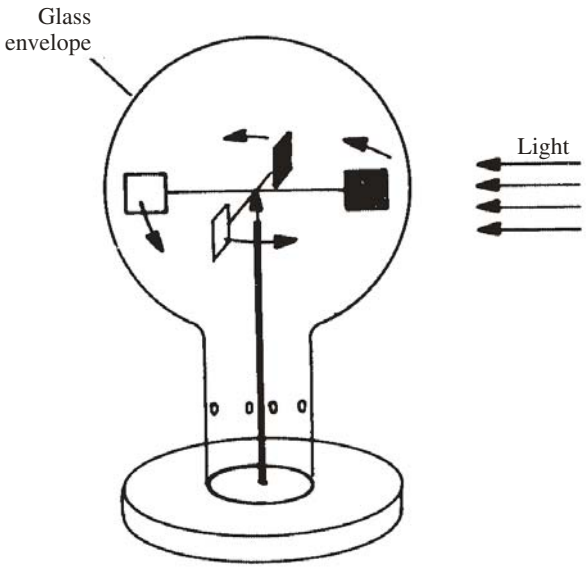
radiolysis Chemical decomposition brought about by radiation.

radioman A radio technician or operator.

radio map A map of a geographic area, on which lines are drawn connecting measured points of equal field strength for signals from a radio station at the approximate center of the area.

radiometeorograph See RADIOSONDE.

radiometer A device for detecting and measuring the strength of radiant energy. One form consists of a set of vanes blackened on one side and mounted on pivots in a partially evacuated glass bulb. Visible light or infrared causes the vane assembly to rotate, the speed being proportional to the intensity of the light.



radiometer

radiometry The science and art of measuring radiation in the infrared, visible, and ultraviolet regions of the electromagnetic frequency spectrum. Compare PHOTOMETRY.

radio micrometer See MICRORADIOMETER.

radionavigation The use of radio apparatus, usually in conjunction with computers, by personnel aboard moving vessels, for the purpose of plotting, correcting, and maintaining a course. The intersecting-line method is simplest. Two or three land-based transmitters are needed. Their locations must be accurately known. A direction-finding device on the vessel is used to determine the bearings of each of the transmitters. Aircraft radionavigation can be performed with the aid of radar. The most sophisticated radionavigation techniques employ the Global Positioning System (GPS). Computers are used to project the course of a craft based on its current position, its speed, and the direction of its movement. Course corrections are made by choosing the desired course and having the computer calculate speed and/or direction changes. Compare RADIOLOCATION.

radio net A group of radio stations operating together in an organization, often on or near the same frequency.

radio network See RADIO NET.

radio operator A technician licensed to operate a transmitter in the radio, television, or radar services.

radiopaque Opaque to X rays or other ionizing radiation. Compare RADIOPARENT.

radioparent Transparent to X rays or other ionizing radiation. Compare RADIOPAQUE.

radiophone See RADIOTELEPHONE.

radiophoto A photograph transmitted and received by radio. Also see FACSIMILE.

radio pill See ENDORADIOSONDE.

radio prospecting The use of radio-frequency devices to locate underground or underwater metals and mineral deposits. Also see METAL LOCATOR.

radio range A radio station providing navigational aid to airplanes.

radio receiver The complete apparatus that selects, amplifies, demodulates, and reproduces a radio signal for purposes of communication, as distinct from *facsimile receiver*, *remote-control receiver*, *telemetry receiver*, *television receiver*, etc.

radiosensitivity **1.** The property of being sensitive to ionizing radiation. Most photographic films have this property. **2.** The extent to which a substance or device is sensitive to ionizing radiation.

radio service technician An electronics technician skilled in the repair and maintenance of radio equipment—especially receivers.

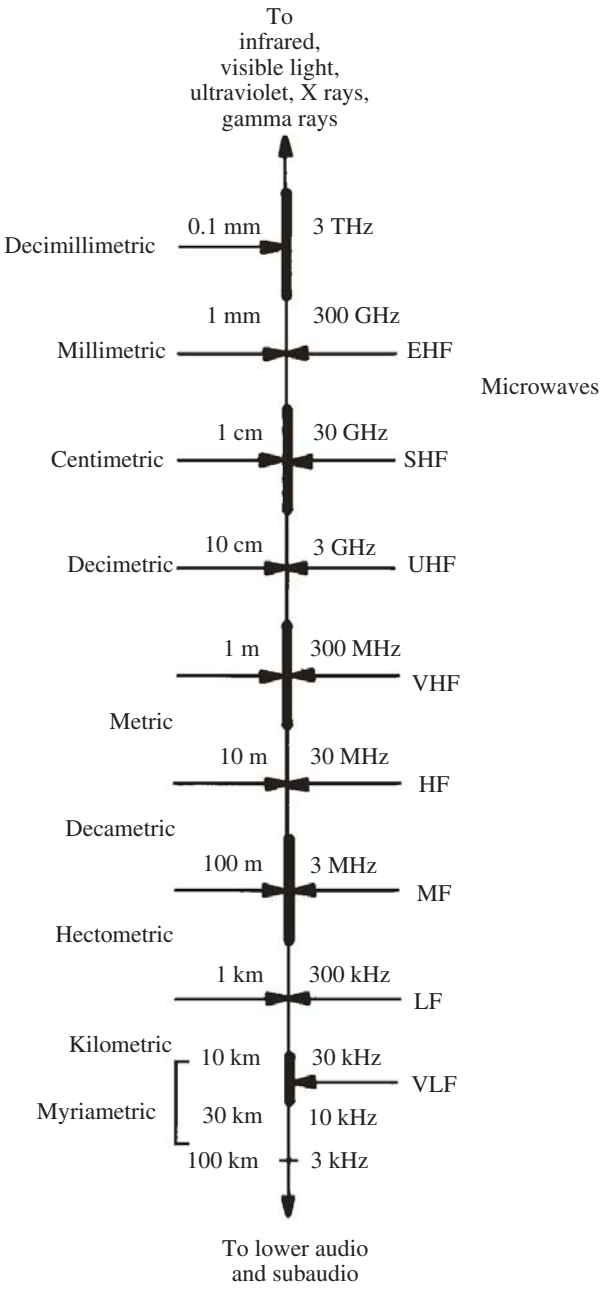
radiosonde A balloon-carried combination of radio transmitter and transducers, for sending to a ground monitoring station signals revealing such atmospheric conditions as temperature, humidity, and pressure. It is used mainly for gathering meteorological data at high altitudes.

radiosonobuoy See SONOBUOY.

radio spectroscope A device used by radio astronomers to obtain the radio-frequency profile of a distant star or galaxy. It generally consists of a

graph, obtained by scanning the radio spectrum and plotting signal intensity as a function of frequency or wavelength.

radio spectrum The continuum of frequencies useful for radio communication and control. Classified in the following manner: *Very low frequency (VLF)*, 9 to 30 kHz; *low frequency (LF)*, 30 to 300 kHz; *medium frequency (MF)*, 300 to 3000 kHz; *high frequency (HF)*, 3 to 30 MHz; *very high frequency (VHF)*, 30 to 300 MHz; *ultrahigh frequency (UHF)*, 300 to 3000 MHz; *super high frequency (SHF)*, 3 to 30 GHz; *extremely high frequency (EHF)*, 30 to 300 GHz.



radio spectrum

radiostat See CRYSTAL FILTER.

radio station **1.** The location at which a radio transmitter and/or receiver is/are installed. **2.** The complete set of equipment for a radio receiving and/or transmitting installation, including the studio, linking apparatus, and antennas. **3.** A standard broadcast station.

radio technician A professional skilled in the construction, testing, repair, and maintenance of radio equipment, and sometimes in its design, and who usually works under the supervision of a radio engineer. Also see RADIO SERVICE TECHNICIAN.

radiotelegram See RADIOGRAM.

radiotelegraph **1.** Pertaining to the theory and application of, and the equipment for, Morse code transmission and/or reception via radio. **2.** An installation for Morse code transmission and/or reception via radio. **3.** The transmission and/or reception of Morse code signals via radio.

radiotelegraph code See CONTINENTAL CODE.

radiotelegraph distress signal See SOS.

radiotelegraph monitor See KEYING MONITOR.

radiotelegraphy The transmission and/or reception of telegraphic communications, usually Morse code, by means of radio.

radiotelephone **1.** Pertaining to the theory and application of, and the equipment for, voice transmission and/or reception via radio. **2.** An installation for voice transmission and/or reception via radio. **3.** The transmission and/or reception of voice signals via radio.

radiotelephone distress signal See MAYDAY.

radio/telephone patch See PHONE PATCH.

radiotelephony The transmission and/or reception of audio signals, usually human voices, by means of radio.

radio telescope A directional antenna and associated equipment for receiving and evaluating the radio-frequency electromagnetic radiation from space—especially from celestial objects (such as the sun, planets, stars, nebulae, galaxies, quasars, etc.). See RADIO ASTRONOMY.

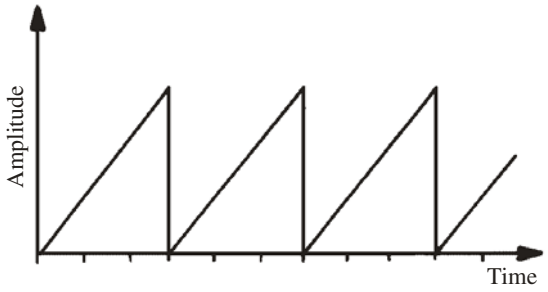
radioteletype **1.** Pertaining to the theory and application of, and the equipment for, text data transmission and/or reception via radio. **2.** An installation for text data transmission and/or reception via radio. **3.** The transmission and/or reception of text data signals via radio.

radioteletypewriter A teletypewriter adapted to radio, rather than wire service; it is used in some RADIOTELETYPE installations. In recent years, personal computers and terminals have largely replaced adapted teletypewriters for this purpose.

radiotherapy The use of X rays and/or radioactive substances in the treatment of disease and disorders.

radiothermics The science of the generation of heat by means of radio-frequency current.

radiothermy See DIATHERMY.
radio thorium Radioactive THORIUM.
radiotracer See TRACER.
radio transceiver A RADIO RECEIVER and RADIO TRANSMITTER built into a single unit, and generally intended for use in two-way communication.
radio transmitter The complete apparatus that generates radio-frequency power, modifies it with the data needed for communication, and delivers the product to an antenna for radiation into space. Here, the radio transmitter is distinguished from similar equipment: *facsimile transmitter*, *remote-control transmitter*, *telemetry transmitter*, *television transmitter*, etc.
radio-transparent material 1. A substance through which radio waves pass with little or no attenuation. **2.** A substance through which X rays, gamma rays, or high-speed subatomic particles can pass with little or no attenuation.
radiotrician Acronym for *radio electrician.* See RADIO SERVICE TECHNICIAN.
radio tube 1. A VACUUM TUBE used at radio frequencies. **2.** A vacuum tube used as an amplifier, local oscillator, detector, or mixer in an early radio receiver.
radiovision See TELEVISION.
radio watch See WATCH.
radio waves Electromagnetic waves in the RADIO SPECTRUM.
radio window That portion of the radio-frequency electromagnetic spectrum that passes through the atmosphere, rather than being refracted or absorbed. The wavelength range is about 20 meters to 5 millimeters, or 15 MHz to 60 GHz. The lower limit of this range is affected by ionospheric conditions. The upper frequency limit depends on various factors, including relative humidity and dust content of the air.
radium Symbol, Ra. A rare radioactive metallic element. Atomic number, 88. Atomic weight, 226.025.
radius The straight-line distance from the center of a circle or sphere to its periphery.
radius vector In spherical or polar coordinates, a line segment drawn from the pole, or origin, and representing the vector magnitude.
radix The number indicating the number of symbols in a system of numerical notation, and the powers of which give the place values of the system. Thus, 10 is the radix of the decimal system, and 2 is the radix of the binary system. Also called BASE.
radix point In a number, the point (dot or period) separating the integral and fractional digits. Its specific name depends on the system of notation involved: *binary point*, *decimal point*, etc.
radome A plastic shell housing a radar antenna—especially aboard an aircraft.
radon Symbol Rn. A gaseous radioactive element that results from the disintegration of radium. Atomic number, 86. Atomic weight, 222.
rad/s Abbreviation of *radians per second*, the SI unit of angular velocity.
rad/s^2 Abbreviation of *radians per second squared*, the SI unit of angular acceleration.
radux A continuous-wave, low-frequency radionavigation system. Position is determined by comparing the phase of two signals sent from different locations.
RAID Acronym for REDUNDANT ARRAY OF INDEPENDENT DISKS.
rainbow generator A test-signal generator that produces a full color spectrum, a pattern resembling the successive coloration of a rainbow, on the screen of a color-television receiver. Also see RAINBOW PATTERN.
rainbow pattern A test pattern for servicing a color-television receiver. It consists of a full color spectrum, thus taking its name from its resemblance to a rainbow. Also see RAINBOW GENERATOR.
RAM Abbreviation of RANDOM-ACCESS MEMORY.
ramp A sawtooth wave with a linear rise and a practically instantaneous decay; its name was derived from its resemblance to an incline.



ramp

ramp generator A test-signal generator that produces sawtooth-wave signals. Also see RAMP.
R and D Abbreviation of research and development or research and design. (Also, R&D.)
random access Abbreviation, RA. In computer and data-processing operations, pertaining to storage or memory in which data can be recovered in any order.
random-access memory In computer and data-processing systems, a memory providing access time that is independent of the address.
random deviation Irregular RIPPLE.
random-fed antenna An antenna that uses RANDOM FEED.
random feed A method of connecting a transmission line to an antenna, wherein the feed point is not necessarily at the center and not necessarily at a current loop or voltage loop. This technique is rarely used; it generally results in some radiation from the feed line.

random noise Electrical noise in which the pulses or fluctuations have no discernible pattern of occurrence (i.e., they are haphazard in frequency and amplitude).

random number A number derived by chance. It is used in statistical analysis for various purposes.

random number generator Hardware or software that provides a sequence of numbers or digits that are random for the purpose of a given statistical application.

random occurrence See CHANCE OCCURRENCE.

random variable In statistics, a variable that can have a number of values, each of the same probability.

random winding A coil winding in which the turns are wound haphazardly to reduce distributed capacitance.

range **1.** The limits within which a circuit or device operates (i.e., the territory defined by such limits). Examples: *current range*, *frequency range*, and *voltage range*. **2.** The difference between the upper and lower limits of deflection of a meter. **3.** The distance over which a transmitter operates reliably. **4.** A clear area for testing antennas. **5.** The distance between a radar station and a target. **6.** The possible values for a quantity or function that lie between given limits.

range capacitor See TRIMMER CAPACITOR.

range-height indicator Abbreviation, RHI. A radar display in which the horizontal axis shows distance to the target, and the vertical axis shows elevation of the target.

range mark See DISTANCE MARK.

range plotting The creation of a graph of the distance (range) to objects, as a function of direction or orientation in two or three dimensions. Commonly used in robot guidance systems.

range resistor See TRIMMER RESISTOR.

range sensing The measurement of distances to objects via electronic methods such as radar, sonar, vision systems, etc. Commonly used in robot guidance systems.

ranging **1.** Any means of determining the distance from a station or vehicle to an object or objects. **2.** Any of several methods for a vehicle, vessel, aircraft, spacecraft, or robot to navigate in its environment by measuring, and keeping track of changes in, the distance between itself and one or more objects or beacons.

rank **1.** To arrange in a specific sequence according to significance. **2.** A place in such a sequence.

Rankine scale A temperature scale on which the freezing point of water is 491.69 degrees, and the boiling point 671.69 degrees. Absolute zero is represented by 0 degrees. For conversion to kelvins, multiply degrees Rankine by 5/9.

rapid drift A fast change of a quantity or setting (usually in one direction) with time.

rapid printer See QUICK PRINTER.

raser A device that produces coherent electromagnetic waves at radio frequencies; the radio-frequency equivalent of a LASER.

raster The rectangle of light (composed of unmodulated lines) seen on the screen of a television picture tube when no signal is present.

ratchet circuit See COMMUTATOR, **2** and ELECTRONIC RATCHET.

rate action See DERIVATIVE ACTION.

rate effect In a four-layer semiconductor device, the tendency for the switch to conduct undesirably as a result of a transient spike.

rate-grown transistor See GRADED-JUNCTION TRANSISTOR.

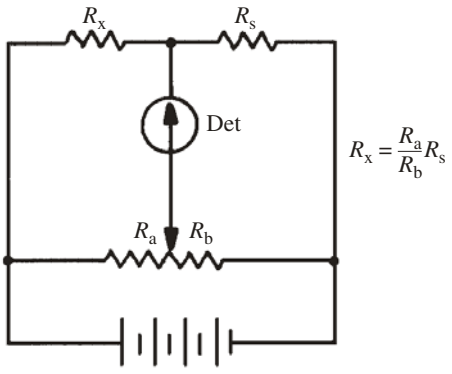
rate gyro A special gyroscope for measuring angular rates.

rate of change **1.** The extent to which the value of a dependent variable changes in accordance with a specified change in an independent variable (usually time). **2.** A quantitative expression of the speed with which a dependent variable changes, with respect to an independent variable (usually time).

rate signal A signal whose amplitude is proportional to the derivative of a variable, with respect to time.

rate time In automatic-control operations, the time over which the addition of DERIVATIVE ACTION advances PROPORTIONAL ACTION.

ratio-arm bridge A simple four-arm bridge in which the balancing potentiometer supplies the two arms, one on each side of the slider at all settings.



ratio-arm bridge

ratio arms Two impedance arms serving to establish the numerical ratio of a bridge circuit.

ratio control In automatic-control operations, a system in which the controlled variable is in a prescribed ratio to another variable.

ratio detector A frequency-modulation (FM) second detector resembling the FOSTER-SEELEY DISCRIMINATOR, except that one of the two

diodes is reversed and the junction point of the load resistors is grounded. In an FM circuit using a ratio detector, no limiter is required. The ratio of the direct-current outputs is proportional to the ratio of the instantaneous signal voltages applied to the two diodes.

ratio meter An instrument that compares two different signals (and indirectly their sources) and delivers a reading of their ratio.

rational number A number that can be expressed in the form a/b, where a and b are integers and b is not equal to zero.

rational operation Any of the conventional arithmetic operations: multiplication, division, addition, or subtraction.

ratio of geometric progression In a geometric progression, the ratio of one value to the next.

ratio of similitude The ratio of the lengths of corresponding sides in similar geometric figures.

rat race See HYBRID RING.

raven red A variety of red oxide of iron, a commercial red paint used as the magnetic coating of early recording tapes.

raw ac Unrectified alternating current (ac) or voltage.

raw data Data that has not been processed in any way.

rawinsonde A RADIOSONDE tracked by a radio direction finder to determine wind velocity. The name is an acronym from *radar wind radiosonde.*

raw tape See BLANK TAPE.

ray **1.** A line of radiant energy. Such a line (e.g., the path of a single photon of visible light) is imagined to arise from a point source and have zero width. **2.** A thin beam of radiant energy (e.g., the beam of electrons in a cathode-ray tube). **3.** A quantity of radiant energy or ionizing radiation (e.g, *gamma ray*). **4.** One of numerous lines converging toward, or emanating from, a specific point. **5.** A vector representing the direction in which an electromagnetic field or acoustic disturbance travels. **6.** Also called *half line.* The set of points on a line consisting of a defined origin and all the points on one side of the origin. Example: the positive reactance axis in an ARGAND DIAGRAM.

Raydist A continuous-wave, medium-frequency radionavigation system. The position is determined according to the phase difference between two signals transmitted from different locations.

Rayleigh-Carson theorem An expression of the reciprocal relationship between the transmitting and receiving properties of an antenna. If voltage E applied to antenna A causes current I to flow at a given point in antenna B, then the same voltage (E) applied at that point in antenna B will produce identical current I (same magnitude and phase) at the point in antenna A, where voltage E originally was applied. Also see RECIPROCITY THEOREM.

Rayleigh distribution A probability-density function, used to describe the behavior of sky-wave electromagnetic signals.

Rayleigh's law The hysteresis loss in a magnetic material varies in proportion to the cube of the magnetic induction.

Rb Symbol for RUBIDIUM.

$\boldsymbol{R_B}$ Symbol for BASE RESISTANCE. (Also, r_B.)

RC **1.** Abbreviation of RESISTANCE-CAPACITANCE. **2.** Abbreviation of RADIO-CONTROLLED. **3.** Abbreviation of REMOTE CONTROL.

$\boldsymbol{R_c}$ **1.** Symbol for COLLECTOR RESISTANCE. (Also, r_C.) **2.** Symbol for COLD RESISTANCE.

RCA jack See PHONO JACK.

RCA plug See PHONO PLUG.

RC circuit See RESISTANCE-CAPACITANCE CIRCUIT.

RC-coupled amplifier See RESISTANCE-CAPACITANCE-COUPLED AMPLIFIER.

RC coupling See RESISTANCE-CAPACITANCE COUPLING.

RC filter See RESISTANCE-CAPACITANCE FILTER.

RCL **1.** Abbreviation of RECALL. **2.** Abbreviation of RESISTANCE-CAPACITANCE-INDUCTANCE.

RCM Abbreviation of RADAR COUNTERMEASURES. (Also, radCM.)

RC phase shifter See RESISTANCE-CAPACITANCE PHASE SHIFTER.

RC time constant See RESISTANCE-CAPACITANCE TIME CONSTANT.

RCTL Abbreviation of RESISTOR-CAPACITOR-TRANSISTOR LOGIC.

RC tuning See RESISTANCE-CAPACITANCE TUNING.

RCV Abbreviation for *receive.* (Also, rcv.)

RCVR Abbreviation for RECEIVER. (Also, rcvr, rx.)

rd Abbreviation for *rutherford.*

R & D See R AND D.

$\boldsymbol{R_D}$ Symbol for DRAIN RESISTANCE.

$\boldsymbol{R_d}$ **1.** Symbol for DIODE RESISTANCE. (Also, r_d.) **2.** Symbol for DISTRIBUTED RESISTANCE.

R-DAT Abbreviation of ROTARY DIGITAL AUDIO TAPE.

$\boldsymbol{R_{dc}}$ Symbol for DC RESISTANCE. (Also, r_{dc}.)

RDF Abbreviation of RADIO DIRECTION FINDER.

Re Symbol for RHENIUM.

$\boldsymbol{R_e}$ Symbol for EMITTER RESISTANCE. (Also, r_E.)

REA Abbreviation of *Rural Electrification Administration.*

reachthrough See PUNCHTHROUGH.

reachthrough region See PUNCHTHROUGH REGION.

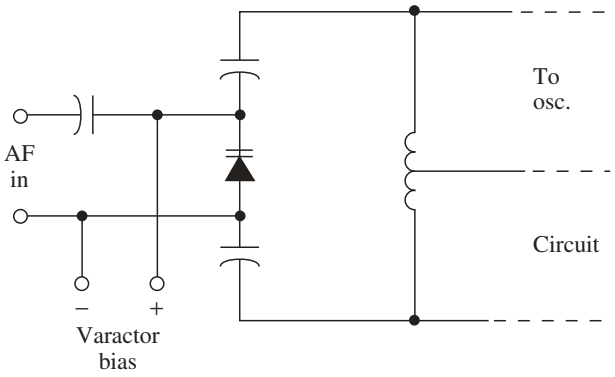
reachthrough voltage See PUNCHTHROUGH VOLTAGE.

reactance Symbol, X. Unit, ohm. The opposition offered to the flow of alternating current by pure capacitance, pure inductance, or a combination of the two. Reactance introduces phase shift. Also see CAPACITIVE REACTANCE and INDUCTIVE REACTANCE. Compare RESISTANCE.

reactance chart A nomograph for capacitance, inductance, and frequency.

reactance factor The ratio of the alternating-current resistance of a conductor to the direct-current resistance. The reactance factor generally increases as the frequency increases because of skin effect and because the length of the conductor might be a sizable part of the wavelength of the transmitted energy.

reactance modulator A frequency modulator using a variable reactance, usually a varactor diode in the oscillator.



reactance modulator

reactance transistor A transistor used as a REACTANCE MODULATOR.

reaction-time meter See NEOMATACHOGRAPH and NEOMATACHOMETER.

reactive absorber In acoustics, a device that dissipates impinging sound waves by means of reflection, resonance, and other effects, besides dissipation in the form of heat.

reactive attenuator An attenuator that functions by means of reactance, rather than by means of resistance.

reactive current The component of alternating current that is not in phase with the voltage. Compare RESISTIVE CURRENT.

reactive kilovolt-ampere Abbreviation, kVAR. A unit of high apparent power; it is the product of kilovolts and amperes in a reactive component of a circuit. Also see APPARENT POWER, KILOVOLT-AMPERE, REACTIVE VOLT-AMPERE, and VOLT-AMPERE.

reactive load **1.** A load device that is capacitive or inductive, rather than resistive. **2.** A load device that contains reactance as well as resistance.

reactive power See REACTIVE KILOVOLTAMPERE and REACTIVE VOLT-AMPERE.

reactive volt-ampere Abbreviation, VAR. A unit of apparent power; it is the product of volts and amperes in a reactive component of a circuit. Also see APPARENT POWER, KILOVOLT-AMPERE, REACTIVE KILOVOLT-AMPERE, and VOLT-AMPERE.

reactor **1.** An inductor, especially one having very low internal resistance, used principally for its inductive reactance. **2.** A chamber in which the nuclei of atoms are split to provide atomic energy. Also see NUCLEAR REACTOR. **3.** In industrial chemistry, a vat in which reactions take place.

read **1.** In computer operations, to extract data from memory or a storage medium and (usually) transfer it to another area of memory or other medium. Compare WRITE. **2.** In digital communications, to transcribe data into printed form. **3.** In radiotelegraphy, to listen to Morse-code signals and comprehend the text without necessarily writing it down. **4.** To observe and note the indication of an instrument, such as a meter.

readability In electronic communications, the degree to which a desired signal can be recognized and interpreted in a given context.

readback In a multiplexer, a feature that facilitates inspection of the contents of the control latch.

reader A device that transcribes digital signals or markings into meaningful data. Examples: *Morse-code reader* and *bar-code reader*.

read head In a magnetic memory or in a tape recorder or wire recorder used for data recording, the head that picks up the magnetic pulses from the drum, tape, disk, or wire. Compare WRITE HEAD.

reading rate The number of input characters per second that a computer or other data-processing device handles.

read-only memory Abbreviation, ROM. In a computer or calculator, a memory unit in which instructions or data are permanently stored for use by the machine or for reference by the user. The stored information is read out nondestructively.

readout lamp An electron tube containing several cathodes, filled with a gas (such as neon), and used as a numeric or alphanumeric display device. Each cathode is connected to a separate pin on the base. A single anode is common to all cathodes. The cathode(s) to which a voltage is applied glow(s), showing the shape of a numeral, letter of the alphabet, or other symbol. In recent years, this type of display has been replaced by light-emitting diodes (LEDs) and liquid-crystal displays (LCDs).

readout pulse In a random-access memory (RAM), a pulse applied to the word line, facilitating readout of the information in a certain storage slot.

read pulse In computer operations, a pulse that activates the read function (see READ). Compare WRITE PULSE.

read rate The number of data units an input read device can transcribe per unit of time [e.g., *bits per second (bps)* and *words per minute (wpm)*].

readthrough **1.** The reception of signals between transmitted pulses at the same frequency. **2.** The continuous monitoring of a signal being jammed. Any change in the frequency, modulation, or other characteristics of the signal can

then be detected, and the jamming signal adjusted accordingly.

read time The period during which data is being transferred from a computer storage unit.

read-write channel In computer operations, a channel over which activity between a central processing unit and a specific peripheral occurs.

read-write head An electromagnetic transducer used for both reading and writing data. See READ and WRITE.

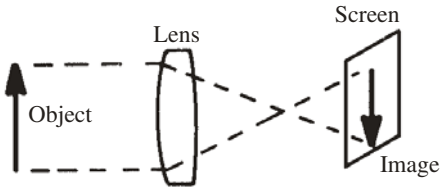
read-write memory **1.** A small data storage bank for short-term use. The contents of the memory are easily changed. **2.** See RANDOM ACCESS MEMORY.

real address See ABSOLUTE ADDRESS.

real axis The axis of the real-number component of a COMPLEX NUMBER (i.e., the horizontal axis in an ARGAND DIAGRAM).

real component The real-number part of a COMPLEX NUMBER.

real image The image formed on a screen when rays from the object converge on passing through a lens. Compare VIRTUAL IMAGE.



real image

real number A number in the category that includes zero, all rational numbers, and all irrational numbers. Also see COMPLEX NUMBER, IMAGINARY NUMBER, IRRATIONAL NUMBER, and RATIONAL NUMBER.

real power The apparent power multiplied by the power factor in an alternating-current circuit containing reactance. Real power is the difference between the apparent power and the reactive power. Actual radiated or dissipated power cannot exceed the real power.

real time Pertaining to the operation of a computer, communications, or data processing system in which events are represented or acted on as they occur. Data is processed as it becomes available, usually through the use of time-sharing, direct-access storage devices, and remote terminals.

real-time clock A device that produces periodic signals that reflect the interval between events. It is sometimes used to indicate time of day.

rear end The low-frequency portion of a superheterodyne receiver (i.e., the intermediate-frequency amplifier, second detector, and audio-frequency amplifier). Compare FRONT END.

rear projection A method of big-screen television picture reproduction. The image is focused onto a translucent, flat surface. The viewer is positioned on the side of the screen opposite to the projecting beam.

Reaumur scale A thermometer scale on which zero is the freezing point of water and 80 degrees is the boiling point of water. Compare ABSOLUTE SCALE, CELSIUS SCALE, FAHRENHEIT SCALE, and RANKINE SCALE.

rebecca The airborne interrogator in the British REBECCA-EUREKA SYSTEM.

rebecca-eureka system A British 90-mile-hovering radar navigation system that consists of an airborne interrogator (rebecca) and a ground transponder beacon (eureka).

rebroadcast The retransmission of a radio broadcast simultaneously by a station other than the originator. Also see AUTOMATIC RELAY STATION.

rebroadcast station See AUTOMATIC RELAY STATION.

recalescence During the cooling of a metal, the sudden release of heat. Also see RECALESCENT POINT. Compare DECALESCENCE.

recalescent point In a metal whose temperature is being lowered from a higher value, the temperature at which heat is suddenly released. Compare DECALESCENT POINT.

recall Abbreviation, RCL. In computers and calculators, an instruction that brings material from the memory for examination or use. The opposite instruction is STORE.

receiver **1.** A device or system operated at the destination end of a communication link; it accepts a signal and processes or converts it for local use. Also see specific entries for various types of receiver. **2.** The earpiece of a telephone. **3.** A radio broadcast-band tuner integrated with a general-purpose preamplifier and power amplifier, and containing standard jacks for input and output of audio signals to and from peripheral equipment.

receiver detector In a wireless communications or broadcast receiver, a circuit that extracts the information from the signal. The design depends on the type of emission to be received. See also DISCRIMINATOR, ENVELOPE DETECTOR, PHASE-LOCKED LOOP, PRODUCT DETECTOR, RATIO DETECTOR.

receiver dynamic range A quantitative measure of the ability of a wireless receiver to maintain a fairly constant output, and yet to maintain its rated sensitivity, in the presence of signals ranging from very weak to extremely strong. This figure is specified in decibels. It is typically 100 dB or more in a well-engineered communications receiver.

receiver front end The portion of a wireless communications or broadcast receiver consisting of the first radio-frequency (RF) amplifier, and often also including bandpass filters between this amplifier and the antenna. The dynamic range and sensitivity of a receiver are determined by the performance of this stage. These two characteristics are among the most important for any receiver.

Low-noise, high-gain amplifiers are the rule. Field-effect transistors are commonly used.

receiver IF chain In a wireless communications or broadcast receiver, the series of radio-frequency (RF) amplifier stages in which most of the gain takes place. These stages are also where the best possible RF selectivity is obtained. The intermediate frequency (IF) on which the amplifiers works is a constant frequency. This simplifies the design of the amplifiers to produce optimum gain and selectivity. Crystal-lattice filters or mechanical filters are commonly used in these stages to obtain the desired bandwidth and response.

receiver mixer In a superheterodyne wireless communications or broadcast receiver, a stage that converts the variable input signal frequency to a constant intermediate frequency (IF), or a stage that converts the first IF to a second IF usually having a lower frequency. This type of circuit is nonlinear, and combines the signal with a carrier from a local oscillator (LO). The output is either the sum or the difference of the signal frequency and the LO frequency.

receiver muting See MUTING, **1**.

receiver noise figure A quantitative measure of the ability of a wireless receiver to respond to desired signals while rejecting unwanted noise. This can be quantified in various ways. In general, the lower the noise figure, the better the sensitivity. Gallium–arsenide field-effect transistors (GaAsFETs) are well known for the low levels of noise they generate, even at quite high frequencies. Other types of FETs can be used at lower frequencies. Bipolar transistors tend to be noisy. See also NOISE FACTOR, NOISE FIGURE.

receiver post-detector stages In a wireless communications or broadcast receiver, one or more stages of amplification and/or filtering employed to refine the detector output to a form suitable for feeding a speaker, headset, printer, fax machine, slow-scan television picture tube, computer, electromechanical device, or other peripheral equipment.

receiver primaries See DISPLAY PRIMARIES.

receiver selectivity A quantitative measure of the ability of a wireless receiver to respond to a desired signal, but not to undesired ones. The frequency window is established by a preselector in the early RF amplification stages, and is honed to precision by bandpass filters in later amplifier stages. The preselector passes energy within a range of about plus-or-minus 10 percent of the signal frequency; other frequencies are attenuated. This reduces the chance for strong, out-of-band signals to impair the performance of the receiver. The narrowband filter in the final intermediate-frequency (IF) stage responds only to energy within the actual signal band. This minimizes adjacent-channel interference. In some receivers, yet another bandpass filter is used in the audio-amplifier stages.

receiver sensitivity A quantitative measure of the ability of a wireless receiver to recover weak signals and process them into readable data. The most common expression is the number of signal microvolts that must exist at the antenna terminals to produce a certain signal-to-noise ratio (S/N). Sometimes, the signal-plus-noise-to-noise ratio (abbreviated S+N/N) is given. The front end, or first RF amplifier stage, of a receiver is the most important stage with regard to sensitivity. Sensitivity is directly related to the gain of this stage, but the amount of noise the stage generates is even more significant. A good front end should produce the best possible S/N or S+N/N ratio at its output. All subsequent stages amplify the front-end noise output as well as the front-end signal output.

receiving set RADIO RECEIVER.

receiving station A station that ordinarily only receives signals (i.e., it makes no type of transmission). Compare TRANSMITTING STATION.

receptacle **1.** See SOCKET. **2.** The half of a connector that is mounted on a support, such as a panel, and that is therefore stationary.

recharge In certain cells and batteries, the restoration of chemical energy following use so that the device is ready to deliver its full rated electric current. Also see RECHARGEABLE.

rechargeable Pertaining to a secondary cell or battery that can accept a restoration of chemical energy following use, and thus can be completely charged and discharged numerous times. Examples: *nickel-metal-hydride (NiMH) battery* and *lead-acid battery.*

reciprocal impedances See INVERSE IMPEDANCES.

reciprocal ohm See SIEMENS and MHO.

reciprocation **1.** The determination of a mathematical reciprocal value from a given value. **2.** The transmission of a message in response to a received message.

reciprocity in antennas See RAYLEIGH-CARSON THEOREM.

reciprocity theorem When a voltage E across branch A of a network causes a current I to flow in branch B of the network, the voltage can be applied across branch B to cause the same value of current to flow in branch A. Compare COMPENSATION THEOREM, MAXIMUM POWER TRANSFER THEOREM, NORTON'S THEOREM, SUPERPOSITION THEOREM, and THEVENIN'S THEOREM.

recombination The refilling of holes by electrons in a semiconductor.

recombination current In a transistor circuit, base current resulting from recombination.

recombination rate In a semiconductor material, the speed at which the electrons and holes recombine. It can be expressed as the time required for a certain proportion of charge carriers to recombine.

recompile In computer operations, to COMPILE again, usually according to program amendments following debugging, or to create a different form of a program so that it will be compatible with other hardware.

record **1.** See PHONOGRAPH DISC. **2.** A chart delivered by a graphic recorder. **3.** To make one of the foregoing. **4.** In data processing, a constituent of a file. **5.** In data processing, a data unit portraying a specific transaction.

record blocking In data processing operations, making data blocks from groups of records so that the blocks can, in a single operation, be transferred to a nonvolatile storage medium, such as diskette or tape.

record count A usually running total of a file's records.

recorded disc A phonograph disc on which a recording has been made. Also called PRERECORDED DISC.

recorded tape Magnetic tape containing recorded material. Also called PRERECORDED TAPE. Compare BLANK TAPE.

recorder **1.** A machine for preserving sound, video, or data signals in the sequence in which they occur (e.g., DISC RECORDER, TAPE RECORDER, and WIRE RECORDER). **2.** A machine for making a permanent visual record (photographically or by stylus) of an electrical phenomenon. Examples: DRUM RECORDER and OSCILLOGRAPH.

record head See RECORDING HEAD.

recording density In a magnetic storage medium, the number of information units (bits, bytes, etc.) represented by magnetized areas, per unit area or length.

recording disc A phonograph record on which material has not been recorded, or from which recorded material has been removed. Compare PRERECORDED DISC.

recording head In a magnetic recorder/reproducer, the head that magnetizes the medium in accordance with sounds or other signals. Also called RECORD HEAD and WRITE HEAD. Compare PLAYBACK HEAD.

Recording Industry Association of America Abbreviation, RIAA. An organization that sets standards for audio recording and reproduction in the United States.

recording instrument A measuring instrument, such as a voltmeter or ammeter, that makes a permanent record of its deflections. Also see RECORDER, **2**.

recording loss **1.** Loss of data during a recording process. **2.** Loss resulting from recording efficiency of less than 100 percent; audio power loss.

recording tape Magnetic tape on which nothing has been recorded, or from which all data has been erased. Compare PRERECORDED TAPE.

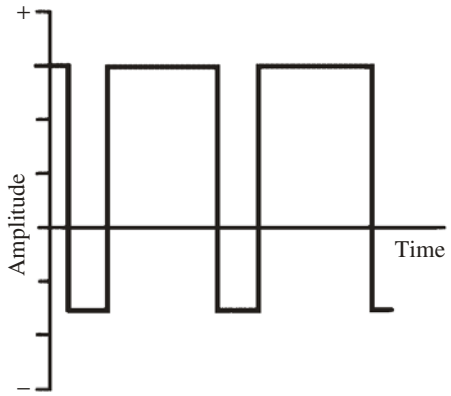
recovery time **1.** Symbol, t_r. The time required for a semiconductor pn junction to attain its high-resistance state when the bias voltage is suddenly switched from forward to reverse. **2.** The time required for a circuit to recover from momentary overdrive. **3.** The time required for a computer system to stabilize following a degenerative operation. **4.** The time required for switching a memory from the write to the read mode. It is measured as the length of time from switching out of the write mode until meaningful signals occur at the output. **5.** In a transceiver, the time required from the completion of a transmitted signal until the receiver is activated.

rect Abbreviation of RECTIFIER.

rectangular coordinates See CARTESIAN COORDINATES.

rectangular scan **1.** A method of beam scanning in a cathode-ray tube, in which the beam moves sequentially in parallel lines to cover a rectangular region. Used in television. **2.** In radar, a two-dimensional scan, covering a specific rectangular region.

rectangular wave An alternating or pulsating current or voltage whose rise and decay times are essentially zero, and whose maxima and minima are essentially flat, but not necessarily of equal duration. The SQUARE WAVE is a special type of rectangular wave.



rectangular wave

rectangular waveguide A waveguide having a rectangular cross section.

rectification The conversion of alternating current into pulsating direct current by any means other than the use of a motor-generator. Also see RECTIFIER.

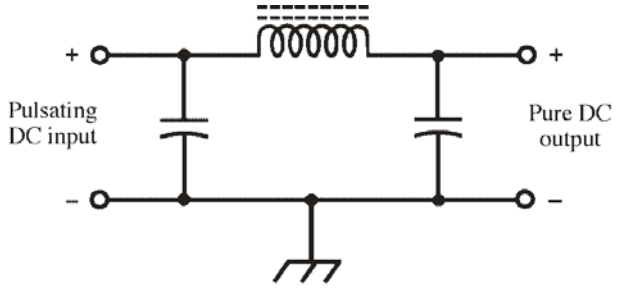
rectification efficiency The ratio (expressed as a percentage) of the direct-current output voltage to the peak alternating-current input voltage of a rectifier.

rectified alternating current The unfiltered, pulsating direct-current output of a rectifier. It consists of the unidirectional half-cycles passed by the rectifier (one per cycle for half-wave rectification, and two per cycle for full-wave rectification).

rectifier Abbreviation, rect. An electronic or electromechanical device that converts alternating current into pulsating direct current.

rectifier diode A heavy-duty tube or semiconductor diode designed primarily to change alternating current to pulsating direct current in power supplies.

rectifier filter A circuit containing parallel capacitance, sometimes in combination with series inductance, intended for smoothing out the ripple in the output of a power-supply rectifier.



rectifier filter

rectifier-filter system The rectifier plus power-supply-filter combination for converting alternating current into direct current.

rectifier photocell A photovoltaic cell consisting of two layers of material with a semiconductor junction between them. The device produces direct current when exposed to visible light, infrared, or ultraviolet radiation.

rectifier probe A diode-type probe used with a direct-current (dc) voltmeter to measure radio-frequency (RF) voltage. The diode rectifies the RF signal and presents to the meter a dc voltage proportional to the peak RF voltage.

rectifier stack An assembly of separate rectifier disks or plates in series on a central bolt, as in most selenium rectifiers.

rectifier tube A two-element electron tube, once commonly used for converting alternating current into pulsating direct current in high-voltage, high-current power supplies.

rectifier-type meter See DIODE-TYPE METER.

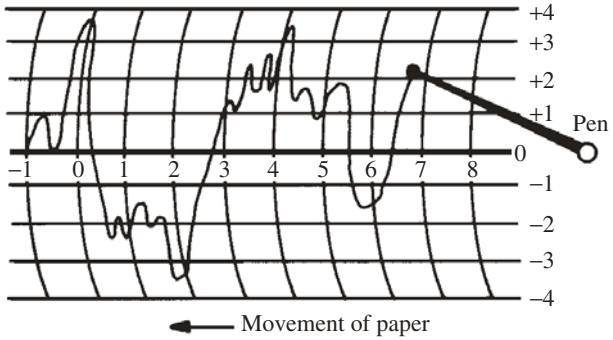
rectilinear chart A graphic-recorder chart in which the crossing coordinates are arcs, rather than straight lines, to correspond to the swing of the pen. Also see STRIP CHART.

rectilinear scan See RECTANGULAR SCAN, **1**.

recurrent network A circuit in which several sections of identical configuration (e.g., L sections) are cascaded.

recurrent phenomenon A phenomenon that repeats itself periodically.

recurrent sweep In an oscilloscope, a repetitive horizontal sweep of the beam occurring at a frequency determined by the settings of the sweep



rectilinear chart

controls. Also called REPETITIVE SWEEP. Compare NONREPETITIVE SWEEP.

recursion **1.** Generating a complete sequence of functions or numbers by applying an algorithm to initial values in the sequence. **2.** In computer programming and artificial intelligence, a logical process containing loops in calculation or reasoning.

recursive Relating to a procedure or set of steps that repeat endlessly.

Red Book The first format developed for compact-disc data storage media, developed by Sony and Philips. It is commonly used in digital audio systems. See also CD-ROM, GREEN BOOK, ORANGE BOOK, and YELLOW BOOK.

red-green-blue Abbreviation, RGB. In video applications, the three primary colors from which all other colors are derived. Also see COLOR TELEVISION.

red gun In a three-gun color-television picture tube, the electron gun whose (correctly adjusted) beam strikes only the red phosphor dots on the screen.

red oxide of iron An iron oxide of the general formula Fe_2O_3, used as the magnetic coating of recording tape. Also see IRON OXIDE.

red oxide of zinc See ZINCITE.

red-tape operation An operation or function needed for organizational purposes, but that does not directly contribute to the completion of the task at hand.

reduced instruction set computer Abbreviation, RISC. A computer architecture in which program instructions are simplified to obtain enhanced processing speed. It is useful especially in complex graphics, animation, multimedia, and scientific work requiring many calculations.

reductio ad absurdum A method of obtaining a conclusion by proving that its negation results in a contradiction. It is sometimes used in computer programming involving mathematical proofs.

reduction In an electrochemical cell or battery, a transfer of electrons to the active chemical.

reductionism The theory that all human thought processes, including emotion and intuition, can

be reduced to digital logic, and thus can be duplicated by a sufficiently powerful computer. It is of interest to researchers in artificial intelligence.

reductionist A person who subscribes to the theory of REDUCTIONISM.

redundancy **1.** The repetition of components in a circuit (e.g., series or parallel connection of them) so that one will be available for circuit operation if the other fails. **2.** Having available more than one method for performing a function. **3.** Having on hand several copies of data as a safeguard against data loss.

redundancy check A check for the integrity of digitized data to which extra bits have been added for the purpose (e.g., *parity check*).

redundant **1.** Pertaining to any two units of data that resemble each other in such a manner that if either unit is removed, no information is lost from the system. **2.** A unit of data that contains information already present in the system.

redundant array of independent disks Acronym, RAID. A set of data storage media used to store video programs.

red video voltage In a three-gun color-television circuit, the red-signal voltage that actuates the red gun.

reed A usually thin metal blade, leaf, or strip used in vibrators, reed-type relays, reed-type oscillators, and similar devices.

reed oscillator See REED-TYPE OSCILLATOR.

reed relay See DRY-REED SWITCH and MERCURY-WETTED REED RELAY.

reed-relay logic Logic circuits using reed relays. Also see RELAY LOGIC.

reed switch **1.** A frequency-sensitive switch in which the movable contact is mounted on the tip of a thin, metal strip (reed). The reed is actuated by an alternating-current (ac) coil. The reed closes the contacts when the ac excitation is at its natural frequency. **2.** See DRY-REED SWITCH.

reed-type oscillator An electromechanical audio-frequency oscillator whose frequency is controlled by a vibrating metal strip (reed) instead of a tuning fork. Also see HUMMER.

reed-type switch See REED SWITCH.

reel **1.** The spool around which a magnetic tape or video film is wound. **2.** A spool containing magnetic tape or video film.

reentrant cavity A resonant cavity in which one or more sections are directed inward to confine the electric field to a small volume.

reentrant winding A winding of wire that returns to its starting point—especially in a motor armature.

ref Abbreviation of REFERENCE.

reference address As a point of reference, an address for instructions having relative addresses.

reference amplifier A voltage-regulation device consisting of a transistor and Zener diode in the same envelope.

reference angle In radar, the angle of incidence of the beam against a target surface, measured with respect to the normal (perpendicular) line at the surface.

reference antenna A standard antenna, such as an isotropic radiator or a half-wave dipole, used to establish a reference for determining the relative gain of another antenna.

reference bias current In a reference amplifier, the input current that subtracts from the reference current. It is generally measured in microamperes.

reference current range In a digital-to-analog converter, the difference between the maximum and minimum reference current for which the device is within specifications for resolution.

reference diode A Zener diode whose constant voltage drop is used as a direct-current reference potential in calibrator circuits and voltage regulators.

reference dipole See REFERENCE ANTENNA.

reference electrode For use with a pH meter, an electrode that provides a reference potential.

reference input slew rate In a digital-to-analog converter, the average rate of change in output for a given change in the reference input. It is expressed in milliamperes or microamperes per microsecond.

reference level A specific value of a quantity (e.g., current, frequency, power, or voltage) to which other values of the same quantity are referred.

reference time The point at which a trigger pulse attains 10 percent of its maximum amplitude.

reference tone A standard audible tone of known frequency [e.g., 440 Hz (representing A below middle C)]. Sometimes the intensity as well, as the frequency, is specified.

reference white level The television picture signal value representing the uppermost limit for peak white signals.

R_{eff} Symbol for EFFECTIVE RESISTANCE.

reflectance **1.** See MISMATCH FACTOR. **2.** The reflected part of the radiant flux striking a surface. It is expressed as a fraction of the total incident radiation.

reflected binary code See CYCLIC CODE.

reflected electromagnetic field In a transmission line, the electromagnetic energy not absorbed by the load when an impedance mismatch exists between the load and the line. See INCIDENT POWER and REFLECTED POWER.

reflected impedance In a coupled circuit, the impedance in the secondary that appears in the primary circuit, or vice-versa, as if it were reflected through the coupling transformer.

reflected power In a transmission line not perfectly matched to a load at the feed point, an expression of the amount of electromagnetic field reflected from the feed point, rather than absorbed by the load. In general, this can be expressed in watts or as a percentage of the incident power. It is not a true indicator of the

loss caused by the mismatch because the reflected field is usually all returned again when it arrives back at the transmitter.

reflected-power meter A radio-frequency instrument, connected between a source and a load, that can measure INCIDENT POWER and REFLECTED POWER.

reflected ray The ray that is reflected by the surface of a body or region it strikes. Compare INCIDENT RAY and REFRACTED RAY.

reflected resistance **1.** In a transformer, the effective resistance across the primary winding when a resistive load is connected to the secondary. **2.** In a transmission line, the resistance at the input end when a load is connected to the output end.

reflected wave **1.** An electromagnetic wave reflected by the ionosphere or by the surface of the earth. Compare INCIDENT WAVE and REFRACTED WAVE. Also see IONOSPHERE and IONOSPHERIC PROPAGATION. **2.** A wave that is bounced off an obstruction, such as a building or mountain.

reflecting galvanometer A galvanometer having a light-beam pointer.

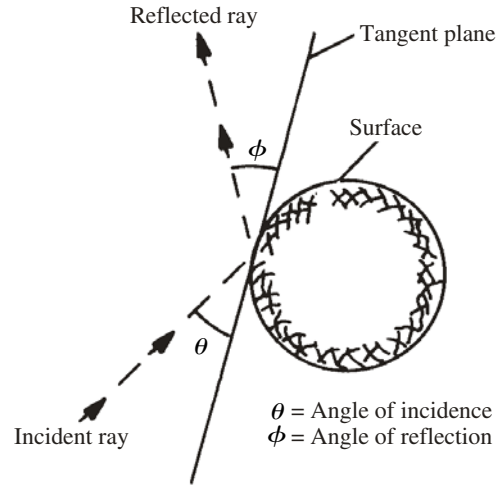
reflecting shell See IONOSPHERE.

reflection **1.** The turning back of a ray by a surface it strikes. Examples of reflecting media are the surface of the earth, the polished surface of a material, and a layer of the ionosphere. Compare REFRACTION. **2.** The return of energy to the source by the mismatched end of a transmission line or by the end of a radiator.

reflection error In a radar, radionavigation, or radiolocation system, an error in the reading caused by reflections of the signal from objects other than the intended signal source or object.

reflection factor See MISMATCH FACTOR.

reflection law When a ray strikes a smooth reflecting surface, the angle of incidence is equal to the angle of reflection.



reflection law

reflection loss **1.** Loss caused by the reflection of an electromagnetic field at a discontinuity in a transmission line. **2.** Loss that occurs when an electromagnetic wave is reflected from a surface or object.

reflection phase grating A device that diffuses sound waves by diffraction effects. The acoustic equivalent of an electromagnetic-wave DIFFRACTION GRATING.

reflective code See GRAY CODE.

reflectivity **1.** See MISMATCH FACTOR. **2.** The degree to which a point, plane, or surface reflects the radiation (light, for example) that strikes it.

reflectometer **1.** See REFLECTED-POWER METER. **2.** A type of photometer used to measure reflection.

reflector **1.** A smooth, metal surface or wire screen for reflecting radio waves. See, for example, PARABOLIC REFLECTOR. **2.** A length of wire, rod, or tubing used in a parasitic antenna to reflect radio waves. Compare DIRECTOR and RADIATOR. **3.** A polished surface for reflecting visible light or infrared rays (i.e., a mirror). **4.** See REPELLER.

reflector element See REFLECTOR, **2**.

reflector satellite A satellite whose skin reflects radio waves.

reflector voltage In a reflex Klystron, the reflector-to-cathode voltage.

reflex baffle A loudspeaker BAFFLE constructed so that some of the sound radiated to the rear of the diaphragm is transmitted forward (after phase shift) to boost acoustic radiation at some frequencies.

reflex bunching In a Klystron, electron bunching following direct-current-field-induced reversal of the velocity-modulated electrons. Also see REFLEX KLYSTRON.

reflex circuit A radio receiver circuit in which a single transistor is used successively for different functions. For example, one active device can act as a mixer and as a radio-frequency amplifier.

reflex Klystron A Klystron having only one cavity. This cavity serves first as the buncher and then, as the electrons are turned around and caused to pass through again, as the catcher.

refracted ray The ray that is refracted by a body or region through which it passes. Compare INCIDENT RAY and REFLECTED RAY.

refracted wave An electromagnetic wave that is refracted by the ionosphere. Compare INCIDENT WAVE and REFLECTED WAVE. Also see IONOSPHERE and IONOSPHERIC PROPAGATION.

refraction The bending of an energy ray as it passes through media that cause a change in the speed of propagation. It can occur with radio waves, infrared, visible light, ultraviolet, X rays, gamma rays, and sound waves.

refractive index See INDEX OF REFRACTION.

refractivity The extent of the ability to refract, given as the quantity $(v_1/v_2) - 1$, where v_1 is the phase

velocity in free space, and v_2 is the phase velocity in the medium through which a wave passes.

refractory A heat-resistant, nonmetallic ceramic material.

refrigerator A chamber used to maintain a circuit or component at a constant temperature that is lower than the ambient temperature. This device is analogous to the oven, which maintains a higher temperature than the surrounding medium. A refrigerator can be used to maintain precise frequency for a reference oscillator.

regeneration **1.** The processing of a distorted signal so that it has its original characteristics. **2.** Positive feedback generally used for the purpose of causing oscillation, or for detection in a regenerative receiver. See POSITIVE FEEDBACK.

regeneration period The period during which the electron beam scans a cathode-ray tube screen to restore changes to the screen surface.

regenerative amplifier An amplifier that uses regeneration to increase its gain and/or selectivity.

regenerative detector A detector provided with regenerative feedback. Although such a detector is sensitive, it can be unstable. Compare NONREGENERATIVE DETECTOR.

regenerative feedback Feedback producing regeneration (i.e., positive feedback). Compare DEGENERATIVE FEEDBACK.

regenerative IF amplifier An intermediate-frequency amplifier in which regeneration is introduced to boost sensitivity and, sometimes, selectivity.

regenerative reading A method of reading data (see READ) so that it is automatically restored, by writing, to locations from which it came.

register In computer systems, an arrangement of several storage devices, such as flip-flops, for storing a certain number of digits (a two-bit register, for example, requires two flip-flops).

register capacity The range of values for quantities that can be handled by a register.

registered professional engineer A title granted by a state board of examiners to a person licensed to work as an engineer.

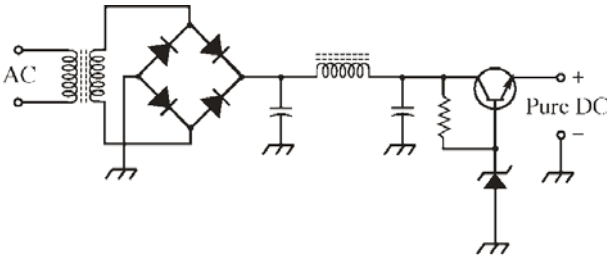
register length The number of characters or bits that can be held in a register, according to its capacity.

registration The accurate alignment of terminals or other points on different components or on opposite sides of a board so that when the surfaces containing those points are overlaid, all points mate precisely.

regulated power supply A power supply whose output is held automatically to a constant level or within a narrow range, regardless of loading variations.

regulating transformer See VOLTAGE-REGULATING TRANSFORMER.

regulation **1.** In general, the adjustment or control of a component, device, or system. **2.** Automatic control. See, for example, SELF-REGULATION.



regulated power supply

3. See CURRENT REGULATION. **4.** See VOLTAGE REGULATION.

regulator **1.** A device that automatically holds a quantity to a constant value (e.g., a voltage regulator). **2.** A device via which a quantity can be varied (e.g., *potentiometer*, *rheostat*, and *variable autotransformer*).

regulator diode A semiconductor diode—especially a Zener diode used as a two-terminal voltage regulator.

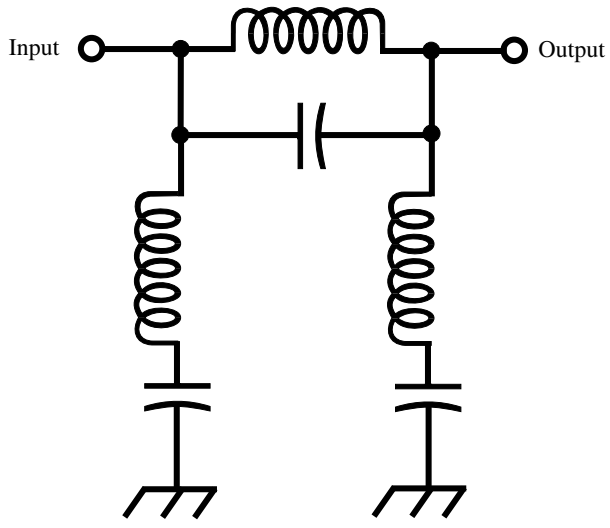
reinitialization The setting of all lines in a microcomputer or microprocessor to logic zero automatically when power is removed, then reapplied.

reject amplifier A tuned amplifier having the response of a band-suppression filter. Like the filter, the amplifier rejects or severely attenuates one frequency (or band of frequencies) while readily passing lower and higher frequencies. Compare PASS AMPLIFIER.

reject filter See REJECTION FILTER.

rejection circuit A circuit performing the function of a REJECTION FILTER.

rejection filter A filter that suppresses one frequency (or band of frequencies) while passing all other frequencies.



rejection filter

rejection notch A sharp dip in the transmission characteristic of a crystal filter. It provides rejection-filter action at the notch frequency. Also see CRYSTAL RESONATOR and REJECTION FILTER.

rejectivity The degree to which a selective circuit rejects an unwanted signal. Compare TRANSMITTIVITY.

rejuvenation See REACTIVATION.

rel Symbol, R. The cgs unit of reluctance, equivalent to gilberts per maxwell.

relative accuracy In a measuring instrument, the error determined as a percentage of the actual value; the difference between the actual and measured values, divided by the actual value, then multiplied by 100.

relative address In the address part of a computer program instruction, a number specifying a location relative to a BASE ADDRESS. When the base address is added to the relative address, it yields the ABSOLUTE ADDRESS.

relative error The ratio of the absolute error to the exact value of a quantity.

relative gain The current, voltage, or power gain, measured, with respect to a reference standard.

relative humidity Abbreviation, rh. The ratio, as a percentage, of the amount of moisture in the air to the amount the air could contain at a given temperature. Compare ABSOLUTE HUMIDITY.

relative luminosity Luminosity measured with respect to a reference level.

relative permeability The ratio of the permeability of a given material to the permeability of another material (or of the same material under different conditions).

relative power Power level specified with respect to another (often reference) power level.

relative uncertainty The uncertainty of a measurement divided by the measured value. The maximum value that this quotient can have is 1. Also see UNCERTAINTY IN MEASUREMENT.

relative visibility Response of the human eye to light. This is relative because the eye does not see equally well throughout the visible spectrum. The peak response of the human eye is around 5.4×10^{14} Hz; this represents yellow-green light. Photoelectric devices have peak responses that can differ considerably from this value.

relativity theory See EINSTEIN'S THEORY.

relaxation A delayed change in circuit conditions, as a result of change in the input.

relaxation inverter An inverter circuit in which the direct-to-alternating-current conversion device is a RELAXATION OSCILLATOR.

relaxation oscillator An oscillator whose operation results from the buildup of a charge in a capacitor, followed by sudden discharge of the capacitor, the sequence being repeated periodically. In one circuit, a capacitor is connected in series with a resistor and a direct-current power supply, and a neon bulb is connected in parallel with the capacitor. The output is a sawtooth wave.

relaxation time **1.** The time required for an exponentially decreasing variable to fall to $1/e$ (approximately 36.8 percent) of its initial value, where e is the natural-logarithm base (approximately 2.71828). **2.** For a gas, the time required for it to return to its original state after having been disturbed.

relay **1.** A signal-actuated switching device. In most instances, a relatively weak current or voltage is used to make the relay switch a higher current or voltage. A relay can be electromechanical or fully electronic (no moving parts). See, for example, ELECTROMECHANICAL RELAY and ELECTRONIC RELAY. **2.** A repeater station. **3.** In communications, to receive a message and retransmit it en route from a source to a destination.

relay amplifier See RELAY DRIVER.

relay booster See RELAY DRIVER.

relay driver A direct-current amplifier (usually one stage) used to actuate an electromechanical relay in response to a low-powered signal.

relay flip-flop See BISTABLE RELAY.

relay logic Abbreviation, RL. In computer and industrial-control operations, a logic system using electromechanical relays as flip-flops (see BISTABLE RELAY).

relay transmitter See AUTOMATIC REPEATER STATION.

release time **1.** The interval between the instant power is removed from a relay and the instant the armature is released sufficiently to operate the contacts. **2.** The time between one control input becoming inactive and another becoming active. **3.** The time required for reception to resume in a transceiver, once transmission has stopped. **4.** An expression for the rapidity with which an automatic gain control reverts to maximum sensitivity following the reception of a strong signal.

reliability **1.** The dependability of operation of a device or circuit under specified conditions. **2.** The proportion of units that still work after a set of units has been in use for a specified length of time.

reliability engineering The branch of engineering devoted to the theory and application of reliability; based on fundamental engineering and advanced statistical concepts.

reluctance Symbol, R. SI unit, A/Wb; cgs unit, rel. In a magnetic circuit, the opposition to the establishment of a magnetic field; it is analogous to resistance in electric circuits.

reluctance motor An electric motor having a squirrel-cage rotor with some of its teeth ground down, and a shaded-pole or split-phase type of stator that supplies a rotating magnetic field. When starting, this motor comes up to speed like an induction motor, but the protruding teeth of the rotor then follow the field in the manner of the poles of a hysteresis motor.

reluctivity Specific reluctance (i.e., the reluctance of a sample of magnetic material one centimeter long and one square centimeter in cross section). Reluctivity is the reciprocal of permeability.

rem Acronym for *roentgen equivalent man*, an amount of ionizing radiation having the same effect on the body as a one-roentgen dose of gamma or X radiation.

remagnetizer A magnetizer used principally to restore weakened permanent magnets.

remainder **1.** The result of subtracting one quantity (the subtrahend) from another (the minuend). Also called DIFFERENCE. **2.** In division, the numerical value left over after the integral part of the quotient has been determined; it becomes the fractional part when divided by the divisor. For example, in 25/3, the remainder is 1.

remanence See RESIDUAL MAGNETISM.

remanent flux density See REMANENCE.

remodulator Any device that changes the modulation of a signal from one form to another, such as from frequency modulation to amplitude modulation, without loss of intelligence.

remote alarm In security systems, an alarm that occurs at a location different from where an intrusion occurs (e.g., at the headquarters of a security company).

remote control Control of distant devices by mechanical means or by radio-frequency signals sent from a transmitter especially designed for the purpose; in the latter case, it is sometimes called *radio control.*

remote-control receiver The complete device that selects, amplifies, and demodulates or rectifies a radio signal for control of a circuit or mechanism at a distance from the transmitter of the control signal. Some receivers have self-contained antennas.

remote-control transmitter The complete device that generates radio-frequency power, adds to it the signals needed for remote control, and radiates the modified power.

remote-control system The complete set of hardware units and software programs facilitating the operation of a computer or robot from a distance.

remote data terminal In a computer system, a terminal connected to the central processor by a telephone line or radio link. It is used for the transfer of data without providing control of the system. Also called *remote data station.*

remote error sensing A method of regulation used in some power supplies. The voltage across the load, or the current through the load, is determined by remote control. The power-supply output is adjusted to compensate for losses in the system.

remote job entry In computer operations, the keying-in of input data at a site physically distant from the central processor.

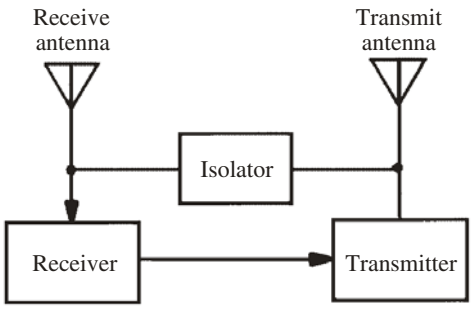
remote tuning The electrical or radio tuning of a circuit or device from a distance.

rendering In three-dimensional computer animation, the software process in which all the aspects of the model are combined to obtain the presentation.

rep **1.** Acronym for *roentgen equivalent physical*, an amount of ionizing radiation that, upon absorption by body tissue, will develop the energy of a one-roentgen dose of gamma or X radiation. **2.** Colloquial abbreviation for *repetition*, as in *rep rate.* **3.** Colloquial abbreviation for *representative*, as in *service representative.*

repeatability The ability of an instrument, system, or method to give identical performance or results in successive instances.

repeater A receiver/transmitter device that retransmits a signal it receives from another source, often simultaneously. In this way, a signal can be transmitted on several frequencies, or the service area of the original station can be extended. Also see ONE-WAY REPEATER and TWO-WAY REPEATER.



repeater

repeater station See AUTOMATIC REPEATER STATION and REPEATER.

repeating decimal A decimal fraction in which groups of digits recur endlessly (e.g., 25/99 = 0.252525. . .).

repeller An electrode, especially in a velocity-modulated tube, for reversing the direction of an electron beam.

repertoire The instruction set for a particular object or source computer programming language.

repetition instruction In a loop in a computer program, an instruction that causes the repetitive implementation of one or more instructions.

repetitive phenomenon See RECURRENT PHENOMENON.

repetitive sweep See RECURRENT SWEEP.

replication In an electronic system, especially in a computer, the redundancy of hardware units to provide standby facilities in case of failure.

replacement A component or circuit that can be substituted directly for another; it fits exactly into place and functions exactly like the component it replaces, without modification to the equipment.

report **1.** The results of testing and evaluation of a device, organized into a written document. **2.** The output of a computer, printed on paper for permanent reference.

report program generator Abbreviation, RPG. A computer programming language with which programs can be produced for the generation of business reports.

reproduce head See PLAYBACK HEAD.

reproducing stylus A stylus for the playback of material from a phonograph disc.

reproduction **1.** The recovery of data from storage, and its presentation in original form. **2.** Data obtained by the process defined in **1**. **3.** See PLAYBACK.

reproduction loss See PLAYBACK LOSS.

repulsion A force that pushes objects away from each other, as between similar electric charges or similar magnetic poles. Compare ATTRACTION. Also see LAW OF REPULSION.

repulsion-induction motor An alternating-current motor arranged to start as a REPULSION MOTOR and run as an INDUCTION MOTOR, but with better regulation than that of the latter.

repulsion motor An alternating-current motor having an armature and commutator similar to those of a direct-current motor, and a stator similar to that of a split-phase motor, without the auxiliary starting winding. Repulsion caused by the negative half-cycle of torque is utilized to drive the armature, by placing the brushes in such a way that they close the coils only when the latter are in position to receive this repulsive action.

repulsion-start motor An alternating-current motor that starts as a REPLUSION MOTOR but at approximately 75 percent of full speed. Its commutator is automatically short-circuited and the motor runs as an INDUCTION MOTOR. Also see REPULSION INDUCTION MOTOR.

request slip In computer operations, peripheral and memory needs for a program given in a written statement.

reradiation Radiation of energy by a body that has been exposed to radiation, as when a receiving antenna retransmits a signal.

rerecording A recording of played-back material.

reroute **1.** In computer operations, to establish new channels between peripherals and main memory. **2.** To establish new circuit paths, physically (as by changing conductor orientation) or electronically (as by selecting an alternate signal bus).

rerun See ROLLBACK.

res **1.** Abbreviation of RESISTANCE or RESISTOR. (Also, R and r.) **2.** Abbreviation of RESEARCH. **3.** Abbreviation of RESOLUTION.

reset **1.** The clearing of a flip-flop of data in storage (i.e., the setting of the flip-flop to its zero state). **2.** In a computer program, an instruction to initialize the value of a variable. **3.** In a security system, a function that terminates an alarm signal following an intrusion, and renders the system operational again so that it can detect subsequent intrusions should they occur.

reset action **1.** The return of a circuit or device to its normal operating condition. **2.** A method of adjusting a circuit to compensate for the severity of an abnormal condition. The extent of readjustment is determined by the extent of the departure from normal conditions.

reset generator A circuit or device that generates a pulse for resetting a flip-flop or counter. Also see RESET and RESET TERMINAL.

reset pulse A pulse that resets (see RESET, **1**) a storage cell in a computer memory.

reset terminal In a flip-flop, the zero-input terminal. Compare SET TERMINAL.

reset time The elapsed time between a malfunction and the completion of the reset action.

reset timer A device that returns a circuit or device to its initial state after a specified time delay.

reserve In multiple programming computer operations, to allocate memory areas and peripherals for a program.

reserve battery A battery in which the electrolyte is in a special standby chamber outside of the interelectrode section while the battery is on the shelf. When the battery is readied for service, the electrolyte is caused to flow into position between the electrodes, either by heating the battery, shocking it mechanically, or inverting it.

residual amplitude modulation See INCIDENTAL AM.

residual charge The electric charge remaining in a capacitor after it has been initially discharged. It results from dielectric absorption.

residual current A current that continues to flow in a circuit after removing power. The duration is measured in nanoseconds or microseconds.

residual frequency modulation **1.** See INCIDENTAL FM. **2.** Frequency modulation of the fundamental frequency of a Klystron by noise or alternating-current heater voltage.

residual gas Minute quantities of gas remaining in a vacuum tube after evacuation.

residual magnetism Magnetism remaining in a material, such as iron, after the magnetizing force has been removed.

residual modulation **1.** Modulation of a signal by hum or noise. **2.** See INCIDENTAL AM. **3.** See INCIDENTAL FM.

residual voltage In the output of a null device, such as a bridge, a usually small voltage still present at null and preventing zero balance.

residue check In computer operations, the verification of the result of an arithmetic operation using the remainders generated when each operand is divided by a special number; the remainder is transmitted along with the operand as a check digit.

resilience Also called *fault resilience.* The ability of an electronic device or system, especially a computer, to keep functioning after part of it has failed.

resin A natural or synthetic organic substance that is polymeric in structure and largely amorphous. Various plastics are made from synthetic resins.

resistance **1.** Symbol, *R* or *r*. Unit, ohm. In a device, component, or circuit, the simple opposition to current flow. Resistance by itself causes no phase shift. In a purely resistive circuit, $R = E/I$, where R is the resistance in ohms, E is the voltage in volts, and I is the current in amperes. **2.** A property of circuits, devices, or substances that causes impinging energy to be dissipated by conversion to heat. Compare REACTANCE.

resistance

Per kilometer of solid copper wire for American Wire Gauge (AWG) 1 through 40.

AWG	*ohms/km*	*AWG*	*ohms/km*
1	0.42	21	43
2	0.52	22	54
3	0.66	23	68
4	0.83	24	86
5	1.0	25	110
6	1.3	26	140
7	1.7	27	170
8	2.1	28	220
9	2.7	29	270
10	3.3	30	350
11	4.2	31	440
12	5.3	32	550
13	6.7	33	690
14	8.4	34	870
15	11	35	1100
16	13	36	1400
17	17	37	1700
18	21	38	2200
19	27	39	2800
20	34	40	3500

resistance alloys Metallic alloys used in the manufacture of resistance wire and resistance elements. Such alloys include CONSTANTAN, GERMAN SILVER, MANGANIN, MONEL METAL, and NICHROME.

resistance balance A device used to balance a circuit, by means of the insertion of resistances.

resistance brazing A method of brazing in which metal is heated by passing a current through it. The I^2R loss, or dissipated power, occurs in the form of heat.

resistance bridge A bridge (see BRIDGE, **2**) for measuring resistance only.

resistance-capacitance Abbreviation, *RC.* Pertaining to a combination of resistance and capacitance (e.g., RESISTANCE-CAPACITANCE CIRCUIT).

resistance-capacitance bridge **1.** A four-arm null circuit containing only resistors and capacitors. Also see BRIDGE, **1**. **2.** An alternating-current bridge (see BRIDGE, **2**) for measuring resistance and capacitance.

resistance-capacitance circuit A circuit containing only resistors and capacitors. There are no inductors.

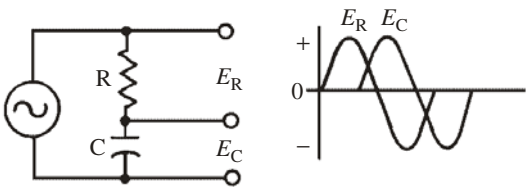
resistance-capacitance-coupled amplifier A multistage amplifier circuit in which RESISTANCE-CAPACITANCE COUPLING is used between stages and at the input and output points of the circuit.

resistance-capacitance coupling Coupling, especially between stages in a circuit, using blocking capacitors and supply-path resistors.

resistance-capacitance filter A power-supply filter or wave filter containing only resistors and capacitors. The resistors are in the positions occupied by inductors in inductance-capacitance filters.

resistance-capacitance-inductance Abbreviation, *RCL.* Pertaining to a combination of resistance, capacitance, and inductance.

resistance-capacitance phase shifter A phase shifter containing only resistors and capacitors to obtain the desired shift.



resistance-capacitance phase shifter

resistance-capacitance time constant Symbol, *t.* The time constant (see ELECTRICAL TIME CONSTANT) of a circuit containing (ideally) only resistance and capacitance; $t = RC$, where t is in seconds, R is in ohms, and C is in farads. Compare RESISTANCE-INDUCTANCE TIME CONSTANT.

resistance-capacitance tuning Tuning of a circuit, such as that of an amplifier or oscillator, by means of a variable resistor or ganged units of this type. See, for example, PARALLEL-TEE AMPLIFIER, PARALLEL-TEE OSCILLATOR, and WIEN-BRIDGE OSCILLATOR.

resistance-coupled amplifier See RESISTANCE-CAPACITANCE-COUPLED AMPLIFIER.

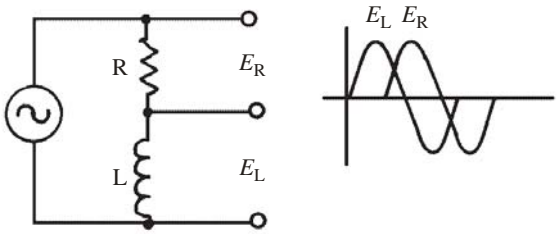
resistance drop The voltage drop across a resistor, or across the inherent resistance of a device.

resistance-inductance Abbreviation, *RL.* Pertaining to a combination of resistance and inductance (e.g., RESISTANCE-INDUCTANCE CIRCUIT).

resistance-inductance bridge **1.** A four-arm null circuit containing only resistors and inductors. Also see BRIDGE, **1**. **2.** An alternating-current bridge (see BRIDGE, **2**) for measuring resistance and inductance only.

resistance-inductance circuit A circuit containing only resistors and inductors. There are no capacitors.

resistance-inductance phase shifter A phase shifter containing only resistors and inductors to obtain the desired phase shift.



resistance-inductance phase shifter

resistance lamp An incandescent bulb inserted in series with a circuit to provide a dropping resistance. Such a lamp is capable of dissipating a large amount of power, shows very little reactance at low frequencies, and is inexpensive.

resistance magnetometer A magnetometer whose operation is based upon the change of electrical resistance of a material (such as bismuth wire) placed in the magnetic field under test.

resistance material A substance, such as carbon or German silver, whose resistivity is high enough to enable its use as a lumped resistor. See, for example, RESISTANCE ALLOYS and RESISTANCE METAL.

resistance metal A metal, such as iron, whose resistivity is high enough to enable its use as a lumped resistor. Also see RESISTANCE ALLOYS.

resistance pad An attenuator composed of noninductive resistors.

resistance standard A highly accurate and stable resistor used in precision measurements of resistance. Also see PRIMARY STANDARD and SECONDARY STANDARD.

resistance strain gauge An electrical strain gauge in which the stressed element is a thin resistance wire.

resistance strip A strip of metallic or nonmetallic resistance material. Also see RESISTANCE ALLOYS and RESISTANCE METAL.

resistance temperature detector A transducer consisting of a specially made resistor whose resistance varies linearly with temperature.

resistance thermometer An electronic thermometer whose operation is based on the change of resistance of a wire as it is heated or cooled.

resistance transducer See RESISTIVE TRANSDUCER.

resistance tuning See VARIABLE-RESISTANCE TUNING.

resistance welding An electrical or electronic welding process in which the workpieces are heated by current flowing through the inherent resistance of their junction.

resistance wire Wire made of a metal or alloy that exhibits significant resistivity. See, for example, RESISTANCE ALLOYS and RESISTANCE METAL.

resistance-wire sensor A specific length of resistance wire, properly mounted, whose resistance is proportional to a sensed phenomenon (such as strain, temperature, presence of gas, pressure, etc.). See, for example, ELECTRICAL STRAIN GAUGE, GAS DETECTOR, and PRESSURE TRANSDUCER.

resistive current The component of alternating current that is in phase with voltage. Also called WATT CURRENT. Compare REACTIVE CURRENT.

resistive cutoff frequency Symbol, f_{rco}. The frequency beyond which a tunnel diode ceases to exhibit negative resistance.

resistive load A load device that is essentially a pure resistance.

resistive losses Losses resulting from the resistance of a circuit or device, and usually appearing as heat.

resistive transducer A transducer in which the sensed phenomenon causes a change in resistance, which in turn produces a corresponding change in output current or voltage. Compare CAPACITIVE TRANSDUCER, CRYSTAL TRANSDUCER, INDUCTIVE TRANSDUCER, MAGNETIC TRANSDUCER, and PHOTOELECTRIC TRANSDUCER.

resistive trimmer See TRIMMER RESISTOR.

resistive voltage The voltage across the resistance component in a circuit. In an alternating-current circuit, the resistive voltage is in phase with the current.

resistivity Symbol, *r*. Resistance per unit volume or per unit area. It can be expressed in terms of ohms per cubic meter or ohms per square meter. Also see MICROHM-CENTIMETER and OHM-CENTIMETER.

resistor A device having resistance concentrated in lumped form. Also see RESISTANCE and RESISTIVITY.

resistor-capacitor-transistor logic Abbreviation, RCTL. A form of RESISTOR-TRANSISTOR LOGIC in which capacitors are used to enhance switching speed.

resistor color code See COLOR CODE.

resistor core A form around which a resistance wire can be wound for the purpose of constructing a high-power resistor.

resistor decade See DECADE RESISTOR.

resistor diode A usually forward-biased semiconductor diode that acts as a VOLTAGE-DEPENDENT RESISTOR.

resistor FET See ELECTRONIC RESISTOR.

resistor fuse See FUSIBLE RESISTOR.

resistors in parallel See PARALLEL RESISTORS.

resistors in parallel-series See PARALLEL-SERIES RESISTORS.

resistors in series See SERIES RESISTORS.

resistors in series-parallel See SERIES-PARALLEL RESISTORS.

resistor substitution box A self-contained assortment of common-value resistors arranged to be switched one at a time to a pair of terminals. In troubleshooting and circuit development, any of several useful fixed resistance values can thus be obtained.

resistor transistor See ELECTRONIC RESISTOR.

resistor-transistor logic Abbreviation, RTL. A circuit in which the logic function is performed by resistors, and an inverted output is provided by transistors.

resnatron A form of vacuum tube that is used as an oscillator and amplifier at ultra-high and microwave frequencies. It is essentially a cavity resonator.

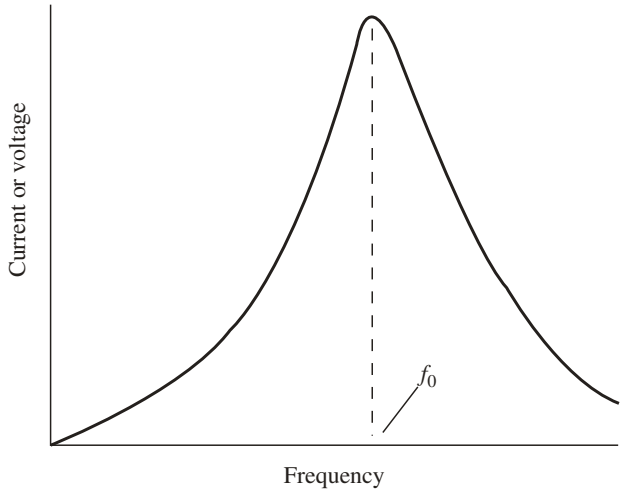
resolution **1.** The degree to which closely adjacent parts of an image can be differentiated. **2.** The reduction of a problem by means of logical analysis. **3.** The ability of a vision or ranging system to distinguish between objects that are close together in terms of radial distance, direction, or absolute separation.

resolution ratio In a television image, the ratio of horizontal resolution to vertical resolution.

resonance **1.** The state in which the natural response frequency of a circuit coincides with the frequency of an applied signal, or vice versa, yielding intensified response. **2.** The state in which the natural vibration frequency of a body coincides with an applied vibration force, or vice versa, yielding reinforced vibration of the body.

resonance bridge An alternating-current bridge (see BRIDGE, **2**) in which one or two arms are series-resonant or parallel-resonant, the other arms being resistances. Also see SERIES-TYPE RESONANCE BRIDGE and SHUNT-TYPE RESONANCE BRIDGE.

resonance curve A graph of the insertion gain or loss of a component, device, circuit, or system to variations in the frequency of an applied sound or signal. Such curves are almost always plotted in rectangular coordinates with frequency as the independent variable on the horizontal axis. The dependent variable, plotted on the vertical axis, can be any characteristic that displays a peak or dip at the resonant frequency or frequencies. In radio-frequency circuits, such parameters include current, voltage, attenuation, gain, and impedance.



resonance curve

resonance theory of hearing The theory that sound waves pass down the *auditory canal* and cause the *eardrum* to vibrate. Behind the eardrum is a system of three bones leading to the *cochlea.* The cochlea consists of fibers that resonate. Therefore, they vary in length and tension. Various groups of fibers are activated by different sounds, and the vibrations are transmitted to nerves leading to the brain.

resonance radiation Electromagnetic radiation from an energized substance, resulting from movement of electrons from a higher to lower energy level. When an electron moves from a higher to a lower orbit, a photon, having a definite wavelength, is emitted.

resonant cavity A chamber whose size reinforces energy injected into it at a natural frequency, which is determined by the chamber's dimensions. Such cavities can be used with acoustic or electromagnetic waves.

resonant circuit A circuit whose constants are chosen for maximum circuit response at a given frequency. Examples: *parallel-resonant circuit* and *series-resonant circuit.* Also see RESONANCE and RESONANT FREQUENCY.

resonant current Current flowing in a tuned circuit at resonance.

resonant feeder An antenna feeder that is resonant at the operating frequency.

resonant filter A filter containing at least one series- or parallel-resonant arm for sharp response. Thus, a power-supply filter of this kind might have a parallel-resonant arm acting as a wave-trap at the ripple frequency.

resonant frequency Symbol, f_r or f_o. The natural frequency at which a circuit oscillates or a device vibrates. In an inductance-capacitance circuit (series-resonant or parallel-resonant), the reactances cancel at the resonant frequency, leaving only resistance.

resonant-gate transistor A transistor embodying a tiny tuning fork for resonance at low frequencies, thus eliminating bulky coils and capacitors.

resonant line A transmission line that is resonant at the operating frequency.

resonant-line amplifier See LINE-TYPE AMPLIFIER.

resonant-line circuit A circuit using resonant lines as a tank. See, for example, LINE-TYPE AMPLIFIER and LINE-TYPE OSCILLATOR.

resonant-line oscillator See LINE-TYPE OSCILLATOR.

resonant-line wavemeter See LECHER WIRES.
resonant rise See VOLTAGE RISE.
resonant-slope amplifier See DIELECTRIC AMPLIFIER.
resonant-slope detector See SLOPE DETECTOR.
resonant suckout The drawing of radio-frequency energy out of the energized part of a coil or transmission line by the part not intended to be energized, when the latter resonates at the same frequency.
resonant-voltage rise See VOLTAGE RISE.
resonant-voltage stepup See VOLTAGE RISE.
resonate **1.** To exhibit RESONANCE—either electrically or acoustically. **2.** To adjust a variable-frequency electrical or acoustical device so that it exhibits RESONANCE at a specific frequency.
resonator A device that produces or undergoes resonance. See, for example, HELMHOLTZ RESONATOR and RESONANT CAVITY.
resource A part of a computer system that can be used for a specific application as a unit (e.g., printer, PCMCIA standard adapter card, tape drive, etc.).
responder The transmitting section of a transponder.
response The behavior of a circuit or device (especially in terms of its dependent variables), in accordance with an applied signal (e.g., *frequency response* and *current-vs.-voltage response*).
response curve A graph depicting the performance of a circuit or device. Examples: *attenuation-vs.-frequency curve* and *current-vs.-voltage curve.*
response time The interval between the instant a signal is applied to or removed from a circuit or device and the instant that the circuit acts accordingly.
restart Following a malfunction or error occurring during a computer program run, to go back to an earlier point in the program.
resting state See QUIESCENT STATE.
restore See RESET.
resultant **1.** The vector that results from the addition of two or more vectors. **2.** A quantity that results from mathematical operations performed on other quantities.
retarding magnet See DRAG MAGNET.
retentivity **1.** The property whereby a material retains magnetism imparted to it. **2.** A quantitative measure of the extent to which a material retains magnetism imparted to it.
retention period In computer operations, the time during which the data on a magnetic medium (disk or tape) must be kept intact.
retrace **1.** In a cathode-ray tube, the return of the scanning beam to its starting point. **2.** In a cathode-ray tube, a line traced on the screen by the scanning beam as it returns to its starting point, if RETRACE BLANKING is not used.
retrace blanking Obliteration of the RETRACE of the electron beam in a cathode-ray tube. It renders the retrace line invisible on the screen so that it will not interfere with the display.
retrace line See RETRACE, **2**.
retrace ratio For the swept beam in a cathode-ray tube, the ratio of the scanning velocity in the trace direction to the scanning velocity in the RETRACE direction.
retrace time In a cathode-ray tube, the amount of time required for the scanning beam to move from the end of one trace or line to the beginning of the next.
retrofit To supply something with specially designed or adapted parts that were not available when it was made.
retrograde orbit For an artificial earth satellite, an orbit whose direction is east-to-west, relative to the earth's surface.
return **1.** See RETRACE. **2.** See RETURN CIRCUIT. **3.** See RETURN POINT. **4.** In an electronic circuit, the electrical ground and ground current path.
return circuit The circuit through which current returns to a generator.
return instruction In a computer program, an instruction in a subroutine directing operation back to a specific point in the main program.
return interval See RETRACE TIME.
return line See RETRACE, **2**.
return point **1.** The point to which circuits are returned (e.g., a common ground point). **2.** The terminal point of a return circuit.
return ratio See FEEDBACK FACTOR.
return time See RETRACE TIME.
return to zero **1.** Abbreviation RZ or RTZ. In the magnetic recording of data, a method in which the write current returns to zero following the write pulse. Compare NONRETURN-TO-ZERO. **2.** A logic system in which the zero and one states are represented by zero voltage and a discrete voltage.
return trace See RETRACE, **1**, **2**.
REV **1.** Abbreviation of REENTRY VEHICLE. **2.** Abbreviation of REVERSE.
rev **1.** Abbreviation of REVOLUTION. **2.** To quickly and substantially increase the angular velocity of a motor.
reverberation **1.** Multiple reflections of sound waves from the inside surfaces of an enclosed chamber. **2.** The dying-out of sound waves in an enclosed chamber as the waves reflect repeatedly from the inside surfaces. **3.** In sound recording and/or reproduction, an electronically produced echo. It is used for special effects—especially in electronic music systems. **4.** See RESONANCE, **2**.
reverberation chamber A room in which the walls, floor, and ceiling absorb very little sound, resulting in echoes. To avoid standing waves, the room is designed so that no two surfaces are exactly parallel.
reverberation system A system of devices operated with an electronic organ to simulate the effect of reverberation in a large room, such as a church auditorium.

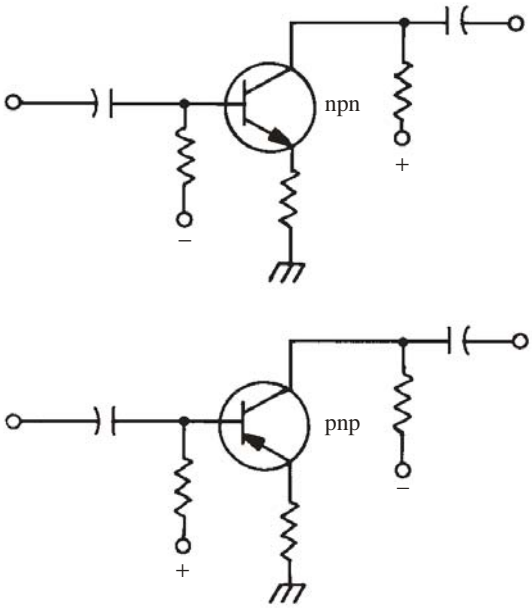
reverberation time In an enclosed chamber, the time required for a sound to die down to a specified level (usually -60 dB) after the disturbance has stopped.

reverberation unit A device for producing artificial echoes—especially in the operation of electronic music systems.

reverse **1.** To alter the direction of a current or process or motion of an object so that the new direction is exactly opposite the previous direction. **2.** In a directional wattmeter, the reflected-power indication or switch position.

reverse AGC Automatic gain control in which a signal-dependent voltage is fed back to an earlier stage to adjust its gain automatically. Compare FORWARD AGC.

reverse bias Reverse voltage or current in a transistor or a semiconductor diode. Compare FORWARD BIAS.



reverse bias

reverse breakdown See AVALANCHE.

reverse breakdown voltage See AVALANCHE VOLTAGE.

reverse characteristic The current-vs.-voltage response of a semiconductor junction that is biased in the reverse (low-conduction) direction. Compare FORWARD CHARACTERISTIC.

reverse conduction The very small current conduction through a pn junction when it is reverse-biased. Compare FORWARD CONDUCTION.

reverse current Symbol, I_r. The current that flows through a pn junction when it is reverse-biased. Also called *back current*. Compare FORWARD CURRENT.

reverse engineering A design process in which a specific device or system is copied functionally, but not literally.

reverse Polish notation Abbreviation, RPN. A system of notation for expressing mathematical operations in which the operators follow the operands being manipulated. It is a mode of entry for some calculators (e.g., the operation 7×2 might be entered by pressing keys in this order: 7, ENTER, 2, ×).

reverse recovery time See RECOVERY TIME, **1**.

reverse resistance Symbol, R_r. The resistance of a reverse-biased pn junction. Also called BACK RESISTANCE. Compare FORWARD RESISTANCE.

reverse voltage Symbol, E_r or V_r. Direct-current voltage applied to a pn junction so that the p-type material is electrically more negative than the n-type material. Also called BACK VOLTAGE. Compare VOLTAGE.

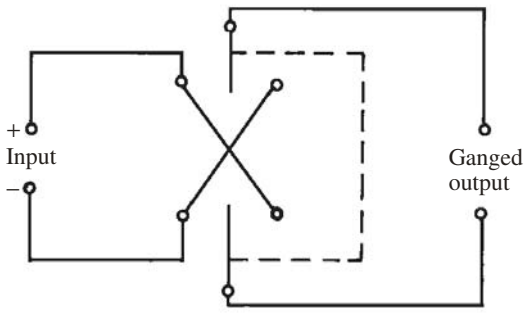
reverse-voltage capacitance The internal capacitance of a reverse-biased semiconductor pn junction.

reverse voltage drop The voltage drop across a semiconductor pn junction that is biased in the reverse (low-conduction) direction.

reversible counter A counter that, by a control signal, can have the value it is holding either increased or decreased.

reversible permeability The permeability of a ferromagnetic substance when the magnitude of the alternating-current field is arbitrarily small.

reversing switch **1.** A switch that reverses the polarity of a direct-current voltage. **2.** A switch that reverses the direction of motor rotation.



reversing switch

revolute geometry A method by which a robot arm can move freely in three dimensions. The entire assembly rotates from the base in a horizontal plane through a complete circle (360 degrees). An elevation joint at the base moves the arm from horizontal to vertical (90 degrees). A joint in the middle of the arm can bend through about 180 degrees.

revolution Abbreviation, r or rev. One complete rotation (i.e., 360 degrees of circular travel).

revolving field See ROTATING FIELD.

rewind To run a magnetic tape on a transport at a high speed, in the direction opposite to that associated with the play mode.

rewrite In computer operations, to return information read from a storage location to that location by recording.

R_F Symbol for FILAMENT RESISTANCE.

RF Abbreviation of RADIO FREQUENCY.

RF amplifier See RADIO-FREQUENCY AMPLIFIER.

RFC Abbreviation of RADIO-FREQUENCY CHOKE.

RF heating See RADIO-FREQUENCY HEATING.

RFI Abbreviation of RADIO-FREQUENCY INTERFERENCE.

RF inverse feedback A negative-feedback system for radiophone transmitters, in which a portion of the modulated radio-frequency (RF) signal is rectified, and the resulting direct-current voltage is filtered and applied as bias to one of the audio stages in the proper polarity for degeneration.

RF lamp A lighting lamp, used with radio-frequency (RF) alternating current, rather than the conventional 60-Hz utility current. This results in better efficiency, and allows much more light to be generated with a given filament lamp, as compared with 60-Hz current.

RF motion detector In security systems, an intrusion detection and alarm system that senses Doppler-effect-induced changes in the frequency or phase of a radio-frequency (RF) electromagnetic field. The Doppler effect results from motion of objects in the secured area.

RFO Abbreviation of *radio-frequency oscillator.*

RF power supply See OSCILLATOR-TYPE POWER SUPPLY.

RF preamplifier A sensitive, radio-frequency amplifier circuit intended for improving the signal-to-noise (S/N) ratio in a wireless receiver. Generally placed between the receiver and the antenna or feed line. Some such devices are tunable; others are broadbanded. See also PREAMPLIFIER.

RF probe See RECTIFIER PROBE.

RF resistance See RADIO-FREQUENCY RESISTANCE.

RF selectivity See RADIO-FREQUENCY SELECTIVITY.

RF transformer See RADIO-FREQUENCY TRANSFORMER.

RF transistor See RADIO-FREQUENCY TRANSISTOR.

R_g Symbol for GRID RESISTANCE.

R_G Symbol for GATE RESISTANCE.

RGB Abbreviation of RED-GREEN-BLUE.

RGT Abbreviation of RESONANT-GATE TRANSISTOR.

Rh Symbol for RHODIUM.

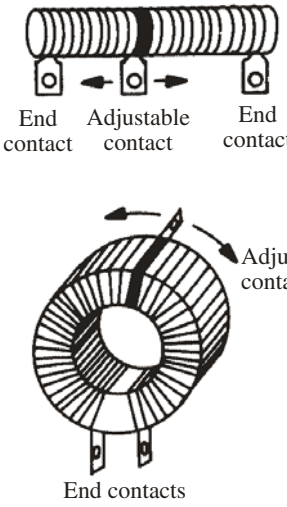
R/h Abbreviation of ROENTGENS PER HOUR.

R_H **1.** Symbol for HEATER RESISTANCE. **2.** Symbol for HOT RESISTANCE.

rh Abbreviation of RELATIVE HUMIDITY.

rhenium Symbol, Re. A metallic element. Atomic number, 75. Atomic weight, 186.207. It is used in some thermocouples.

rheostat A wirewound variable dropping resistor of the rotary type or slider type.



rheostat

R_{HF} Symbol for *high-frequency resistance* (see RADIO-FREQUENCY RESISTANCE).

RHI Abbreviation of RANGE-HEIGHT INDICATOR.

rhodium Symbol, Rh. A metallic element. Atomic number, 45. Atomic weight, 102.906.

rhombus A four-sided geometric plane figure, in which all four sides have equal length, and opposite angles have equal measure.

rhombic antenna See DIAMOND ANTENNA.

rho-theta A radio-navigation system in which a single transmitting station is used, and the position is determined, according to polar coordinates (distance and direction).

rhumbatron A RESONANT CAVITY—especially one in a KLYSTRON.

RI Abbreviation of RADIO INTERFERENCE.

R_i Symbol for INPUT RESISTANCE. (Also, R_{in}.)

RIAA Abbreviation of RECORDING INDUSTRY ASSOCIATION OF AMERICA.

RIAA curve The amplitude-versus-frequency function used in recording and reproduction of long-playing (33.3 rpm) phonograph discs, and specified by the Recording Industry Association of America (RIAA). The RIAA curve takes advantage of the sensitivity of the human ear at various frequencies to reduce the level of audible noise.

ribbon microphone See VELOCITY MICROPHONE.

ride gain In broadcasting, the operations of constantly adjusting the audio modulation of the transmitter for optimum operation.

Rieke chart A visual aid, similar to the SMITH CHART, used with traveling-wave tubes in the