STAN GIBILISCO

THE ILLUSTRATED DICTIONARY OF Electronics

EIGHTH EDITION

Audio/Video
Consumer Electronics
Wireless Technology

The Illustrated Dictionary of Electronics

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The Illustrated Dictionary of Electronics

Eighth Edition

Stan Gibilisco
Editor-in-Chief

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To Tony, Tim, and Samuel
from Uncle Stan

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Contents

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Preface

The Illustrated Dictionary of Electronics—8th Edition has been revised, clarified, and updated, reflecting technological advances of recent years. New definitions have been added in the fields of wireless technology, robotics, and artificial intelligence. Every effort has been made to be concise and accurate, without "talking down" to the reader.

Many definitions contain cross references (indicated in ALL CAPITALS); these provide recommended additional information or allow comparison with related terms. Expressions of special significance are printed in italics. Electronics abbreviations are included in the text; the full terms are stated as definitions.

While an effort has been made to avoid superfluous mathematics, equations are sometimes necessary to completely and effectively define a term. Mathematics beyond the high-school level has not been used.

Appendix A contains the standard symbols used in electrical and electronic diagrams. These symbols are used in illustrations throughout this dictionary. Appendix B contains the following data tables:

1. Conversion between electrical systems
2. Greek alphabet
3. Mathematical functions and operations
4. Prefix multipliers
5. Resistor color code

Suggestions for future editions are welcome.

Stan Gibilisco
Editor-in-Chief

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The Illustrated Dictionary of Electronics

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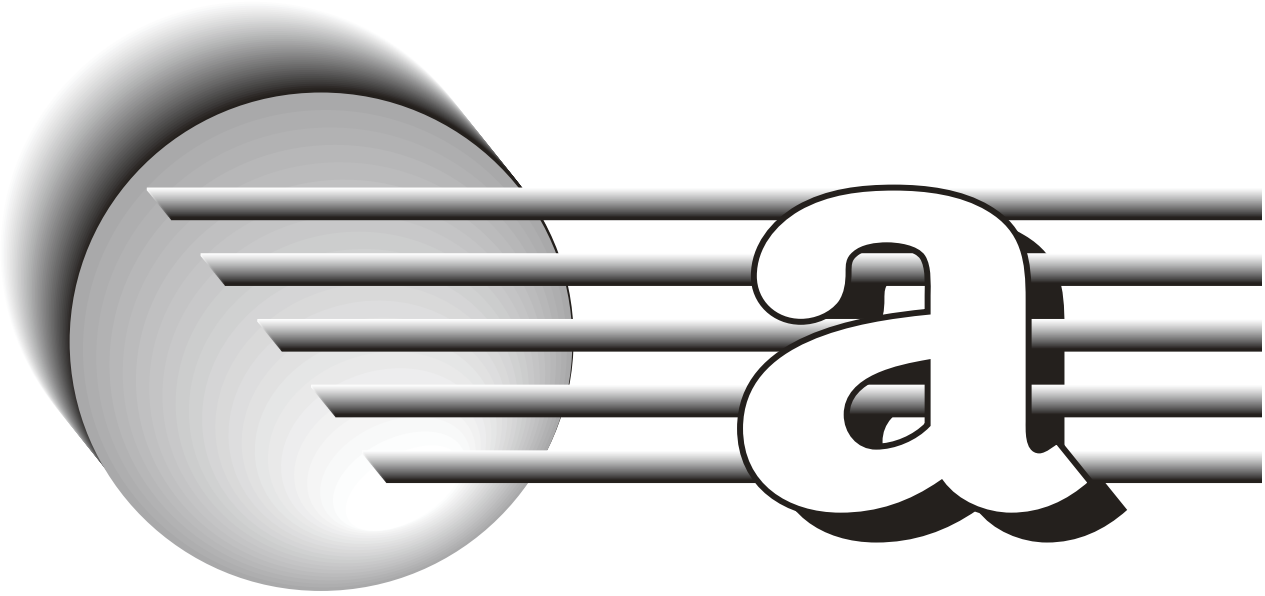


A **1.** Symbol for GAIN. **2.** Symbol for AREA. **3.** Symbol for AMPERE (SI unit for current).

A− Symbol for negative terminal of filament-voltage source in a vacuum-tube circuit.

A+ Symbol for positive terminal of filament-voltage source in a vacuum-tube circuit.

a **1.** Abbreviation of ATTO- (prefix). **2.** Abbreviation of AREA. **3.** Abbreviation of ACCELERATION. **4.** Abbreviation of ANODE. **5.** Obsolete abbreviation of cgs prefix AB-.

aA **1.** Abbreviation of *attoampere.* **2.** Obsolete for ABAMPERE.

AAAS Abbreviation for *American Association for the Advancement of Science.*

AAC Abbreviation of *automatic aperture control* (NASA).

AAS Abbreviation of *advanced antenna system* (NASA).

AASR Abbreviation of *airport and airways surveillance radar.*

AB Abbreviation of *acquisition beacon* (NASA).

A-B In sound and acoustics, the direct comparison of two sources of sound by alternately turning on one and the other.

ab- **1.** Prefix that transforms the name of a practical electrical unit to that of the equivalent electromagnetic cgs unit (e.g., ABAMPERE, ABOHM, ABVOLT). See individual entries of such cgs units. **2.** Abbreviation for ABSOLUTE.

abac A graphic device for the solution of electronics problems. Also see ALIGNMENT CHART.

abampere The unit of current in the cgs electromagnetic system. One abampere equals 10 amperes and corresponds to 1 abcoulomb per second.

Abbe condenser **1.** In microscopy, a special two-piece lens that has enhanced light-gathering power. **2.** A similar focusing device in an electromagnetic antenna.

abbreviated dialing In telephone systems, special circuits requiring fewer-than-normal dialing operations to connect subscribers.

abc **1.** Abbreviation of AUTOMATIC BASS COMPENSATION, a system for boosting the volume of bass sounds at low amplifier gain. **2.** Abbreviation of AUTOMATIC BIAS CONTROL. **3.** Abbreviation of AUTOMATIC BRIGHTNESS CONTROL. **4.** Abbreviation of AUTOMATIC BRIGHTNESS COMPENSATION.

abcoulomb The unit of electrical quantity in the cgs electromagnetic system. One abcoulomb equals 10 coulombs and is the quantity of electricity that flows past any point in a circuit in one second when the current is one abampere.

aberration **1.** Distortion from perfect shape in a lens or reflecting mirror or antenna dish. **2.** A small error in the determination of the direction of a source of electromagnetic energy, on account of the motion of the source and/or the detecting apparatus. **3.** A small displacement in the apparent positions of the stars from month to month on account of the earth's orbital motion.

ABETS Acronym for *airborne beacon electronic test set* (NASA).

abfarad The unit of capacitance in the cgs electromagnetic system. One abfarad equals 10^9 farads and is the capacitance across which a charge of 1 abcoulomb produces a potential of 1 abvolt.

abhenry The unit of inductance in the cgs electromagnetic system. One abhenry equals 10^{-9} henry

and is the inductance across which a current that changes at the rate of 1 abampere per second induces a potential of 1 abvolt.

ABL Abbreviation of *Automated Biology Laboratory* (NASA).

abmho The obsolete unit of conductance and of conductivity in the cgs electromagnetic system. Replaced with ABSIEMENS.

abnormal dissipation Power dissipation higher or lower than the customary level, usually an overload.

abnormal oscillation **1.** Oscillation where none is desired or expected, as in an amplifier. **2.** Oscillation at two or more frequencies simultaneously when single-frequency operation is expected. **3.** Oscillation at an incorrect frequency. **4.** Parasitic oscillation.

abnormal propagation **1.** The chance shifting of the normal path of a radio wave, as by displacements in the ionosphere, so that reception is degraded. **2.** Unintentional radiation of energy from some point other than the transmitting antenna. **3.** Propagation over a path or in a direction not expected.

abnormal reflections Sharp, intense reflections at frequencies higher than the critical frequency of the ionosphere's ionized layer.

abnormal termination The shutdown of a running computer program or other process. Caused by the detection of an error by the associated hardware that indicates that some ongoing series of actions cannot be executed correctly.

abnormal triggering The false triggering or switching of a circuit or device, such as a flip-flop, by some undesirable source instead of the true trigger signal. Electrical noise pulses often cause abnormal triggering.

abohm The unit of resistance and of resistivity in the cgs electromagnetic system. One abohm equals 10^{-9} ohms and is the resistance across which a steady current of 1 abampere produces a potential difference of 1 abvolt.

abort To deliberately terminate an operation, experiment, process, or project before it has run its normal course.

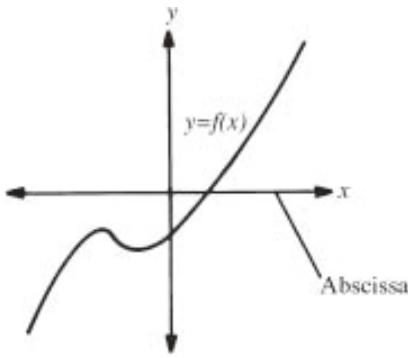
AB power pack **1.** A portable dry-cell or wet-cell array containing both A and B batteries in one package. **2.** An ac-operated unit in one package for supplying A and B voltages to equipment normally operated from batteries.

abrasion machine An instrument for determining the abrasive resistance of a wire or cable.

abrasion resistance A measure of the ability of a wire or wire covering to resist mechanical damage.

ABS A basic programming abbreviation for the absolute value (of a number, variable, or expression).

abscissa **1.** The independent variable in a function. **2.** The axis (usually horizontal) on the graph of a function that indicates the independent variable.



abscissa

absence-of-ground searching selector A rotary switch that searches for an ungrounded contact in a dial telephone system.

absiemens The unit of conductance or conductivity in the cgs electromagnetic system. One absiemens equals 10^9 siemens and is the conductance through which a potential of 1 abvolt forces a current of 1 abampere.

absolute **1.** A temperature scale in which zero represents the complete absence of heat. Units of measure are same as units on Celsius and Fahrenheit scales. See ABSOLUTE SCALE. **2.** Independent of any arbitrarily assigned units of measure or value.

absolute accuracy The full-scale accuracy of a meter with respect to a primary (absolute) standard.

absolute address In a digital computer program, the location of a word in memory, as opposed to location of the word in the program.

absolute code A computer code in which the exact address is given for storing or locating the reference operand.

absolute coding In computer practice, coding that uses absolute addresses.

absolute constant A mathematical constant that has the same value wherever it is used.

absolute delay The time elapsing between the transmission of two synchronized signals from the same station or from different stations, as in radio, radar, or loran. By extension, the time interval between two such signals from any source, as from a generator.

absolute digital position transducer A digital position transducer whose output signal indicates absolute position. (See ENCODER.)

absolute efficiency The ratio X_x/X_s, where X_x is the output of a given device, and X_s is the output of an ideal device of the same kind under the same operating conditions.

absolute encoder system A system that permits the encoding of any function (linear, nonlinear, continuous, step, and so on) and supplies a nonambiguous output.

absolute error The difference indicated by the approximate value of a quantity minus the actual

value. This difference is positive when the approximate value is higher than the exact value, and it is negative when the approximate value is lower than the exact value. Compare RELATIVE ERROR.

absolute gain Antenna gain for a given orientation when the reference antenna is isolated in space and has no main axis of propagation.

absolute humidity The mass of water vapor per unit volume of air. Compare RELATIVE HUMIDITY.

absolute instruction A computer instruction that states explicitly and causes the execution of a specific operation.

absolute magnitude For a complex number quantity, the vector sum of the real and imaginary components (i.e., the square root of the sum of the squares of those components). Also see ABSOLUTE VALUE and IMPEDANCE.

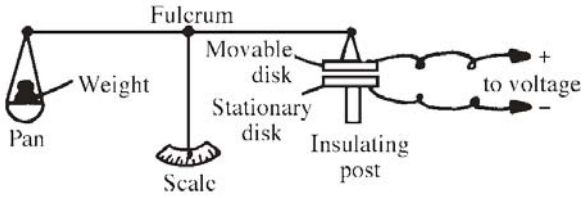
absolute maximum rating The highest value a quantity can have before malfunction or damage occurs.

absolute maximum supply voltage The highest supply voltage that can be applied to a circuit without permanently altering its characteristics.

absolute measurement of current Measurement of a current directly in terms of defining quantities. **1.** TANGENT GALVANOMETER method: Current is proportional to the tangent of the angle of deflection of the needle of this instrument. Deflection depends on torque, resulting from the magnetic field produced by current in the galvanometer coil acting against the horizontal component of the earth's magnetic field. **2.** ELECTRODYNAMOMETER method: With this 2-coil instrument, current is determined from the observed deflection, the torque of the suspension fiber of the movable coil, and the coil dimensions.

absolute measurement of voltage Measurement of a voltage directly in terms of defining quantities. **1.** CALORIMETRIC method: A current-carrying coil immersed in water raises the temperature of the water. The difference of potential that forces the current through the coil then is determined in terms of the equivalent heat energy. **2.** Disk-electrometer method: In this setup, a metal disk attached to one end of a balance beam is attracted by a stationary disk mounted below it, the voltage being applied to the two disks. The other end of the beam carries a pan into which accurate weights are placed. At balance, the voltage is determined in terms of the weight required to restore balance, the upper-disk area, and the disk separation.

absolute minimum resistance The resistance between the wiper and the nearer terminal of a potentiometer, when the wiper is as close to that terminal as physically possible. All potentiometers have two such specifications, one for each end terminal.



absolute measurement of voltage, 2

absolute Peltier coefficient The product of the absolute Seebeck coefficient and absolute temperature of a material.

absolute pitch A tone in a standard scale, determined according to the rate of vibration, independent of other tones in the range of pitch.

absolute pressure Pressure (force per unit area) of a gas or liquid determined with respect to that of a vacuum (taken as zero).

absolute-pressure transducer A transducer actuated by pressure from the outputs of two different pressure sources, and whose own output is proportional to the difference between the two applied pressures.

absolute scale **1.** A scale in which the zero value indicates the lowest physically possible value that a parameter can attain. **2.** A standard scale for measurement of a quantity. **3.** A universally agreed-upon scale for the determination of a variable quantity. **4.** The Kelvin temperature scale. **5.** The Rankine temperature scale.

absolute Seebeck coefficient The quotient, as an integral from absolute zero to the given temperature, of the Thomson coefficient of a material divided by its absolute temperature.

absolute spectral response The frequency output or response of a device in absolute power units (such as milliwatts) as opposed to relative units (such as decibels).

absolute system of units A system of units in which the fundamental (ABSOLUTE) units are those expressing length (l), mass (m), charge (q), and time (t). All other physical units, including practical ones, are then derived from these absolute units.

absolute temperature Temperature measured on either the Kelvin or Rankine scales, where zero represents the total absence of heat energy.

absolute temperature scale **1.** The Kelvin temperature scale, in which the divisions are equal in size to 1° Celsius, and the zero point is absolute zero, the coldest possible temperature, approximately –273.16° Celsius. **2.** The Rankine temperature scale, in which the divisions are equal in size to 1° Fahrenheit, and the zero point is absolute zero or approximately –459.7° Fahrenheit.

absolute tolerance The value of a component as it deviates from the specified or nominal value. It is usually expressed as a percentage of the specified value.

absolute units Fundamental physical units (see ABSOLUTE SYSTEM OF UNITS) from which all others are derived. See, for example, AMPERE, OHM, VOLT, and WATT.

absolute value The magnitude of a quantity without regard to sign or direction. The absolute value of a is written $|a|$. The absolute value of a positive number is the number itself; thus, $|10|$ equals 10. The absolute value of a negative number is the number with its sign changed: $|-10|$ equals 10.

absolute-value circuit A circuit that produces a unipolar signal in response to a bipolar input and in proportion to the absolute value of the magnitude of the input.

absolute-value computer A computer in which data is processed in its absolute form; i.e., every variable maintains its full value. (Compare to INCREMENTAL COMPUTER.)

absolute-value device In computer practice, a device that delivers a constant-polarity output signal equal in amplitude to that of the input signal. Thus, the output signal always has the same sign.

absolute zero The temperature –273.16°C (−459.7°F and 0 Kelvin). The coldest possible temperature, representing the complete absence of heat energy.

absorbed wave A radio wave that dissipates in the ionosphere as a result of molecular agitation. This effect is most pronounced at low and medium frequencies.

absorptance The amount of radiant energy absorbed in a material; equal to 1 minus the transmittance.

absorption The taking up of one material or medium by another into itself, as by sucking or soaking up. Also, the retention of one medium (or a part of it) by another medium, through which the first one attempts to pass. See, for example, ABSORBED WAVE, ABSORPTION COEFFICIENT, DIELECTRIC ABSORPTION. Compare ADSORPTION.

absorption band See ABSORPTION SPECTRUM.

absorption circuit A circuit that absorbs energy from another circuit or from a signal source—especially a resonant circuit, such as a wavemeter or wavetrap.

absorption current In a capacitor, the current resulting from absorption of energy by the dielectric material.

absorption dynamometer A power-measuring instrument in which a brake absorbs energy from a revolving shaft or wheel.

absorption fading Fading of a radio wave, resulting from (usually) slow changes in the absorption of the wave in the line of propagation.

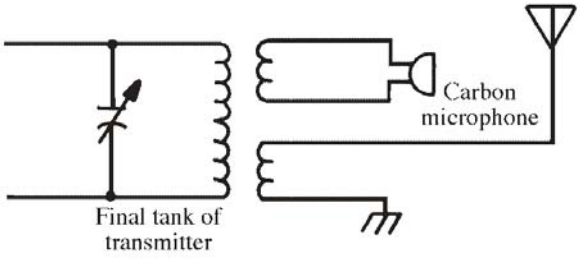
absorption frequency meter See WAVEMETER.

absorption line See ABSORPTION SPECTRUM.

absorption loss **1.** Transmission loss caused by dissipation of electrical energy, or conversion of it into heat or other forms of energy. **2.** Loss of all or part of a skywave because of absorption by the ionosphere. Also called *ionospheric absorption* or *atmospheric absorption.*

absorption marker A small blip introduced onto an oscilloscope trace to indicate a frequency point. It is so called because it is produced by the action of a frequency-calibrated tuned trap, similar to an absorption wavemeter.

absorption modulation Amplitude modulation of a transmitter or oscillator by means of an audio-frequency-actuated absorber circuit. In its simplest form, the modulator consists of a few turns of wire coupled to the transmitter tank coil and connected to a carbon microphone. The arrangement absorbs energy from the transmitter at a varying rate as the microphone changes its resistance in accordance with the sound waves it receives.

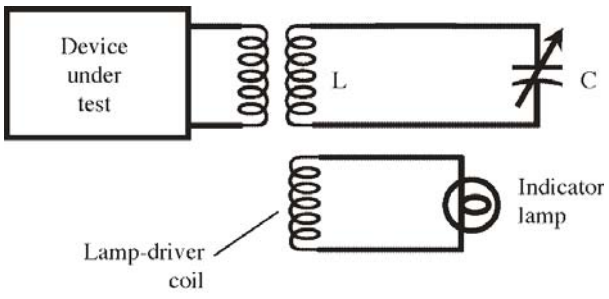


absorption modulation

absorption spectrum For electromagnetic waves, a plot of absorption coefficient (of the medium of propagation) versus frequency. Also called EMISSION SPECTRUM.

absorption trap See WAVETRAP.

absorption wavemeter A resonant-frequency indicating instrument that is inductively coupled to the device under test.



absorption wavemeter

absorptivity In audio and microwave technologies, a measure of the energy absorbed by a given volume of material.

A-B test Comparison of two sounds by reproducing them in alternating succession.

abvolt The unit of potential difference in the cgs electromagnetic system. One abvolt equals 10^{-8} V and is the difference of potential between any two points when 1 erg of work is required to move 1 abcoulomb of electricity between them.

abwatt The unit of power in the cgs electromagnetic system. One abwatt equals 10^{-7} W and is the power corresponding to 1 erg of work per second.

ac **1.** Abbreviation of ALTERNATING CURRENT. **2.** Abbreviation of ATTITUDE CONTROL. **3.** Abbreviation of AERODYNAMIC CENTER. **4.** A suffix meaning AUTOMATIC CALCULATOR or AUTOMATIC COMPUTER.

a/c **1.** Abbreviation of AIRCRAFT. **2.** Abbreviation of AIR CONDITIONING.

Ac Symbol for ACTINIUM.

ACA Abbreviation of *automatic circuit analyzer.*

ac base current Symbol, $I_{B(ac)}$. The ac component of base current in a bipolar transistor.

ac base resistance Symbol, $R_{B(ac)}$. The dynamic base resistance in a bipolar transistor.

ac base voltage Symbol, $V_{B(ac)}$. The ac component of base voltage in a bipolar transistor. It is the ac input signal voltage in a common-emitter amplifier or emitter-follower amplifier.

ac bias In a tape recorder, the high-frequency current that passes through the recording head to linearize operation.

acc **1.** Abbreviation of AUTOMATIC CHROMINANCE CONTROL. **2.** Abbreviation of AUTOMATIC COLOR COMPENSATION. **3.** Abbreviation of ACCELERATION.

ac cathode current Symbol, $I_{K(ac)}$. The ac component of cathode current in an electron tube.

ac cathode resistance Symbol, $R_{K(ac)}$. The dynamic cathode resistance in an electron tube. $R_{K(ac)}$ equals dV_K/dI_K for a constant value of V_G.

ac cathode voltage Symbol, $V_{K(ac)}$. The ac component of cathode voltage in an electron tube. It is the ac output signal voltage in cathode-follower and grounded-grid amplifiers.

accelerated life test A test program that simulates the effects of time on devices or apparatus, by artificially speeding up the aging process.

accelerated service test A service or bench test in which equipment or a circuit is subjected to an extreme condition in an attempt to simulate the effects of average use over a long time.

accelerating conductor or relay A conductor or relay that prompts the operation of a succeeding device in a starting mode according to established conditions.

accelerating electrode In a cathode-ray tube or klystron, the electrode to which the accelerating voltage is applied.

accelerating time The elapsed time that starts when voltage is applied to a motor, and ends when the motor shaft reaches maximum speed.

accelerating voltage A positive high voltage applied to the accelerating electrode of a cathode-ray tube to increase the velocity of electrons in the beam.

acceleration at stall The angular acceleration of a servomotor at stall, determined from the stall torque and the moment of inertia of the motor's rotor.

acceleration derivative Acceleration (a) expressed as the second derivative of distance (s) with respect to time (t): a equals d^2s/dt^2.

acceleration potential See ACCELERATING VOLTAGE.

acceleration switch A switch that operates automatically when the acceleration of a body to which it is attached exceeds a predetermined rate in a given direction.

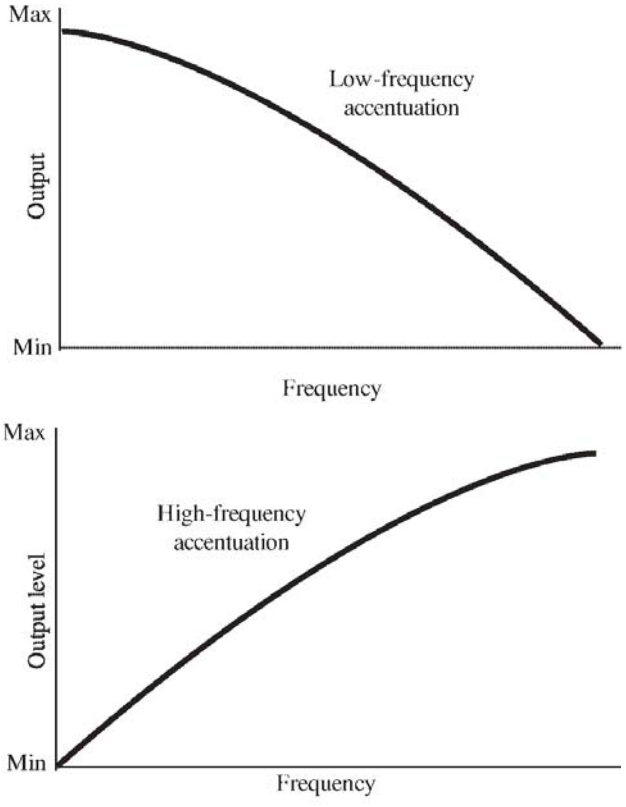
acceleration time The time required by a computer to take in or deliver information after interpreting instructions. Compare ACCESS TIME.

acceleration torque During the accelerating period of a motor, the difference between the torque demanded and the torque actually produced by the motor.

acceleration voltage The potential between accelerating elements in a vacuum tube, the value of which determines average electron velocity.

accelerometer A transducer whose output voltage is proportional to the acceleration of the moving body to which it is attached.

accentuation The emphasis of a desired band of frequencies, usually in the audio-frequency spectrum.



accentuation

accentuator A circuit or device, such as a filter, tone control, or equalizer, used to emphasize a band of frequencies, usually in the audio-frequency spectrum. Also see ACCENTUATION.

acceptable-environmental-range test A test to disclose the environmental conditions that equipment can endure while maintaining at least the minimum desired reliability.

acceptable quality level Abbreviation, AQL. A percentage that represents an acceptable average of defective components allowable for a process, or the lowest quality that a supplier is permitted to regularly present for acceptance.

acceptance sampling plan A probabilistic method of sampling a quantity of units from a lot, and determining from the sample whether to accept the lot, reject the lot, or perform another sampling.

acceptance test A test performed on incoming equipment or on submitted samples to determine if they meet tester's or supplier's specifications.

acceptor **1.** Any device or circuit, such as a series-resonant circuit, that provides relatively easy transmission of a signal, in effect accepting the signal. **2.** A hole-rich impurity added to a semiconductor to make the latter p-type. It is so called because its holes can accept electrons. Compare DONOR.

acceptor circuit See ACCEPTOR, **1.**

acceptor impurity See ACCEPTOR, **2.**

access **1.** To gain entrance to something, such as the interior of the cabinet of a high-fidelity amplifier. **2.** In a computer, the action of going to a specific memory location for the purpose of data retrieval. **3.** A port or opening into a piece of equipment, placed there to make the equipment easy to maintain and repair.

access arm A mechanical device that positions the read/write mechanism in a computer storage unit.

access control register A register that is part of a computer protection system that prevents interference between different software modules.

access method A method of transferring information or data from main storage to an input/output unit.

access right The access status given to computer system users that indicates the method of access permitted (e.g., read a file only or write to a file).

access time The time required by a computer to begin delivering information after the memory or storage has been interrogated.

accidental error An unintentional error committed by a person making measurements and recording data.

accidental triggering The undesired chance-operation of a flip-flop or other switching circuit caused by a noise pulse or other extraneous signal.

ac collector current Symbol, $I_{C(ac)}$. The ac component of collector current in a bipolar transistor.

ac collector resistance Symbol, $R_{C(ac)}$. The dynamic collector resistance of a bipolar transistor. $R_{C(ac)}$ equals dV_C/dI_C for a constant value of base current I_B (in a common-emitter circuit) or emitter current I_E (in a common-base circuit).

ac collector voltage Symbol, $V_{C(ac)}$. The ac component of collector voltage in a bipolar transistor. The ac output signal voltage in a common-emitter or common-base amplifier.

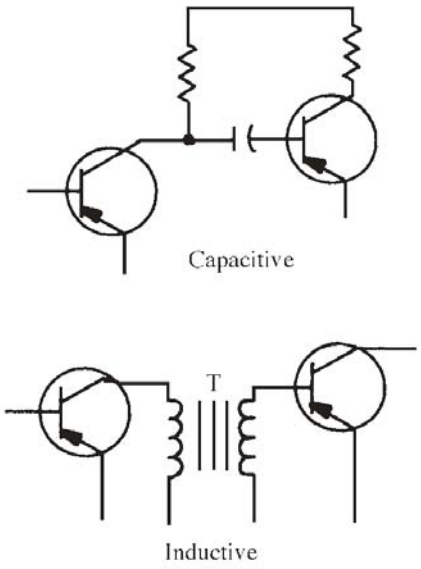
accompanying audio channel The RF signal that supplies television sound. Also called *Cochannnel sound frequency.*

ac component In a complex wave (i.e., one containing both ac and dc), the alternating, fluctuating, or pulsating part of the combination. Compare DC COMPONENT.

accordion A printed-circuit connector contact with a Z-shaped spring that allows high deflection with low fatigue.

ac-coupled flip-flop A flip-flop that is operated by the rise or fall of a clock pulse.

ac coupling Transformer coupling or capacitive coupling, which transmit ac, but not dc. Compare DIRECT COUPLING.



ac coupling

accumulator **1.** In a digital computer, a circuit or register device that receives numbers, totals them, and stores them. **2.** Storage battery.

accuracy **1.** Precision in the measurement of quantities and in the statement of physical characteristics. **2.** Degree of precision. Usually expressed, in terms of error, as a percentage of the specified value (e.g., 10 V plus or minus 1%), as a percentage of a range (e.g., 2% of full scale), or as parts (e.g., 100 parts per million).

accuracy rating The maximum error in an instrument, given as a percentage of the full-scale value.

accw Abbreviation of ALTERNATING-CURRENT CONTINUOUS WAVE.

ac/dc Abbreviation of ALTERNATING CURRENT/DIRECT CURRENT. Pertains to equipment that will operate from either ac utility power or a dc power source. A notebook computer is a good example.

ac directional overcurrent relay A relay that works on a specific value of alternating overcurrent that is rectified for a desired polarity.

ac drain current Symbol, $I_{D(ac)}$. The ac component of drain current in a field-effect transistor.

ac drain resistance Symbol, $R_{D(ac)}$. The dynamic drain resistance in a field-effect transistor; $R_{D(ac)}$ equals dV_D/dI_D for a constant value of gate voltage V_G.

ac drain voltage Symbol, $V_{D(ac)}$. The ac component of drain voltage in a field-effect transistor. The ac output signal voltage in a common-source FET amplifier.

ac dump The removal of all ac power from a system or component.

ac emitter current Symbol, $I_{E(ac)}$. The ac component of emitter current in a bipolar transistor.

ac emitter resistance Symbol, $R_{E(ac)}$. The dynamic emitter resistance of a bipolar transistor; $R_{E(ac)}$ equals dV_E/dI_E for a constant value of base current I_B (in an emitter-follower circuit) or collector voltage V_{CC} (in a common-base circuit).

ac emitter voltage Symbol, $V_{E(ac)}$. The ac component of emitter voltage in a bipolar transistor. The ac input signal voltage in a common-base amplifier; the ac output signal voltage in an emitter-follower amplifier.

ac equipment An apparatus designed for operation from an ac power source only. Compare DC EQUIPMENT and AC/DC.

ac erasing In tape recording, the technique of using an alternating magnetic field to erase material already recorded on the tape.

ac erasing head Also called *ac erase head.* In tape and wire recording, a head that carries alternating current to erase material already recorded on the tape or wire. Also see AC ERASING.

acetate Cellulose acetate, a tough thermoplastic material that is an acetic acid ester of cellulose. It is used as a dielectric and in the manufacture of photographic films.

acetate base **1.** The cellulose acetate film that served as the base for the magnetic oxide coating in early recording tape. Most such tapes today are of polyester base. **2.** The cellulose acetate substrate onto which certain photosensitive materials are deposited for lithographic reproduction. Also see ACETATE and ANCHORAGE.

acetate tape Recording tape consisting of a magnetic oxide coating on a cellulose acetate film. Also see ACETATE BASE.

ac gate voltage Symbol, $V_{G(ac)}$. The ac component of gate voltage in a field-effect transistor. The ac input signal voltage.

ac generator **1.** A rotating electromagnetic machine that produces alternating current (e.g., a dynamo or alternator). **2.** An oscillator or combination of an oscillator and an output amplifier.

ac grid voltage Symbol, $V_{G(ac)}$. The ac component of control grid voltage in an electron tube. The ac input signal voltage in a common-cathode amplifier or cathode follower.

A channel The left channel of a two-channel stereo system.

achieved reliability A statement of reliability based on the performance of mass-produced parts or systems under similar environmental conditions. Also called OPERATIONAL RELIABILITY.

achromatic **1.** Without color. In a TV image, the tones from black through gray to white. The term occasionally refers to black-and-white television, although MONOCHROMATIC is more often used in this sense.

achromatic locus Also called *achromatic region.* An area on a chromaticity diagram that contains all points, representing acceptable reference white standards.

achromatic scale A musical scale without accidentals.

ACIA Abbreviation of *asynchronous communications interface adapter.*

acicular Pertaining to the shape of magnetic particles on recording tape. Under magnification, these particles look like thin rods.

acid A substance that dissociates in water solution and forms hydrogen (H) ions (e.g., sulfuric acid). Compare BASE, **2.**

acid depolarizer Also called *acidic depolarizer.* An acid, in addition to the electrolyte, used in some primary cells to slow the process of polarization.

ac line A power line that delivers alternating current only.

ac line filter A filter designed to remove extraneous signals or electrical noise from an ac power line, while causing virtually no reduction of the power-line voltage or power.

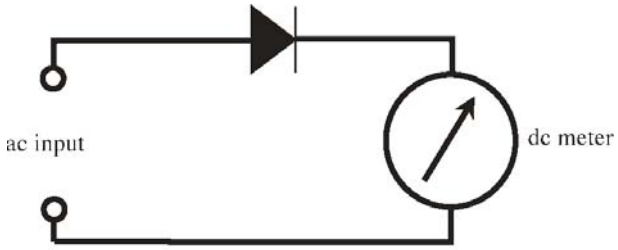
ac line voltage The voltage commonly delivered by the commercial power line to consumers. In the United States, the two standards are 117 V and 234 V (~ about 5 percent). The lower voltage is used by most appliances; the higher voltage is intended for appliances and equipment that draws high power, such as electric ovens, cooking ranges, clothes dryers, and amateur-radio amplifiers. In Europe, 220 V is the common standard.

aclinic line Also called *magnetic equator.* An imaginary line drawn on a map of the world or of an area that connects points of zero inclination (dip) of the needle of a magnetic compass.

ACM Abbreviation for *Association for Computing Machinery.*

ac magnetic bias See AC BIAS.

ac meter A meter that is intended to work only on alternating current or voltage. Such meters include iron-vane and rectifier types.



ac meter

ac noise **1.** Electromagnetic interference originating in the ac power lines. **2.** Electrical noise of a rapidly alternating or pulsating nature.

ac noise immunity In computer practice, the ability of a logic circuit to maintain its state, despite excitation by ac noise.

acous Abbreviation for ACOUSTIC.

acoustic Pertaining to audible sound disturbances, usually in air (versus audio-frequency currents or voltages).

acoustic absorption The assimilation of energy from sound waves passing through or reflected by a given medium.

acoustic absorption loss That portion of sound energy lost (as by dissipation in the form of heat) because of ACOUSTIC ABSORPTION.

acoustic absorptivity The ratio of sound energy absorbed by a material to sound energy striking the surface of the material.

acoustic attenuation constant The real-number component of the complex acoustical propagation constant, expressed in nepers per unit distance.

acoustic burglar alarm An alarm that receives the noise made by an intruder. The alarm device responds to the impulses from concealed microphones.

acoustic capacitance The acoustic equivalent of electrical capacitance.

acoustic clarifier In a loudspeaker system, a set of cones attached to the baffle that vibrate to absorb and suppress sound energy during loud bursts.

acoustic communication Communications by means of sound waves. This can be through the atmosphere, or it can be through solids or liquids, such as a taut wire, a body of water, or the earth.

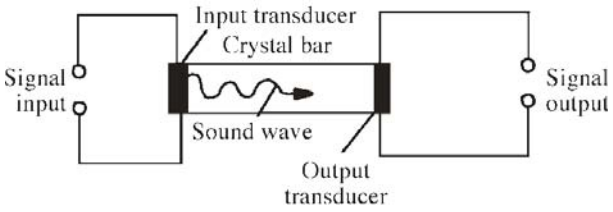
acoustic compliance COMPLIANCE in acoustic transducers, especially loudspeakers. It is equivalent to electrical capacitive reactance.

acoustic consonance An effect that occurs when two objects are near each other but not in physical contact, and both have identical or harmonically related resonant frequencies. An example is shown by two tuning forks with identical fundamental frequencies. If one fork is struck and then brought near the other, the second fork will begin vibrating. If the second fork has a fundamental frequency that is a harmonic of the frequency of the first fork, the second fork will vibrate at its own resonant frequency. See HARMONIC, RESONANCE.

acoustic coupling Data transfer via a sound link between a telephone and a pickup/reproducer. Was once common in computer terminals and facsimile machines. This scheme has been largely replaced by hard wiring and optical coupling.

acoustic damping The deadening or reduction of the vibration of a body to eliminate (or cause to die out quickly) sound waves arising from it.

acoustic delay line Any equivalent of a special transmission line that introduces a useful time delay between input and output signals. In one form, it consists of a crystal block or bar with an input transducer at one end and an output transducer at the other. An electrical input signal in the first transducer sets up sound waves that travel through the interior of the crystal; the piezoelectric reaction of the crystal to sound vibrations sets up an output voltage in the second transducer. The delay is caused by the time required for the acoustic energy to travel the length of the crystal bar.



acoustic delay line

acoustic depth finder A direct-reading device for determining the depth of a body of water, or for locating underwater objects via sonic or ultrasonic waves transmitted downward and reflected back to the instrument.

acoustic dispersion Variation of the velocity of sound waves, depending on their frequency.

acoustic elasticity **1.** In a loudspeaker enclosure, the compressibility of air behind the vibrating cone of the speaker. **2.** In general, the compressibility of any medium through which sound passes.

acoustic electric transducer A transducer, such as a microphone or hydrophone, that converts sound energy into electrical energy. Compare ELECTRICAL/ACOUSTIC TRANSDUCER. Also see ACOUSTIC TRANSDUCER.

acoustic feedback A usually undesirable effect that occurs when sound waves from a loudspeaker (or other reproducer) reach a microphone (or other input transducer) in the same system.

This can cause an amplifier to oscillate, with a resultant rumbling, howling, or whistling.

acoustic filter Any sound-absorbing or transmitting arrangement, or combination of the two, that transmits sound waves of desired frequency while attenuating or eliminating others.

acoustic frequency response The sound-frequency range as a function of sound intensity. A means of describing the performance of an acoustic device.

acoustic generator A device that produces sound waves of a desired frequency and/or intensity. Examples are electrical devices (headphones or loudspeakers operated from a suitable oscillator, buzzer, bell, or flame) and mechanical devices (tuning forks, bells, string, or whistles).

acoustic grating A set of bars or slits that are parallel to one another and arranged a fixed distance apart so that an interference pattern forms as sound passes through. Used to determine the wavelength of acoustic waves.

acoustic homing system **1.** A system that uses a sound signal for guidance purposes. **2.** A guidance method in which a missile homes in on noise generated by a target.

acoustic horn A tapered tube (round or rectangular, but generally funnel-shaped) that directs sound and, to some extent, amplifies it. So called to distinguish it from a microwave horn.

acoustic howl See ACOUSTIC FEEDBACK.

acoustician **1.** A person skilled in acoustics (an acoustics technician). **2.** An AUDIOLOGIST.

acoustic impedance Unit, ACOUSTIC OHM. The acoustic equivalent of electrical impedance. Like the latter, acoustic impedance is the total opposition encountered by acoustic force. Also like electrical impedance, acoustic impedance has resistive and reactive components: ACOUSTIC RESISTANCE and ACOUSTIC REACTANCE.

acoustic inductance Also called *inertance.* The acoustic equivalent of electrical inductance.

acoustic inertance See ACOUSTIC INDUCTANCE.

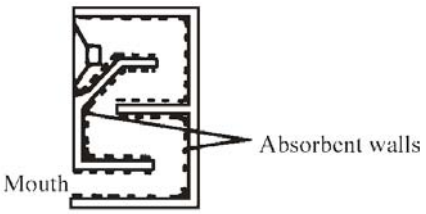
acoustic inhibition See AUDITORY INHIBITION.

acoustic intensity See SOUND INTENSITY.

acoustic interferometer An instrument that evaluates the frequency and velocity of sound waves in a liquid or gas, in terms of a standing wave set up by a transducer and reflector as the frequency or transducer-to-reflector distance varies.

acoustic labyrinth A loudspeaker enclosure whose internal partitions form a maze-like path or "tube" lined with sound-absorbing material. The tube effectively runs from the back of the speaker down to where it terminates in a MOUTH or PORT that opens at the front of the enclosure. The labyrinth provides an extremely efficient reproduction system because of its excellent acoustic impedance-matching capability.

acoustic lens A system of barriers that refracts sound waves the way that an optical lens does with light waves.



acoustic labyrinth

acoustic line Baffles or other such structures within a speaker that act as the mechanical equivalent of an electrical transmission line to enhance the reproduction of very low bass frequencies.

acoustic load A device that serves simultaneously as the output load of an amplifier and as a transducer of electrical energy into acoustic energy (e.g., headphones or a loudspeaker).

acoustic memory In a computer, a volatile memory element employing an acoustic delay line, often incorporating quartz or mercury as the transmission and delay element.

acoustic mirage A type of sound distortion in which the listener experiences the illusion of two sound sources when there is only one. The phenomenon is caused by the effect of a large temperature gradient in the air or water through which the sound passes.

acoustic mode Crystal-lattice vibration without producing an oscillating dipole.

acoustic noise Interferential (usually disagreeable) sounds carried by the air (or other propagation medium) to the ear or to an acoustic transducer. This is in contrast to electrical noise, which consists of extraneous current or voltage impulses and is inaudible until converted into sound.

acoustic ohm The unit of acoustic resistance, reactance, or impedance. One acoustic ohm equals the volume velocity of 1 cm/s produced by a sound pressure of 1 microbar (0.1 Pa). Also called *acoustical ohm.*

acoustic phase constant The imaginary-number component of the complex acoustic propagation constant expressed in radians per second or radians per unit distance.

acoustic phase inverter A bass reflex loudspeaker enclosure.

acoustic pressure **1.** The acoustic equivalent of electromotive force, expressed in dynes per square centimeter; also called *acoustical pressure.* **2.** Sound pressure level.

acoustic propagation The transmission of sound waves, or subaudible or ultrasonic waves, as a disturbance in a medium, rather than as an electric current or electromagnetic field.

acoustic radiator A device that emits sound waves. Examples are the cone of a loudspeaker, the diaphragm of a headphone, and the vibrating reed of a buzzer.

acoustic radiometer An instrument for measuring the intensity of a sound wave (see SOUND INTENSITY) in terms of the unidirectional steady-state pressure exerted at a boundary as a result of absorption or reflection of the wave.

acoustic reactance Unit, ACOUSTIC OHM. The imaginary-number component of ACOUSTIC IMPEDANCE. It can take the form of ACOUSTIC CAPACITANCE or ACOUSTIC INDUCTANCE.

acoustic reflectivity The ratio F_r/F_i, where F_r is the rate of flow of sound energy reflected from a surface and F_i is the rate of flow of sound energy incident to the surface.

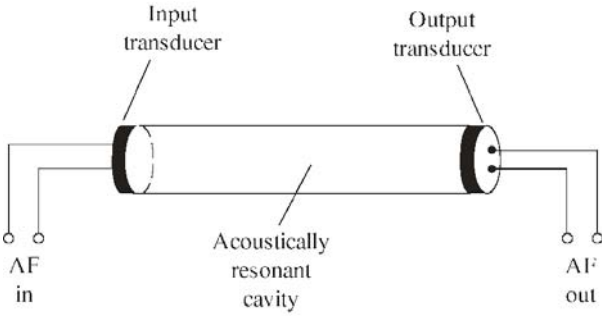
acoustic refraction The deflection of sound waves being transferred obliquely between media that transmit sound at different speeds.

acoustic regeneration See ACOUSTIC FEEDBACK.

acoustic resistance Unit, ACOUSTIC OHM. The real-number component of ACOUSTIC IMPEDANCE. The opposing force that causes acoustic energy to be dissipated in the form of heat. It is attributed to molecular friction in the medium through which sound passes. See ACOUSTIC OHM.

acoustic resonance In an enclosed chamber with walls that reflect sound waves, resonance that occurs at certain wavelengths because the echoes combine in and out of phase. Speaker enclosures almost always have resonance at certain frequencies. This effect can be used to an advantage when it is necessary to get good bass (low-frequency) response from a relatively small speaker.

acoustic resonator **1.** A chamber, such as a box, cylinder, or pipe, in which an air column resonates at a particular frequency. **2.** A piezoelectric, magnetostrictive, or electrostrictive body that vibrates at a resonant audio frequency that is governed by the mechanical dimensions of the body when an audio voltage at that frequency is applied.



acoustic resonator, 1

acoustics **1.** The physics of sound. The study and applications of acoustic phenomena. **2.** The qualities of an enclosure or sound chamber (room, auditorium, or box) that describe how sound waves behave in it.

acoustic scattering The spreading of a sound wave in many directions as a result of diffraction, reflection, or refraction.

acoustic suspension A loudspeaker design that allows exceptional low-frequency reproduction for a fairly small physical size. An airtight enclosure is used to increase the tension on the speaker cone.

acoustic system **1.** A coordinated array of acoustic components (e.g., acoustic filters, resonators, etc.) that responds to sound energy in a predetermined manner. **2.** An audio-frequency system in which sound energy is converted into electrical energy, processed, and then reconverted into sound energy for a clearly defined purpose.

acoustic telegraph A telegraph that gives audible signals, as opposed to visual signals or printed messages.

acoustic transducer **1.** Any device, such as headphones or a loudspeaker, for converting audio-frequency electrical signals into sound waves. **2.** Any device, such as a microphone, for converting sound waves into alternating, pulsating, or fluctuating currents.

acoustic transmission The direct transmission of sound energy without the intermediary of electric currents.

acoustic transmission system A set of components designed to generate acoustic waves.

acoustic transmissivity Also called *acoustic transmittivity.* The ratio e_t/e_i, where e_t is the sound energy transmitted by a medium, and e_i is the incident sound energy reaching the surface of the medium. Acoustic transmissivity is proportional to the angle of incidence.

acoustic treatment Application of sound-absorbing materials to the interior of an enclosure or room to control reverberation.

acoustic wave The traveling vibration, consisting of molecular motion, via which sound is transmitted through a gas, liquid or solid. Usually refers to sound waves in air.

acoustic wave filter See ACOUSTIC FILTER.

acoustoelectric effect The generation of a voltage across the faces of a crystal by sound waves traveling longitudinally through the crystal.

acoustoelectronics A branch of electronics concerned with the interaction of sound energy and electrical energy in devices, such as surface-wave filters and amplifiers. In such devices, electrically induced acoustic waves travel along the surface of a piezoelectric chip and generate electrical energy. Also called *praetersonics* and *microwave acoustics.*

ac plate current Symbol, $I_{P(ac)}$. The ac component of plate current in a vacuum tube.

ac plate resistance Symbol, $R_{P(ac)}$. The dynamic plate resistance of an electron tube. $R_{P(ac)}$ equals dE_P/dI_P, where E_P is the plate voltage and I_P is the plate current, for a constant value for grid voltage E_G.

ac plate voltage Symbol, $E_{P(ac)}$. The ac component of plate voltage in an electron tube. The ac output-signal voltage in a common-cathode amplifier.

ac power Symbol, P_{ac}. Unit, watt (W). The power acting in an ac circuit, P_{ac} equals $EI \cos q$, where E is in volts, I in amperes, and q is the phase angle. Compare DC POWER. Also see POWER.

ac power supply A power unit that supplies ac only (e.g., ac generator, vibrator-transformer, oscillator, or inverter). Compare DC POWER SUPPLY.

acquisition **1.** The gathering of data from transducers or a computer. **2.** Locating the path of an orbiting body for purposes of collecting telemetered data. **3.** Orienting an antenna for optimum pickup of telemetered data.

acquisition and tracking radar An airborne or ground radar, which locks in on a strong signal and tracks the body that reflects (or transmits) the signal.

acquisition radar A radar that spots an oncoming target and supplies position data regarding the target to a fire-control or missile-guidance radar, which then tracks the target.

acr **1.** Abbreviation of AUDIO CASSETTE RECORDER. **2.** Abbreviation of AUDIO CASSETTE RECORDING SYSTEM.

ac reclosing relay The controlling component in an alternating-current circuit breaker. It causes the breaker to reset after a specified period of time.

ac relay A relay designed to operate on alternating current without chattering or vibrating.

ac resistance Pure resistance in an ac circuit. Unlike reactance and impedance, which are also forms of opposition to the flow of current, ac resistance introduces no phase shift.

acronym A word formed from letters or syllables taken from other applicable words of a multiword term. Acronyms are convenient for naming new devices and processes in electronics. Usually, a term is considered an acronym only when it is spelled in all-capital letters; once the term is accepted and popularized, it is written as a conventional word and is no longer thought of as an acronym. For example, *LASER* was once an acronym for light amplification by the stimulated emission of radiation. By the popularization process, the acronym became a conventional word from which other terms (such as the verb "lase") were derived.

acrylic resin A synthetic resin used as a dielectric and in electronic encapsulations. It is made from acrylic acid or one of its derivatives.

ACS Abbreviation of *automatic control system.*

ac source current Symbol, $I_{S(ac)}$. The ac component of source current in a field-effect transistor.

ac source resistance Symbol, $R_{S(ac)}$. The dynamic source resistance in a field-effect transistor; $R_{S(ac)}$ equals dV_S/dI_S for a constant value of V_G.

ac source voltage Symbol, $V_{S(ac)}$. The ac component of source voltage in a field-effect transistor. The ac output-signal voltage in a source-follower (grounded-drain) FET amplifier.

acss Abbreviation of *analog computer subsystem.*

ac time overcurrent relay A device with a certain time characteristic, which breaks a circuit when the current exceeds a certain level.

actinic rays Short-wavelength light rays in the violet and ultraviolet portion of the spectrum that give conspicuous photochemical action.

actinism The property whereby radiant energy (such as visible and ultraviolet light, X-rays, etc.) causes chemical reactions.

actinium Symbol, Ac. A radioactive metallic element. Atomic number, 89. Atomic weight, 227.

actinodielectric Exhibiting a temporary rise in electrical conductivity during exposure to light.

actinoelectric effect The property whereby certain materials (such as selenium, cadmium sulfide, germanium, and silicon) change their electrical resistance or generate a voltage on exposure to light. Also see ACTINODIELECTRIC.

actinometer An instrument for measuring the direct heating power of the sun's rays or the actinic power of a light source.

action current A small transient current that flows in a nerve in the human body as a result of stimulation.

activate To start an operation, usually by applying an appropriate enabling signal.

activation **1.** Supplying electrolyte to a battery cell to prepare the cell for operation. **2.** Causing the acceleration of a chemical reaction.

activation time In the activation of a battery cell (see ACTIVATION, **1**), the interval between addition of the electrolyte and attainment of full cell voltage.

activator A substance added to an accelerator (see ACCELERATOR, **3**) to speed the action of the accelerator.

active Pertaining to a circuit or device that requires a power supply for its operation. This differs from a passive circuit or device, which operates with no external source of power.

active antenna An antenna that uses a small whip, loop, or ferrite loopstick with a high-gain amplifier for receiving at very-low, low, medium, and high radio frequencies (approximately 9 kHz to 30 MHz).

active area The forward-current-carrying portion of the rectifying junction of a metallic rectifier.

active arm See ACTIVE LEG.

active balance In telephone repeater operation, the sum of return currents at a terminal network balanced against the local circuit or drop resistance.

active chord mechanism Abbreviation, ACM. In robots, an electromechanical gripper capable of conforming to irregular objects. It has a structure similar to the human spine, with numerous small, rigid links connected by hinges.

active communications satellite A satellite containing receivers (which pick up beamed electromagnetic signals from a ground point and amplify them) and transmitters (which send signals back to the surface of the earth). Also called *active comsat.* Compare PASSIVE COMMUNICATIONS SATELLITE.

active component **1.** A device capable of some dynamic function (such as amplification, oscillation, or signal control) that usually requires a power supply for its operation. Examples include bipolar transistors, field-effect transistors, and integrated circuits. Compare PASSIVE COMPONENT. **2.** In an ac circuit, a quantity that contains no reactance so that the current is in phase with the voltage.

active component of current See ACTIVE CURRENT.

active computer A computer in an installation or network that is processing data.

active comsat See ACTIVE COMMUNICATIONS SATELLITE.

active control system A device or circuit that compensates for irregularities in the operating environment.

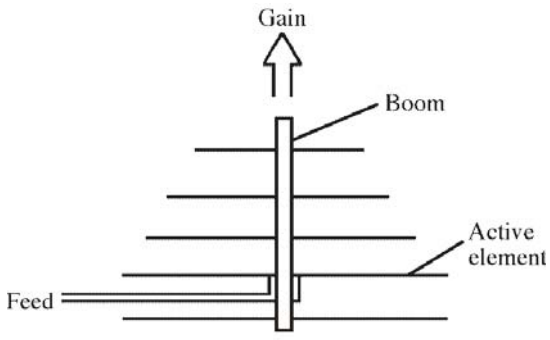
active current In an ac circuit, the current component that is in phase with the voltage. This is in contrast to reactive current, which is not in phase with the voltage, and is "inactive," with respect to power in the circuit. The active current is equal to the average power divided by the effective voltage.

active decoder An automatic ground-station device that gives the number or letter designation of a received radio beacon reply code.

active device **1.** An electronic component, such as a transistor that needs a power supply, and/or that is capable of amplifying. **2.** Broadly, any device (including electromechanical relays) that can switch (or amplify) by application of low-level signals.

active electric network A network containing one or more active devices or components, usually amplifiers or generators, in addition to passive devices or components.

active element The driven or RF-excited element in a multielement antenna or antenna array.



active element

active file A computer file in use (i.e., one that is being updated or referred to).

active filter A bandpass, bandstop, highpass or lowpass filter, consisting of resistors, capacitors, and operational amplifiers, arranged to pass a desired frequency response. Commonly used at audio frequencies.

active infrared detection Detection of infrared rays reflected from a target to which they were beamed.

active jamming Transmission or retransmission of signals for the purpose of disrupting communications.

active junction A pn junction in a semiconductor device that has been created by a diffusion process.

active leg An element within a transducer that changes one or more of its electrical characteristics in response to the input signal of the transducer. Also called *active arm.*

active lines In a U.S. television picture, the lines (approximately 488) that make up the picture. The remaining 37 of the 525 available lines are blanked and are called INACTIVE LINES.

active material **1.** In a storage cell, the chemical material in the plates that provides the electrical action of the cell, as distinguished from the supporting material of the plates themselves. **2.** A radioactive substance. **3.** The phosphor coating of a cathode-ray tube screen. **4.** The material used to coat an electron-tube cathode.

active mixer A signal mixer using one or more active components, such as transistors or integrated circuits. An active circuit provides amplification, input-output isolation, and high input impedance, in addition to the mixing action. Compare PASSIVE MIXER.

active modulator A modulator using one or more active components, such as transistors or integrated circuits. An active circuit provides gain, input-output isolation, and high input impedance, in addition to modulation. Compare PASSIVE MODULATOR.

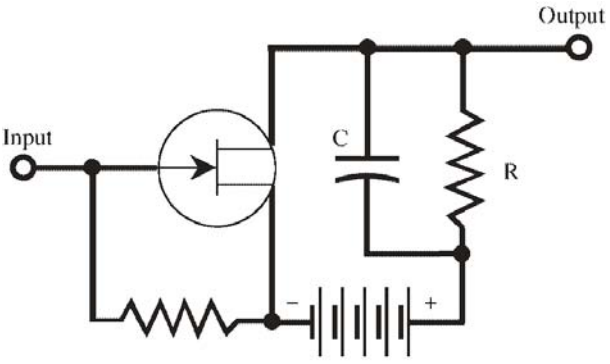
active network See ACTIVE ELECTRIC NETWORK.

active pressure The electromotive pressure that produces a current in an ac circuit.

active pull-up An arrangement using a transistor as a pull-up resistor replacement in an integrated circuit, providing low output impedance and low power consumption.

active RC network **1.** A resistance-capacitance (RC) circuit that contains active components (transistors or integrated circuits), as well as passive components (capacitors and resistors). **2.** An RC network in which some or all of the resistors and capacitors are simulated by the action of active components.

active repair time The time during which maintenance is done on a system and the system is out of operation.



active RC network

active satellite See ACTIVE COMMUNICATIONS SATELLITE.

active sensor In an electronic security system, a transducer that generates an electromagnetic field or acoustic-wave field, and detects changes in the field resulting from the presence or movement of objects in the vicinity.

active substrate In an integrated circuit, a substrate consisting of single-crystal semiconductor material into which the components are formed; it acts as some or all of the components. This is in contrast to a substrate consisting of a dielectric, where the components are deposited on the surface.

active system A radio and/or radar system that requires transmitting equipment to be carried in a vehicle.

active tracking system A system in which a transponder or responder on board a vehicle retransmits information to tracking equipment (e.g., *azusa, secor*).

active transducer **1.** A transducer that contains an active device, such as a transistor or integrated circuit, for immediate amplification of the sensed quantity. **2.** A transducer that is itself an active device.

active wire In the armature of a generator, a wire experiencing induction and, therefore, is delivering voltage.

activity **1.** Intensity of, as well as readiness for, oscillation in a piezoelectric crystal. **2.** Radioactive intensity. **3.** Intensity of thermal agitation. **4.** Thermionic emission of electrons.

activity ratio The ratio of active to inactive records in a computer file.

ac transducer A transducer that either requires an ac supply voltage or delivers an ac output signal—even when operated from a dc supply.

ac transmission The use of an alternating voltage to transfer power from one point to another, usually from generators to a distribution center, and generally over a considerable distance.

actual ground The ground as "seen" by an antenna. The actual ground surface is not necessarily in the same physical location as the true ground surface (i.e., the earth itself). An actual ground can be an artificial ground plane, such as that provided in some antenna structures. Actual ground can also be modified by nearby rooftops, buildings, guy wiring, and utility wiring.

actual height The highest altitude where radio wave refraction actually occurs.

actual power Also called active or AVERAGE POWER. Symbol, P_{avg}. In a resistive circuit under sine-wave conditions, average power is the product of the rms voltage and the rms current. It is also equal to half the product of the maximum current and maximum voltage.

actuating device A device or component that operates electrical contacts to affect signal transmission.

actuating system **1.** An automatic or manually operated system that starts, modifies, or stops an operation. **2.** A system that supplies energy for ACTUATION.

actuating time Also called *actuation time.* The time interval between generation of a control signal, or the mechanical operation of a control device, and the resulting ACTUATION.

actuation **1.** The starting, modification, or termination of an operation or process. **2.** Activation of a mechanical or electromechanical switching device.

actuator An electromechanical device that uses electromagnetism to produce a longitudinal or rotary thrust for mechanical work. It is often the end (load) device of a servosystem.

ACU Abbreviation of *automatic calling unit.*

ac voltage A voltage, the average value of which is zero, that periodically changes its polarity. In one cycle, an ac voltage starts at zero, rises to a maximum positive value, returns to zero, rises to a maximum negative value, and finally returns to zero. The number of such cycles per second is termed the *ac frequency.*

ac voltmeter See AC METER.

acyclic machine Also called ACYCLIC GENERATOR. A dc generator in which voltage induced in the active wires of the armature is always of the same polarity.

A/D Abbreviation for ANALOG-TO-DIGITAL. See ANALOG-TO-DIGITAL CONVERSION.

Ada A microcomputer language designed primarily for use in multi-computer systems, where each small computer communicates with the others, providing some of the advantages of a larger computer.

Adam A communications code word sometimes used for phonetic verbalizing of the letter A. More commonly, ALPHA is used.

adapter **1.** A fitting used to change either the terminal scheme or the size of a jack, plug, or socket to that of another. **2.** A fitting used to provide a transition from one type or style of conductor to another (e.g., waveguide to coaxial line). **3.** An

adapter

auxiliary system or unit used to extend the operation of another system (e.g., a citizens-band adapter for a broadcast receiver).

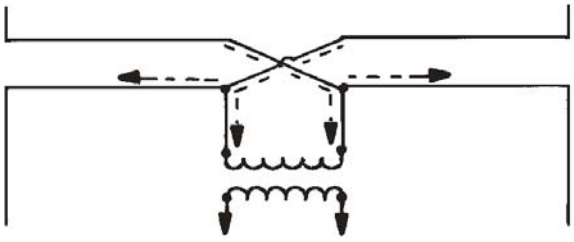
adaptive communication A method of communication that adjusts itself according to the particular requirements of a given time.

adaptive suspension vehicle Abbreviation, ASV. A specialized robot that moves on mechanical legs, rather than on wheels. It generally has six legs and resembles an insect. It is designed to move over extremely irregular or rocky terrain, and to carry a human passenger.

adaptivity The ability of a system to respond to its environment by changing its performance characteristics.

adc Abbreviation of ANALOG-TO-DIGITAL CONVERTER.

Adcock antenna A directional antenna system consisting of two vertical antennas, spaced in such a way that the whole array behaves like a loop antenna. Its members are connected and positioned so that it discriminates against horizontally polarized waves, and delivers output that is proportional to the vector difference of signal voltages induced in the two vertical arms.



Adcock antenna

Adcock direction finder A radio direction-finding system based on the directivity of the ADCOCK ANTENNA.

Adcock radio range A radio range system with four ADCOCK ANTENNAS situated at the corners of a square, and a fifth antenna at the center of the square.

add-and-subtract relay A stepping relay that can be switched either uprange (add) or downrange (subtract).

addend In a calculation, any number to be added to another. Compare AUGEND.

addend register In a digital computer, the register that stores the addend.

adder **1.** In a digital computer, the device or circuit that performs binary addition. A HALF ADDER is a two-input circuit that can produce a sum output and a carry output, but it cannot accommodate a carry signal from another adder. A FULL ADDER can accommodate a carry input, as well as two binary signals to be added. Also see ANALOG ADDER. **2.** A circuit in a color TV receiver that amplifies the receiver primary matrix signal.

additive **1.** The character or characters added to a code to encipher it. **2.** In a calculation, an item that is to be added. **3.** An ingredient, usually in a small quantity, added to another material to improve the latter in quality or performance.

additive color A color formed by combining the rays from two or three primary-colored lights onto a single neutral surface. For example, by projecting a red and a green beam onto a neutral screen, a yellow additive color results.

additive primaries Primary colors that form other colors in a mixing of light (see ADDITIVE COLOR), but are not themselves formed by mixing other additive primaries. For example, red, green, and blue are the additive primaries used in color television. Through appropriate mixing, these colors can be used to generate an unlimited variety of other colors. Compare SUBTRACTIVE PRIMARIES, which form the color spectrum by mixing pigments rather than lights. In additive systems, each superimposed primary color increases the total light output from the reflecting (viewing) surface; in subtractive systems, each superimposed primary decreases the total reflectivity. Thus, equal combination of additive primaries produces gray or white, and equal combination of subtractive primaries produces gray or black.

addition record An extra data store created in a computer during processing.

address **1.** In computer operations, a usually numerical expression designating the location of material within the memory or the destination of such material. **2.** The accurately stated location of information within a computer; a data point within a grid, matrix, or table; a station within a network. **3.** In computer operations, to select the location of stored information.

address comparator A device that ensures that the address being read is correct.

address computation In digital computer operations, the technique of producing or modifying only the address part of an instruction.

address field In a computer, the part of the instruction that gives the address of a bit of data (or a word) in the memory.

address generation The programmed generation of numbers or symbols used to retrieve records from a randomly stored direct-access file.

address indirect An address that specifies a storage location that contains another address.

address memory The memory sections in a digital computer that contain each individual register.

address modification In computer operations, altering only the address portion of an instruction; if the command or instruction routine is then repeated, the computer will go to the new address.

address part In a digital computer instruction, the part of an expression that specifies the location. Also called ADDRESS FIELD.

address register In a computer, a register in which an address is stored.

add/subtract time In a computer, the time required to perform addition or subtraction, excluding the time required to get the quantities from storage and to enter the sum or difference into storage.

add time In computer operations, the time required to perform addition, excluding the time required to get the quantities from storage and to enter the sum into storage.

a/d converter A device that changes an analog quantity into a digital signal. See ANALOG-TO-DIGITAL CONVERSION.

ADF Abbreviation of AUTOMATIC DIRECTION FINDER.

ADI Abbreviation of ALTERNATE DIGIT INVERSION.

adiabatic damping In an accelerator (see ACCELERATOR, **1**), reduction of beam size as beam energy is increased.

adiabatic demagnetization A technique using a magnetic field to keep a substance at a low temperature, sometimes within a fraction of a degree of absolute zero.

adjacency A character-recognition condition in which the spacing reference lines of two characters printed consecutively in line are closer than specified.

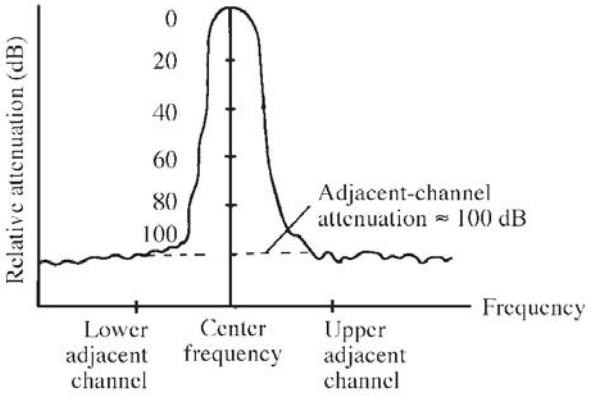
adjacent- and alternate-channel selectivity The selectivity of a receiver or radio-frequency (RF) amplifier, with respect to adjacent-channel and alternate-channel signals. That is, the extent to which a desired signal is passed, and nearby unwanted signals are rejected.

adjacent audio channel See ADJACENT SOUND CHANNEL.

adjacent channel The channel (frequency band) immediately above or below the channel of interest.

adjacent-channel attenuation The reciprocal of the *selectivity ratio* of a radio receiver. The selectivity ratio is the ratio of the sensitivity of a receiver (tuned to a given channel) to its sensitivity in an adjacent channel or on a specified number of channels removed from the original.

adjacent-channel interference In television or radio reception, the interference from stations on adjacent channels. A common form arises from the picture signal in the next higher channel and the sound signal in the next lower channel.



adjacent-channel attenuation

adjacent-channel selectivity The extent to which a receiver or tuned circuit can receive on one channel and reject signals from the nearest outlying channels.

adjacent sound channel In television, the radio-frequency (RF) channel containing the sound modulation of the next lower channel.

adjacent video carrier In television, the radio-frequency (RF) carrier containing the picture modulation of the next higher channel.

adjustable component Any circuit component whose main electrical value can be varied at will (e.g., a variable capacitor, inductor, resistor, or load).

adjustable instrument **1.** An instrument whose sensitivity, range, or response can be varied at will (e.g., multirange meter or wideband generator). **2.** An instrument that requires adjustment or manipulation to measure a quantity (e.g., bridge, potentiometer, or attenuator).

adjustable motor tuning An arrangement that allows the motor tuning of a receiver to be confined to a portion of the frequency spectrum.

adjustable resistor A wirewound resistor in which the resistance wire is partially exposed to allow varying the component's value.

adjustable voltage divider A wirewound resistor with terminals that slide on exposed resistance wire to produce various voltage values.

adjusted circuit A circuit in which leads that are normally connected to a circuit breaker are shunted so that current can be measured under short-circuit conditions without breaker tripping.

adjusted decibels Noise level (in decibels) above a reference noise level (designated arbitrarily as zero decibels) measured at any point in a system with a noise meter that has previously been adjusted for zero (at reference), according to specifications.

admittance Symbol, *Y*. Unit, siemens (formerly mho). The property denoting the comparative ease with which an alternating current flows through a circuit or device. Admittance is the reciprocal of impedance (Z): $Y = 1/Z$.

adp **1.** Abbreviation of AMMONIUM DIHYDROGEN PHOSPHATE, a piezoelectric compound used for sonar crystals. **2.** Abbreviation of AUTOMATIC DATA PROCESSING.

adsorption Adhesion of a thin layer of molecules of one substance to the surface of another without absorption. An example is adsorption of water to the surface of a dielectric. This term is often confused with ABSORPTION because the spellings of the two words are almost identical. Compare ABSORPTION.

adu Abbreviation of *automatic dialing unit.*

advanced-class license An amateur-radio license conveying all operating privileges, except for a few small bands that are allocated to extra-class licensees. The second-highest class of amateur license.

advance information Data published prior to the actual production or availability of a manufactured component, circuit, or system. Advance information is often only an approximate reflection of the expected characteristics of a device.

advance wire A resistance wire used in thermocouples and precision applications. It is an alloy of copper and nickel, which has high resistivity and a negligible temperature coefficient of resistance.

aeolight A glow lamp using a cold cathode and a mixture of inert gases. Because its illumination can be regulated with an applied signal voltage, it is sometimes used as a modulation indicator for motion-picture sound recording.

aerial See ANTENNA.

aerial cable A wire or cable run through the air, using support structures, such as towers or poles.

aerodiscone antenna A miniature discone antenna designed for use on aircraft.

aerodynamics The science dealing with forces exerted by air and other gases in motion—especially upon bodies (such as aircraft) moving through these gases.

aerogram See RADIOGRAM.

aeromagnetic Pertaining to terrestrial magnetism, as surveyed from a flying aircraft.

aeronautical advisory station A civil defense and advisory communications station in service for the use of private aircraft stations.

aeronautical broadcasting service The special service that broadcasts information regarding air navigation and meteorological data pertinent to aircraft operation.

aeronautical broadcast station A station of the aeronautical broadcasting service.

aeronautical fixed service A fixed radio service that transmits information regarding air navigation and flight safety.

aeronautical fixed service station A station that operates in the aeronautical fixed service.

aeronautical ground station A land station that provides communication between aircraft and ground stations.

aeronautical marker-beacon signal A distinctive signal that designates a small area above a beacon transmitting station for aircraft navigation.

aeronautical marker-beacon station A land station that transmits an aeronautical marker-beacon signal.

aeronautical mobile service A radio service consisting of communications between aircraft, and between aircraft and ground stations.

aeronautical radio-beacon station An aeronautical radio-navigation land station that transmits signals used by aircraft and other vehicles to determine their position.

aeronautical radionavigation services Services provided by stations transmitting signals used in the navigation of aircraft.

aeronautical radio service A service that encompasses aircraft-to-aircraft, aircraft-to-ground, and ground-to-aircraft communications important to the operation of aircraft.

aeronautical station A station on land, and occasionally aboard ship, operating in the aeronautical mobile service.

Aeronautical Telecommunication Agency The agency that administers the operation of stations in the aeronautical radio service.

aeronautical telecommunications Collectively, all of the electronic and nonelectronic communications used in the aeronautical service.

aeronautical utility land station A ground station in an airport control tower that provides communications having to do with the control of aircraft and other vehicles on the ground.

aeronautical utility mobile station At an airport, a mobile station that communicates with aeronautical utility land stations and with aircraft and other vehicles on the ground.

aerophare See RADIO BEACON.

aerospace **1.** The region encompassing the earth's atmosphere and extraterrestrial space. **2.** Pertaining to transport and travel in the earth's atmosphere and in outer space. This includes aircraft, orbiting space vessels, and interplanetary spacecraft.

AES Abbreviation for *Audio Engineering Society.*

AEW Abbreviation of *airborne (or aircraft) early warning.*

aF Abbreviation of ATTOFARAD.

AF Abbreviation of AUDIO FREQUENCY.

AFC **1.** Abbreviation of AUTOMATIC FREQUENCY CONTROL. **2.** Abbreviation of AUDIO-FREQUENCY CHOKE.

affirmative In voice communications, a word often used for "yes"—especially when interference is present or signals are weak.

AFIPS Acronym for *American Federation of Information Processing Societies.*

afpc Abbreviation of *automatic frequency/phase control.*

AFSK Abbreviation of AUDIO-FREQUENCY-SHIFT KEYING.

afterglow The tendency of the phosphor of a cathode-ray-tube screen to glow for a certain time after the cathode-ray beam has passed. Also see PERSISTENCE.

afterpulse An extraneous pulse in a multiplier phototube (photomultiplier), induced by a preceding pulse.

AF transformer See AUDIO-FREQUENCY TRANSFORMER.

a/g Abbreviation of AIR-TO-GROUND.

AGC Abbreviation of AUTOMATIC GAIN CONTROL.

AGE Abbreviation of AEROSPACE GROUND EQUIPMENT.

agent An active force, condition, mechanism, or substance that produces or sustains an effect. Thus, a sudden voltage rise is a triggering agent in certain bistable circuits; arsenic is a doping agent in semiconductor processing; the slow cooling of a heated metal to improve ductility is an ANNEALING AGENT.

aging **1.** An initial run of a component or circuit over a certain period of time shortly after manufacture to stabilize its characteristics and performance. **2.** The changing of electrical characteristics or of chemical properties over a protracted period of time.

agonic line An imaginary line connecting points on the earth's surface at which a magnetic needle shows zero declination (i.e., points to true geographic north).

AGREE Acronym for *Advisory Group on Reliability of Electronics Equipment.*

Ah Abbreviation of AMPERE-HOUR. Depending on the standard used, the abbreviation can be amp-hr, a-h, a-hr, or A-h.

aH Abbreviation of ATTOHENRY.

aided tracking In radar and fire control, a system in which manual correction of target tracking error automatically corrects the rate of movement of the tracking mechanism.

AIEE Abbreviation for *American Institute of Electrical Engineers*, now consolidated with the IRE, forming the IEEE.

AIP Abbreviation for *American Institute of Physics.*

air The mixture of gases that constitutes the earth's atmosphere and figures prominently in the manufacture and operation of numerous electronic devices. By volume, air contains about 21 percent oxygen, 78 percent nitrogen, and lesser amounts of argon, carbon dioxide, helium, hydrogen, krypton, neon, and xenon. It also contains varying amounts of water vapor, and in smoggy areas, carbon monoxide and the oxides of sulfur and nitrogen.

airborne intercept radar A type of short-range radar used aboard fighter and interceptor aircraft for tracking their targets.

airborne long-range input Equipment aboard aircraft, for the purpose of facilitating the use of long-range missiles.

airborne noise See ACOUSTIC NOISE.

airborne radar platform Surveillance and altitude-finding radar used aboard aircraft.

air capacitor A capacitor in which air is the dielectric between two sets of conductive plates. Also called *air-dielectric capacitor.*

aircarrier aircraft station On an aircraft, a radio station that is involved in carrying people for hire or in transporting cargo.

air cell A primary electrochemical cell in which the positive electrode is depolarized by reduced oxygen in the air.

air cleaner See DUST PRECIPITATOR.

air column The open space inside an acoustic chamber, pipe, or horn.

air-cooled component A component, such as a power transistor, that is cooled by circulating air, compared with one cooled by a circulating liquid, such as water or oil.

air-cooled transistor A transistor (particularly a power transistor) from which the heat of operation is drawn away, through radiation and convection, into the surrounding air. The transistor is usually mounted on a heatsink or fitted with fins.

air-cooled tube An electron tube from which heat is drawn away, mainly via convection, into the surrounding air. A device called a *chimney* can be placed around the tube, through which air is blown by a fan. Cool air enters through the bottom of the assembly, and hot air escapes from the top.

air-core inductor A coil of wire wound around a hollow cylindrical form or in a loop, designed to introduce inductive reactance into a circuit or system. In practice, the maximum attainable inductance is approximately 1 mH. This type of inductor is used in some wireless transmitters, receivers, and antenna networks. The component can be designed for high current-carrying capacity by using heavy-gauge wire and a large winding radius. The magnetic lines of flux extend considerably beyond the interior of the coil, especially along the winding axis. This increases the likelihood of mutual inductance between the coil and surrounding electrical components, devices, or circuits.

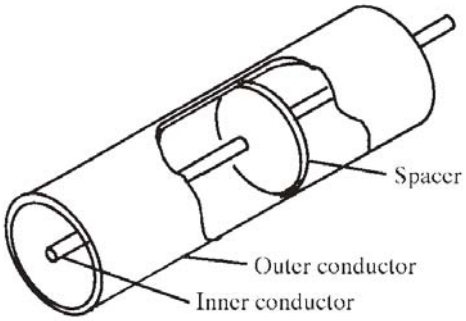
air-core transformer A transformer without a ferromagnetic core, so called because air is the only material at the center of (and immediately surrounding) the transformer coils.

aircraft bonding The practice of solidly connecting, for electrical purposes, the metal parts of an aircraft, including the engine.

aircraft flutter Rapid, repetitive fading and intensifying of a received radio or television signal, resulting from reflections of the signal by passing aircraft.

aircraft station A nonautomatic radio communications station installed on an aircraft.

air-dielectric coax A special type of COAXIAL CABLE designed to have minimum loss. The space between inner and outer conductors is mostly empty (i.e., air-filled). Some such cables are sealed and filled with an inert gas. The inner conductor is held away from the inner wall of the outer conductor by beads, washers, or a spiral-wound filament of high-grade dielectric material, such as polyethylene.



air-dielectric coax

air environment Pertaining to communications equipment aboard aircraft.

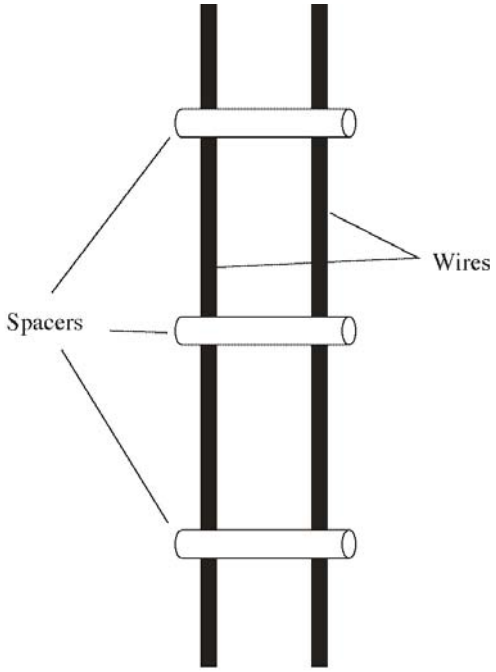
airflow The path or movement of air in, through, or around an electronic device or piece of equipment—especially pertaining to an AIR-COOLED COMPONENT.

air gap **1.** A narrow space between two parts of a magnetic circuit (e.g., the gap in the core of a filter choke). Often, this gap is filled with a nonmagnetic material, such as plastic, for mechanical support. **2.** The space between two or more magnetically coupled or electrostatically coupled components. **3.** A device that gets its name from the narrow gap between two small metal balls, needle points, or blunt rod tips therein. When an applied voltage is sufficiently high, a spark discharges across the gap.

air/ground control radio station A station for aeronautical telecommunications related to the operation and control of local aircraft.

air-insulated line **1.** An open-wire feeder or transmission line. Typically, the line consists of two parallel wires held apart by separators (bars or rods of high-grade dielectric material) situated at wide intervals. **2.** AIR-DIELECTRIC COAX.

air-moving device A mechanical device, such as a specially designed fan or blower, used to facilitate air cooling of electronic components.



air-insulated line, 1

airport beacon A radio or light beacon that marks the location of an airport.

airport control station A station that provides communications between an airport control tower and aircraft in the vicinity.

airport surveillance radar An air-traffic-control radar that scans the airspace within about 60 miles (approximately 100 kilometers) of an airport, and displays in the control tower the location of all aircraft below a certain altitude and all obstructions in the vicinity.

air-position indicator An airborne computer system that, using airspeed, aircraft heading, and elapsed time, furnishes a continuous indication of the position of the aircraft. The indication is affected by high-altitude winds. Compare GROUND-POSITION INDICATOR.

air-to-air communication Radio transmission from one aircraft to another in flight. Compare AIR-TO-GROUND COMMUNICATION and GROUND-TO-AIR COMMUNICATION.

air-to-ground communication Radio transmission from an aircraft in flight to a station located on the ground. Compare AIR-TO-AIR COMMUNICATION and GROUND-TO-AIR COMMUNICATION.

air-to-ground radio frequency The carrier frequency, or band of such frequencies, allocated for transmissions from an aircraft to a ground station.

airwaves **1.** Radio waves. The term is slang, but is widely used. It probably came from the public's

mistaken notion that radio signals are propagated by the air. **2.** Skywaves.

Al Symbol for ALUMINUM.

alabamine See ASTATINE.

alacratized switch A mercury switch in which the tendency of the mercury to stick to the parts has been reduced.

alarm **1.** An electronic security system. **2.** A silent and/or audible alert signal transmitted by an electronic security system when an intrusion occurs. **3.** A silent and/or audible signal that informs personnel of the occurrence of an equipment malfunction.

alarm circuit A circuit that alerts personnel to a system malfunction, a detected condition, or an intruder.

alarm condition **1.** An intrusion or equipment malfunction that triggers an alarm circuit. **2.** The operation of an alarm circuit that occurs in response to an intrusion or equipment malfunction.

alarm hold A device that keeps an alarm sounding once it has been actuated.

alarm output The signal sent from an alarm circuit to a siren, buzzer, computer, or other external device to alert personnel to an ALARM CONDITION.

alarm relay A relay that is actuated by an alarm device.

A-law A form of companding law frequently used in European electronics (the mu-law is more often used in North America). A nonlinear transfer characteristic in companding circuits. It can be continuous, or can be a piecewise linear approximation of a continuous function.

A-law companded Companding by means of an 8-bit binary code following the A-LAW, a specific companding function.

albedo For an unpolished surface, the ratio of reflected light to incident light. It can vary from 0.0 to 1.0, or from 0 to 100 percent.

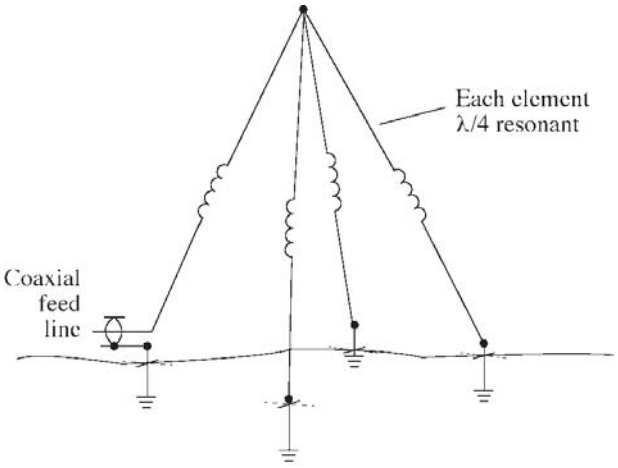
albedograph An instrument for measuring the albedo of planets.

ALC Abbreviation of AUTOMATIC LEVEL CONTROL.

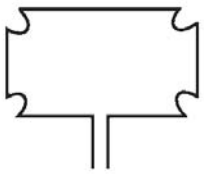
alerting device An audible alarm that includes a self-contained solid-state audio oscillator. Powered from the ac line or a battery, the device produces a raucous noise when actuated.

Alexanderson antenna A very-low-frequency (VLF) and low-frequency (LF) vertically polarized antenna, designed to minimize ground losses in structures of manageable height. It usually consists of several wires, each quarter-wave resonant with a loading coil, and all connected together at the apex of a tower. The antenna is fed between the ground and the base of one of the wires.

Alford antenna A loop antenna, in a square configuration, with the corners bent toward the center to lower the impedance at the current nodes.



Alexanderson antenna



Alford antenna

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

algebraic operation A form of electronic calculator operation, in which the keystrokes proceed in an intuitive sequence, following the way in which the calculation is written down. Compare REVERSE POLISH NOTATION.

algebraic sum The sum of two or more quantities with consideration of their signs. Compare ARITHMETIC SUM.

algorithm A step-by-step procedure for solving a problem, (e.g., the procedure for finding the square root of a number). It can be expressed in a line-by-line instruction set or as a flowchart.

algorithmic language A computer language used to describe a numeral or algebraic process.

alias A label that is an alternate term for items of the same type; a label and several aliases can identify the same data element in a computer program.

aliasing **1.** In analog-to-digital (A/D) conversion, a false output signal that results from a sampling rate that is too slow. Ideally, the sampling rate is at least twice the highest input signal frequency. **2.** Sawtooth-like irregularities, also called *jaggies*, which are sometimes introduced into a bit-mapped computer image when it is changed in size.

aliasing noise A form of signal distortion caused by a signal with an excessive bandwidth.

align **1.** To adjust (i.e., to preset) the circuits of an electronic system, such as a receiver, transmitter, or test instrument, for predetermined response. **2.** To arrange elements in a certain precise orientation and spacing, relative to each other, as in a Yagi antenna. **3.** To orient antennas so that they are in line of sight, with respect to each other.

alignment The process of ensuring that equipment, components, or systems are adjusted, both physically and electronically, for the most efficient possible performance.

alignment chart A line chart for the simple solution of electronic problems. It is so called because its use involves aligning numerical values on various scales, the lines intersecting at the solution on another scale. Also called *nomograph.*

alignment pin A pin or protruding key, usually in the base of a removable or plug-in component, to ensure that the latter will be inserted correctly into a circuit. Often, the pin mates with a keyway, notch, or slot.

alignment tool A specialized screwdriver or wrench (usually nonmagnetic) used to adjust padder or trimmer capacitors or inductor cores.

alive See LIVE.

alkali See BASE, **2.**

alkali metals Metals whose hydroxides are bases (alkalis). The group includes cesium, francium, lithium, potassium, rubidium, and sodium.

alkaline battery **1.** A battery composed of alkaline cells and characterized by a relatively flat discharge curve under load.

alkaline cell A common non-rechargeable electrochemical cell that employs granular zinc for the negative electrode, potassium hydroxide as the electrolyte, and a device called a *polarizer* as the positive electrode. Produces approximately 1.5 volts under no-load conditions. The geometry of construction is similar to that of the zinc–carbon cell, but it can deliver current effectively at lower temperatures. Cells of this type have shelf lives longer than zinc–carbon cells; they also have greater energy-storage capacity per unit volume, but they are more expensive than zinc–carbon cells. They are used in calculators, transistor radios, and cassette tape and compact-disc players. Compare ZINC–CARBON CELL.

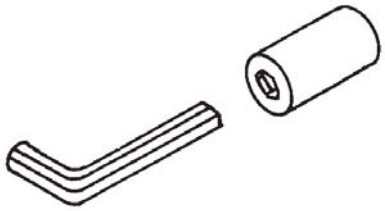
alkaline-earth metals The elemental metals barium, calcium, strontium, and sometimes beryllium, magnesium, and radium, some of which are used in vacuum tubes.

alkaline earths Substances that are oxides of the alkaline-earth metals. Some of these materials are used in vacuum tubes.

all-diffused A type of INTEGRATED CIRCUIT in which both active and passive elements have been fabricated by diffusion and related processes.

Allen screw A screw fitted with a six-sided (hexagonal) hole.

Allen wrench A tool used to tighten or loosen an Allen screw. It is a hexagonal rod and is available in various sizes.



Allen screw and wrench

alligator clip A spring-loaded clip with jagged teeth, designed to be used for temporary electrical connections.

allocate **1.** To assign (especially through legislation) operating frequencies or other facilities or conditions needed for scientific or technical activity; see, for example, ALLOCATION OF FREQUENCIES. **2.** In computer practice, to assign locations in the memory or registers for routines and subroutines.

allocated channel A frequency channel assigned to an individual or group.

allocated-use circuit **1.** A circuit in which one or more channels have been authorized for the exclusive use of one or more services. **2.** A communications link assigned to users needing it.

allocation of frequencies See RADIO SPECTRUM.

allocator A telephone system distributor associated with the finder control group relay assembly. It reserves an inactive line-finder for another call.

allophone A variation in the sound of a phoneme, depending on what comes before and/or after the phoneme in the course of speech. Important in speech recognition and synthesis. There are 128 different phoneme variations in the English language. See PHONEME.

alloter relay A telephone system line-finder relay that reserves an inactive line-finder for the next incoming call from the line.

allotropic Pertaining to a substance existing in two forms.

alloy A metal that is a mixture of several other metals (e.g., brass from copper and zinc), or of a metal and a nonmetal.

alloy deposition In semiconductor manufacture, depositing an alloy on a substrate.

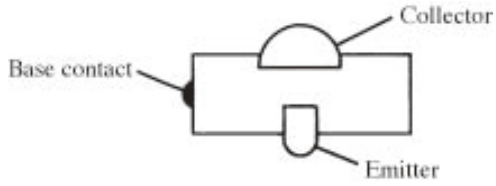
alloy-diffused transistor A transistor in which the base is diffused and the emitter is alloyed. The collector is provided by the semiconductor substrate into which alloying and diffusion are affected. Compare ALLOY TRANSISTOR and DIFFUSE TRANSISTOR.

alloy diode A junction-type semiconductor diode in which a suitable substance (such as p-type) is alloyed into a chip of the opposite type (such as

n-type) to form the junction. Also called *alloy-junction diode.*

alloy junction In a semiconductor device, a positive/negative (pn) junction formed by alloying a suitable material (such as indium) with the semiconductor (silicon or germanium).

alloy transistor A transistor whose junctions are created by alloying. Also see ALLOY JUNCTION.



alloy transistor

all-pass filter Also called *all-pass network.* A filter that (ideally) introduces a desired phase shift or time delay, but has zero attenuation at all frequencies.

all-relay central office In telephone service, an automatic central-office switchboard that uses relay circuits to make line interconnections.

all-wave Pertaining to a wide operating-frequency range. Few systems are literally all-wave. For example, a so-called "all-wave radio receiver" might cover 500 kHz to 30 MHz only.

all-wave antenna An antenna that can be operated over a wide frequency range with reasonable efficiency and preferably without needing readjustment. Examples are the DISCONE ANTENNA and the LOG-PERIODIC ANTENNA.

all-wave generator A signal generator that will supply output over a wide range of frequencies.

all-wave receiver A radio receiver that can be tuned over a very wide range of frequencies, such as 10 kHz to 70 MHz.

allyl plastics Plastics, sometimes used as dielectrics or for other purposes in electronics, based on resins made by polymerization of monomers (such as diallyl phthalate) that contain allyl groups.

alnico Coined from the words aluminum, nickel, and cobalt. An alloy used in strong permanent magnets, it contains the constituents noted plus (sometimes) copper or titanium.

alpha **1.** Symbol, α. The current gain of a common-base-connected bipolar transistor. It is the ratio of the differential of collector current to the differential of emitter current; $\alpha = dI_C/dI_E$. For a junction transistor, alpha is always less than unity, but very close to it. **2.** In voice communications, the phonetic representation of the letter A.

alphabet The set of all characters in a natural language.

alphabetic coding In computer practice, an abbreviation system for coding information to be fed into the computer. The coding contains letters, words, and numbers.

alphabetic-numeric Also called *alphabetical-numerical* and *alphanumeric.* In computer operations, pertaining to letters of the alphabet and special characters, and to numerical digits.

alpha cutoff frequency Also called *alpha cutoff.* In a bipolar transistor circuit, the frequency at which the alpha (current gain) becomes 0.707 (70.7 percent) of its value at 1 kHz. A bipolar transistor can have considerable gain at its alpha cutoff. This specification denotes how rapidly a transistor loses gain as the frequency increases, an important consideration in the design of radio-frequency (RF) amplifiers. See ALPHA. Compare GAIN BANDWIDTH PRODUCT.

alpha decay The decay of a substance in which the nuclei of the atoms emit alpha particles, resulting in a change of the atomic number and atomic weight of the substance over a period of time.

alphanumeric See ALPHABETIC-NUMERIC.

alphanumeric code In computer operations or in communications, a code composed of, or using, both letters and numbers.

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

alpha particle A nuclear particle bearing a positive charge. Consisting of two protons and two neutrons, it is given off by certain radioactive substances. Compare BETA RAYS and GAMMA RAYS.

alpha system An alphabetic code-signaling system.

alphatron An ionizing device in which the radiation source is an emitter of alpha particles.

alteration An inclusive-OR operation.

alternate channel In communications, a channel situated two channels higher or lower than a given channel. Compare ADJACENT CHANNEL.

alternate-channel interference Interference caused by a transmitter operating in the channel beyond an adjacent channel. Compare ADJACENT-CHANNEL INTERFERENCE.

alternate digit inversion In multiplex equipment, a method of switching the binary signals to the opposite state, in accordance with A-law companding.

alternate frequency A frequency allocated as an alternative to a main assigned frequency and used under certain specified conditions.

alternate-mark inversion signal A signal that conveys bits in which the successive signals are of opposite polarity (positive, then negative, then positive, etc.). They are equal in absolute value amplitude.

alternate mode The technique of displaying several signals on an oscilloscope screen by rapidly switching the signals in sequence at the end of each sweep.

alternate routing A secondary, or backup, communications path, used when primary (normal) routing is impossible.

alternating-charge characteristic In a nonlinear capacitor, the relationship between the instanta-

neous charge and the instantaneous value of an alternating voltage.

alternating current Abbreviation, ac. A current that periodically reverses its direction of flow. In one cycle, an alternation starts at zero, rises to a maximum positive level, returns to zero, rises to a maximum negative level, and again returns to zero. The number of such cycles completed per second is termed the *ac frequency.* Also see CURRENT.

alternating-current continuous wave An amplitude-modulated signal resulting from the operation of an oscillator or RF amplifier with raw ac voltage.

alternating current/direct current See AC/DC.

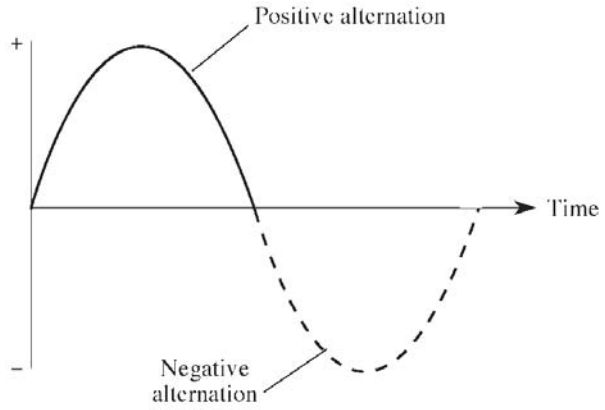
alternating-current erasing head See AC ERASING HEAD.

alternating-current pulse A short-duration ac wave.

alternating-current transmission **1.** The propagation of alternating currents along a length of conductor—especially for power-transfer purposes. **2.** A means of picture transmission in which a given signal strength produces a constant value of brightness for a very short time.

alternating voltage Also called *alternating-current voltage.* See AC VOLTAGE.

alternation In ac practice, a half cycle. In a complete cycle, there are two alternations, one in the positive direction and one in the negative direction.



alternation

alternative denial A NOT-AND operation.

alternator Any mechanically driven machine for generating ac power. Sometimes specifically one having a permanent-magnet rotor, such as a *magneto.*

altimeter station An airborne transmitter whose signals are used to determine the altitude of aircraft.

altitude **1.** The vertical distance of an object above sea level. **2.** The vertical distance of an object above the earth's surface. **3.** The angle, measured in degrees, with respect to the horizon, at which a highly directional antenna is pointed.

altitude delay In a plan-position-indicating type of radar, the sync delay introduced between transmission of the pulse and start of the trace on the indicator screen to eliminate the altitude circle in the display.

ALU Abbreviation of ARITHMETIC AND LOGIC UNIT.

alumel An alloy used in the construction of one type of THERMOCOUPLE. It is composed of nickel (three parts) and aluminum (one part).

alumina An aluminum-oxide ceramic used in electron tube insulators and as a substrate in the fabrication of thin-film circuits.

aluminum Symbol, Al. An elemental metal. Atomic number, 13. Atomic weight, 26.98. Aluminum is widely used in electronics, familiar instances being chassis, wire, shields, semiconductor doping, and electrolytic-capacitor plates.

aluminum antimonide Formula, AlSb. A crystalline compound useful as a semiconductor dopant.

aluminized screen A television picture-tube screen with a thin layer of aluminum deposited on its back to brighten the image and reduce ion-spot formation.

Am Symbol for AMERICIUM.

A/m Abbreviation of *ampere per meter:* the SI unit of magnetic field strength.

AM **1.** Abbreviation of *amplitude modulator.* **2.** Abbreviation of AMPLITUDE MODULATION.

amalgam An alloy of a metal and mercury. Loosely, any combination of metals.

amateur **1.** A nonprofessional, usually noncommercial devotee of any technology (i.e., a hobbyist). **2.** A licensed radio operator legally authorized to operate a station in the AMATEUR SERVICE.

amateur band Any band of radio frequencies assigned for noncommercial use by licensed radio amateurs (see AMATEUR, **2**). In the United States, numerous such bands are above 1.8 MHz (160 meters). Also see AMATEUR SERVICE and AMATEUR STATION.

amateur call letters Call letters assigned by a government licensing authority—especially to amateur stations. Call-letter combinations consist of a letter prefix denoting the country in which the station is situated, plus a number designating the location within the country, and two or more letters identifying the particular station. For example: W6ABC: W (or K) = United States, 6 = California, and ABC = identification of individual licensee (issued alphabetically, except under special circumstances).

amateur callsign See AMATEUR CALL LETTERS.

amateur extra-class license The highest class of amateur-radio operator license in the United States. It conveys all operating privileges.

amateur radio **1.** A general term, referring to the practice of operation, experimentation, and other work in and related to the amateur service. **2.** The hardware that comprises an amateur radio station. **3.** A radio receiver, transmitter, or transceiver that is specifically designed for operation in the amateur bands.

amateur radio operator Also called *radio ham* or *ham radio operator.* An individual licensed to transmit radio signals in the amateur service.

amateur service A two-way radio service, existing purely for hobby purposes (i.e., without pecuniary interest).

amateur station A radio station licensed in the AMATEUR SERVICE.

amauroscope An electronic aid to the blind, in which photocells in a pair of goggles receive light images. Electric pulses proportional to the light are impressed upon the visual receptors of the brain through electrodes in contact with nerves above each eye.

amber A yellow or brown fossil resin that is historically important in electronics. It is the first material reported to be capable of electrification by rubbing (Thales, 600 BC). Also, the words *electricity*, *electron*, and *electronics* are derived from the Greek name for amber, *elektron.*

ambience The acoustic characteristic of a room, in terms of the total amount of sound reaching a listener from all directions.

ambient An adjective meaning "surrounding." Often used as a noun in place of the adjective-noun combination (thus, "10 degrees above ambient," instead of "10 degrees above ambient temperature").

ambient humidity The amount of moisture in the air at the time of measurement or operations in which dampness must be accounted for.

ambient level The amplitude of all interference (acoustic noise, electrical noise, illumination, etc.) emitted from sources other than that of a signal of interest.

ambient light Also called *ambient illumination.* Room light or outdoor light incident to a location at the time of measurement or operations.

ambient-light filter In a television receiver, a filter mounted in front of a picture-tube screen to minimize the amount of ambient light reaching the screen.

ambient noise **1.** In electrical measurements and operation, background electrical noise. **2.** In acoustical measurements and operations, audible background noise.

ambient pressure Surrounding atmospheric pressure.

ambient temperature The temperature surrounding apparatus and equipment (e.g., room temperature).

ambient-temperature range **1.** The range over which ambient temperature varies at a given location. **2.** The range of ambient temperature that will cause no malfunction of, or damage to, a circuit or device.

ambiguity **1.** Any unclear, illogical, or incorrect indication or result. **2.** The seeking of a false null by a servo. **3.** In digital computer operations, an error resulting from improper design of logic.

ambiguous count In digital counters, a clearly incorrect count. See ACCIDENTAL TRIGGERING.

ambisonic reproduction A close approximation of the actual directional characteristics of a sound in a given environment. The reproduced sound almost exactly duplicates the sound in the actual environment in which it was recorded.

American Morse code (Samuel F. B. Morse, 1791–1872). Also called *Railroad Morse.* A telegraph code, at one time used on wire telegraph lines in the United States. It differs from the *Continental code*, also called the *International Morse Code*, which is used in radiotelegraphy. Compare CONTINENTAL CODE.

American National Standards Institute Acronym, ANSI. An industrial group in the United States that encourages companies to manufacture devices and equipment in accordance with certain standards. The objective is to minimize hardware incompatibility problems.

American Radio Relay League A worldwide organization of amateur radio operators, headquartered in Newington, Connecticut. The official publications are the monthly magazines, *QST* and *QEX.* They also publish numerous books and other educational materials.

American Standards Association Abbreviation, ASA. At one time, the name of the national association in the U.S. devoted to the formation and dissemination of voluntary standards of dimensions, performance, terminology, etc. See ANSI.

American wire gauge Abbreviation, AWG. Also called *Brown and Sharpe gauge* or *B & S gauge.* The standard American method of designating wire sizes. Wire is listed according to gauge number from 0000 (460 mils diameter) to 40 (3.145 mils diameter).

americium Symbol, Am. A radioactive elemental metal first produced artificially in the 1940s. Atomic number, 95. Atomic weight, 243.

AM/FM receiver A radio set that can receive either amplitude-modulated or frequency-modulated signals. Usually, a band switch incorporates the demodulation-selection circuitry so that as the frequency range is changed, the appropriate detector is accessed.

AM/FM transmitter A radio transmitter whose output signal can be frequency- or amplitude-modulated by a panel selector switch.

AM/FM tuner A compact radio receiver unit that can handle either amplitude- or frequency-modulated signals, and delivers low-amplitude output to a high-fidelity audio power amplifier. Compare AM TUNER and FM TUNER.

Character	*Symbol*	*Character*	*Symbol*
A	. —	U	. . —
B	— . . .	V	. . . —
C	— . — .	W	. — —
D	— . .	X	— . . —
E	.	Y	— . — —
F	. . — .	Z	— — . .
G	— — .	1	. — — —
H	. . . .	2	. . — — —
I	. .	3	. . . — —
J	. — — —	4	. . . . —
K	— . —	5	. . . . .
L	. — . .	6	— . . . .
M	— —	7	— — . . .
N	— .	8	— — — . .
O	— — —	9	— — — — .
P	. — — .	0	— — — — —
Q	— — . —	period	. — . — . —
R	. — .	comma	— — . . — —
S	. . .	question	. . — — . .
T	—	mark	— . . . . —

American Morse Code

American Wire Gauge (AWG) Diameters

AWG	Millimeters	Inches	AWG	Millimeters	Inches
1	7.35	0.289	21	0.723	0.0285
2	6.54	0.257	22	0.644	0.0254
3	5.83	0.230	23	0.573	0.0226
4	5.19	0.204	24	0.511	0.0201
5	4.62	0.182	25	0.455	0.0179
6	4.12	0.163	26	0.405	0.0159
7	3.67	0.144	27	0.361	0.0142
8	3.26	0.128	28	0.321	0.0126
9	2.91	0.115	29	0.286	0.0113
10	2.59	0.102	30	0.255	0.0100
11	2.31	0.0909	31	0.227	0.00894
12	2.05	0.0807	32	0.202	0.00795
13	1.83	0.0720	33	0.180	0.00709
14	1.63	0.0642	34	0.160	0.00630
15	1.45	0.0571	35	0.143	0.00563
16	1.29	0.0508	36	0.127	0.00500
17	1.15	0.0453	37	0.113	0.00445
18	1.02	0.0402	38	0.101	0.00398
19	0.912	0.0359	39	0.090	0.00354
20	0.812	0.0320	40	0.080	0.00315

AMI See ALTERNATE-MARK INVERSION SIGNAL.

A-minus Also, A-. The negative terminal of an A battery, or pertaining to the part of a circuit connected to that terminal.

ammeter An instrument used to measure the amount of current (in amperes) flowing in a circuit.

ammeter shunt A resistor connected in parallel with an ammeter to increase its current range. Also see AYRTON-MATHER GALVANOMETER SHUNT.

ammeter-voltmeter method The determination of resistance or power values from the measurement of voltage (E) and current (I). For resistance, $R = E/I$; for power, $P = EI$.

ammonium chloride Formula, NH_4Cl. The electrolyte in the carbon-zinc type of primary cell. Also called SAL AMMONIAC.

AMNL Abbreviation of AMPLITUDE-MODULATION NOISE LEVEL.

amortisseur winding **1.** A winding that acts against pulsation of the magnetic field in an electric motor. **2.** A winding that acts to prevent oscillation in a synchronous motor.

amorphous substance A noncrystalline material.

amp **1.** Slang for AMPERE. **2.** Slang for AMPLIFIER—especially in audio high-fidelity applications.

ampacity Current-carrying capacity expressed in amperes.

amperage The strength of an electric current (i.e., the number of amperes).

ampere (Andre Marie Ampere, 1775-1836). Abbreviations, A (preferred), a, amp. The SI base unit of current intensity (I). The ampere is the constant current that, if maintained in two straight parallel conductors of infinite length and of negligible circular cross section and placed 1 meter apart in a vacuum, would produce between the conductors a force of 2×10^{-7} newton per meter. One ampere flows through a 1-ohm resistance when a potential of 1 volt is applied; thus $I = E/R$. Also see MICROAMPERE, MILLIAMPERE, NANOAMPERE, and PICOAMPERE.

ampere balance A device consisting of two conductors in which the force between them (caused by current) is balanced against the gravitational force exerted on an object in the gravitational field of the earth. Used for the precise determination of current of large dimension, or of the size of the ampere.

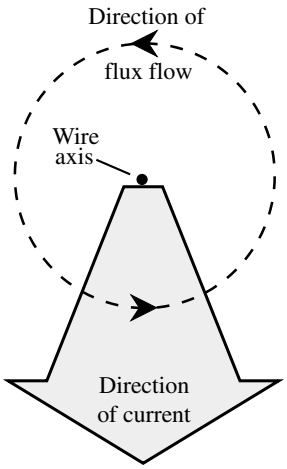
ampere-hour Abbreviations: Ah, amp-hr. The quantity of electricity that passes through a circuit in one hour when the rate of flow is one ampere. Also see BATTERY CAPACITY.

ampere-hour meter An instrument for measuring ampere-hours. It contains a small motor driven by the current being measured and which moves a point on an ampere-hour scale. The motor speed is proportional to the current. The position of the pointer is proportional to current and elapsed time.

Ampere's law Current flowing in a wire generates a magnetic flux that encircles the wire in the clockwise direction when the current is moving away from the observer.

ampere-turn Symbol, NI. A unit of magnetomotive force equal to 1 ampere flowing in a single-turn coil. The ampere-turns value for any coil is obtained by multiplying the current (in amperes) by the number of turns in the coil.

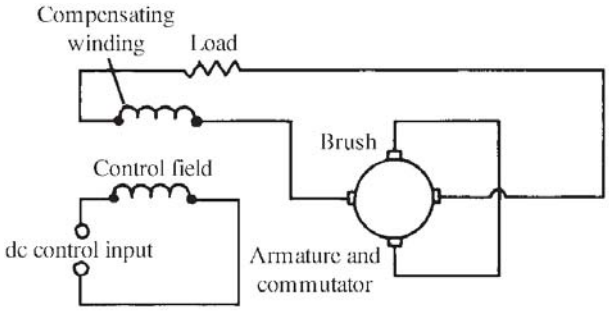
Amperian whirl The stream of electrons in a single-turn, current-conducting wire loop acting as an elementary electromagnet.



Ampere's Law

amp-hr One style of abbreviating AMPERE-HOUR. Also, Ah.

amplidyne A dynamo-like rotating dc machine that can act as a power amplifier because the response of the output voltage to changes in field excitation is quite rapid. Used in servo systems.



amplidyne

amplification **1.** The process of increasing the magnitude of a signal. This entails an input signal controlling a local power supply to produce a larger output signal. Depending on the kind of input and output signals, amplification can be categorized as CURRENT, VOLTAGE, POWER, or some combination of these. **2.** The qualitative signal increase resulting from the process in **1**. **3.** The quantitative signal increase (resulting from the process in **1**), expressed as a factor (such as 100) or in terms of *decibels* (dB). See AMPLIFICATION FACTOR and DECIBEL.

amplification factor **1.** The ratio of the output voltage, current, or power to the input voltage, current, or power of an AMPLIFIER circuit. For voltage or current, this ratio has meaning only when the input and output impedances are identical. **2.** The number of decibels by which an AMPLIFIER circuit increases the amplitude of a signal. For voltage or current, this figure has meaning only when the input and output impedances are identical. See DECIBEL. **3.** The ALPHA or BETA of a bipolar transistor. **4.** In the operation of an electron tube, the ratio of the derivative (instantaneous rate of change) of the plate voltage to the derivative of the grid voltage, for zero change in plate current.

amplified ALC Abbreviation, AALC. An automatic-level-control (ALC) system that uses the amplification of the fed-back control signal. It is used in RF power amplifiers, particularly single-sideband (SSB) linear amplifiers, to prevent overmodulation and nonlinearity.

amplified back bias A declining voltage developed across a fast-time-constant circuit in an amplifier stage and fed back into a preceding stage.

amplifier Any device that increases the magnitude of an applied signal. It receives an input signal and delivers a larger output signal that, in addition to its increased amplitude, is a replica of the input signal. Also see CURRENT AMPLIFIER, POWER AMPLIFIER, and VOLTAGE AMPLIFIER.

amplifier diode Any semiconductor that can provide amplification in a suitable circuit or microwave system. See DIODE AMPLIFIER.

amplifier distortion A change in the waveform of a signal, arising within an amplifier that is operated in compliance with specified conditions.

amplifier input **1.** The terminals and section of an amplifier that receive the signal to be amplified. **2.** The signal to be amplified.

amplifier noise Collectively, all extraneous signals present in the output of an amplifier when no working signal is applied to the amplifier input terminals.

amplifier nonlinearity A condition in which the amplifier output signal does not exhibit a linear relationship to the corresponding input signal. Some amplifiers are designed to operate in a linear manner at all times, but many amplifier types need not function in this manner to be effective. Also see AMPLIFIER DISTORTION and LINEAR AMPLIFIER.

amplifier output **1.** The terminals and section of an amplifier that deliver the amplified signal for external use. **2.** The amplified signal.

amplifier power The power level of the output signal delivered by an amplifier (also called OUTPUT POWER), or the extent to which the amplifier increases the power of the input signal (also called POWER AMPLIFICATION).

amplifier response The performance of an amplifier throughout a specified frequency band. Factors usually included are gain, distortion, amplitude versus frequency, and power output.

amplify To perform the functions of amplification (see AMPLIFICATION, **1**).

amplifying delay line A delay line that causes amplification of signals in a circuit intended for pulse compression.

amplistat A self-saturating magnetic amplifier.

amplitron A backward-wave amplifier used in microwave circuits.

amplitude The extent to which an alternating or pulsating current or voltage swings, positively and negatively, from zero or from a mean value.

amplitude-controlled rectifier A thyratron- or thyristor-based rectifier circuit.

amplitude density distribution A mathematical function giving the probability that, at a given instant in time, a fluctuating voltage has a certain value.

amplitude distortion In an amplifier or network, the condition in which the output-signal amplitude exhibits a nonlinear relationship to the input-signal amplitude.

amplitude error **1.** The error in measuring the amplitude of a signal, normally expressed as a percentage of signal amplitude or as a percentage of full scale. **2.** The frequency at which the output amplitude of a signal is in error by 1% with amplitude at 10% of full scale.

amplitude factor For an ac wave, the ratio of the peak value to the rms value. The amplitude factor of a sine wave is equal to the square root of 2 = 1.4142136.

amplitude fading In the propagation of electromagnetic waves, a condition in which the amplitudes of all components of the signal (i.e., carrier and sidebands) increase and decrease uniformly. Compare SELECTIVE FADING.

amplitude/frequency response Performance of an amplifier throughout a specified range, as exhibited by a plot of output-signal amplitude versus frequency for a constant-amplitude input signal.

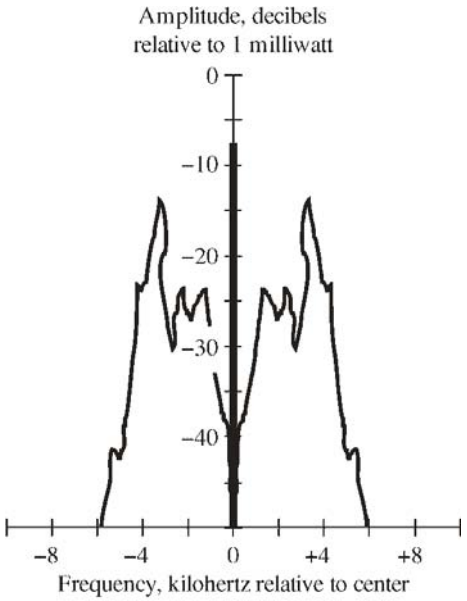
amplitude gate A transducer that transmits only those portions of an input wave that lie within two close-spaced amplitude boundaries; also called *slicer.*

amplitude limiter A circuit, usually with automatic gain control (AGC), that keeps an amplifier output signal from exceeding a certain level, despite large variations in input-signal amplitude. A dc-biased diode performs passive limiting action via *clipping.*

amplitude-modulated generator A signal generator whose output is amplitude modulated. Usually, this instrument is an RF generator that is modulated at an audio frequency.

amplitude-modulated transmitter A radio-frequency transmitter whose carrier is varied in amplitude, according to the rate of change of some data-containing signal (such as voice, music, facsimile, television pictures, control signals, or instrument readings).

amplitude modulation Abbreviation, AM. A method of conveying intelligence in wireless communications and broadcasting. The modulating-signal energy appears at sideband frequencies above and below, and very close to, the carrier frequency. These sideband signals carry all the information. The extent of modulation is expressed as a percentage, from 0, which represents an unmodulated carrier, to 100, which represents full modulation. In a signal modulated 100 percent, one-third of the power is used to convey the data; the other two-thirds is consumed by the carrier. This form of modulation is essentially outmoded, although it is still used in the standard broadcast band from 535 to 1605 kHz. See FREQUENCY MODULATION, PHASE MODULATION, SINGLE SIDEBAND.



amplitude modulation

amplitude-modulation noise Spurious amplitude modulation of a carrier wave by extraneous signals and random impulses, rather than by the intended data-containing signal.

amplitude noise In radar, amplitude fluctuations of an echo returned by a target. This noise limits the precision of the system.

amplitude of noise The level of random noise in a system. The amplitude of noise is measured in the same way that signal amplitude is measured.

amplitude range The maximum-to-minimum amplitude variation of a signal. It can be expressed as a direct numerical ratio or in decibels.

amplitude response The maximum output obtainable at various frequencies over the range of an instrument operating under rated conditions.

amplitude selection The selection of a signal, according to its correspondence to a predetermined amplitude or amplitude range.

amplitude separator In a television receiver, a circuit that separates the control pulses from the composite video signal.

amplitude suppression ratio The ratio of an undesired output of a frequency-modulated (FM) receiver to the desired output, when the test signal is amplitude modulated and frequency modulated simultaneously.

amplitude-versus-frequency distortion Distortion resulting from varying gain or attenuation of an amplifier or network, with respect to signal frequency.

AMTOR A form of amateur-radio data communications, in which the accuracy of a group of characters in a message is checked periodically by the receiving station. If an error appears likely, then the receiving station sends an instruction to the transmitting station to retransmit that particular group of characters. Characters are sent in bunches with pauses for possible inquiries from the receiving station.

AM tuner A compact radio receiver unit that handles amplitude-modulated signals and delivers low-amplitude audio output to a high-fidelity amplifier. Compare AM/FM TUNER and FM TUNER.

amu Abbreviation of *atomic mass unit.*

amusement robot An electromechanical robot, often computer-controlled, that is intended for use as a toy.

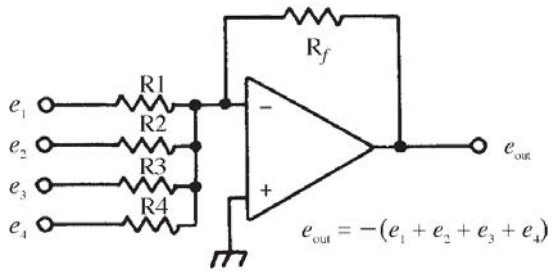
AN- A prefix designator used by American military services to indicate commonality.

anacoustic Pertaining to the lack of sound or absence of reverberation or transmission of sonic waves.

analog **1.** A quantity that corresponds, point for point or value for value, to an otherwise unrelated quantity. Thus, voltage is the analog of water pressure, and current is the analog of water flow. **2.** Varying over a continuous range and, therefore, capable of attaining an infinite number of values or levels. Compare DIGITAL.

analog adder An analog circuit or device that receives two or more inputs and delivers an output equal to their sum.

analog adder/subtracter An analog circuit or device that receives two or more inputs and delivers an output equal to their sum or difference (in any combination), as desired.



analog adder (inverting)

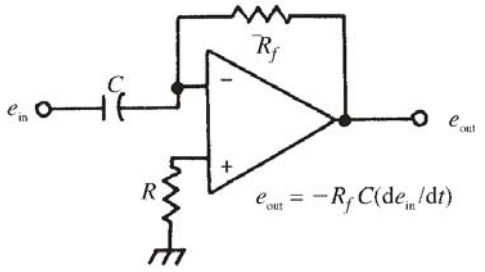
analog channel In an ANALOG COMPUTER, an information channel in which the extreme limits of data magnitude are fixed, and the data can have any value between the limits.

analog communications Any form of communications in which a carrier, generally an electromagnetic wave or high-frequency current, is varied in a continuous and controlled way by a data-containing signal. See ANALOG, **2.**

analog computer A computer in which input and output quantities are represented as points on continuous (or small-increment) scales. To represent these quantities, the computer uses voltages or resistances that are proportional to the numbers to be worked on. When the quantities are nonelectrical (such as pressure or velocity), they are made analogous by proportional voltages or resistances.

analog data **1.** Data represented in a quantitatively analogous way. Examples are the deflection of a movable-coil meter, the positioning of a slider on a slide rule, and the setting of a variable resistor to represent the value of a nonelectrical quantity. Also see ANALOG. **2.** Data displayed along a smooth scale of continuous values (as by a movable-coil meter), rather than in discrete steps (as by a digital meter).

analog differentiator An analog circuit or device whose output waveform is the derivative of the input-signal waveform, with respect to time.



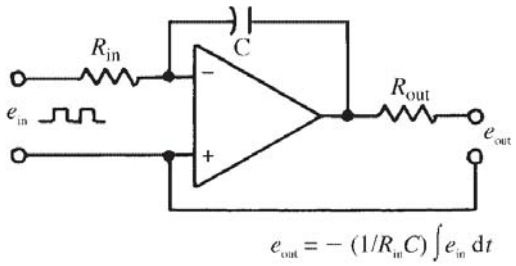
analog differentiator

analog divider An analog circuit or device that receives two inputs and delivers an output equal to their quotient.

analog electronics Electronic techniques and equipment that is based on uniformly changing signals, such as sine waves, and often having continuous-scale indicators, such as D'Arsonval meters. Compare DIGITAL ELECTRONICS.

analog information Approximate numerical information, as opposed to digital information, which is assumed to be exact.

analog integrator An analog circuit or device whose output waveform is the integral of the input signal waveform, with respect to time.



analog integrator

analog inverting adder An analog adder that delivers a sum with the opposite sign to that of the input quantities.

analog meter An indicating instrument that uses a movable-coil arrangement or the equivalent, causing a rotating pointer to indicate a particular value on a graduated printed scale. Compare DIGITAL METER.

analog meter

analog multiplexer **1.** A multiplexer used with analog signals (see MULTIPLEXER). **2.** An analog time-sharing circuit.

analog multiplier An analog circuit or device that receives two or more inputs and delivers an output equal to their product.

analog network A circuit that permits mathematical relationships to be shown directly by electric or electronic means.

analogous pole In a PYROELECTRIC MATERIAL, the end or face having the positive electric charge.

analog output An output quantity that varies smoothly over a continuous range of values, rather than in discrete steps.

analog record Also called *analog recording.* A record or recording method in which some property of the recorded material, such as displacement or magnetization, varies over a continuous range that is relative to time and/or physical position.

analog recorder Any recorder, such as a recording oscillograph, potentiometric recorder, electroencephalograph, electrocardiograph, or lie detector, that produces an analog record. The counterpart is a digital recorder, which produces a readout in discrete numbers (printed or visually displayed).

analog representation Representation of information within a smooth, continuous range, rather than as separate (discrete) steps or points.

analog signal A signal that attains an infinite number of different amplitude levels, as opposed to one that can attain only a finite number of levels as a function of time.

analog subtracter An analog circuit or device that receives two inputs and delivers an output equal to their difference.

analog summer See ANALOG ADDER.

analog switch A switching device that will only pass signals that are faithful analogs of transducer parameters.

analog-to-digital conversion **1.** A process in which an analog signal (such as a voice waveform) is changed into a digital or binary signal that conveys the same information. This process is commonly used in digital computers to encode sounds and images. It is also used in communications systems to improve efficiency, minimize the necessary bandwidth, and optimize the signal-to-noise ratio. **2.** A process in which continuous mechanical motion is encoded into a digital or binary electronic signal.

analog-to-digital converter Any circuit or device that performs ANALOG-TO-DIGITAL CONVERSION.

analysis **1.** The rigorous determination of the constants and modes of operation for electronic equipment. Compare SYNTHESIS. **2.** A branch of mathematics dealing with point sets, relations, and functions.

analytical engine A primitive mechanical calculating machine, invented in 1833 by Charles Babbage.

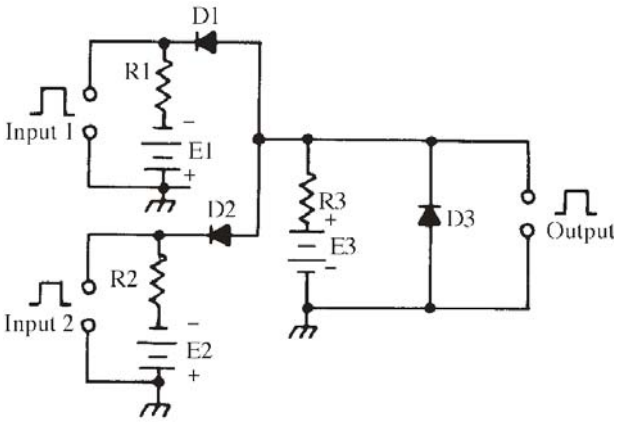
analyzer **1.** Any instrument that permits analysis through close measurements and tests (e.g., distortion analyzer, WAVE ANALYZER, or gas analyzer). **2.** A computer program used for debugging purposes; it analyzes other programs and summarizes references to storage locations. **3.** An analysis interface to an oscilloscope.

anastigmatic yoke Also called *full-focus yoke.* In a television (TV) receiver, a deflection yoke with a cosine winding for better focus at the edges of the picture.

anchorage In plastic recording tape, the adhesion of the magnetic oxide coating to the surface of the tape.

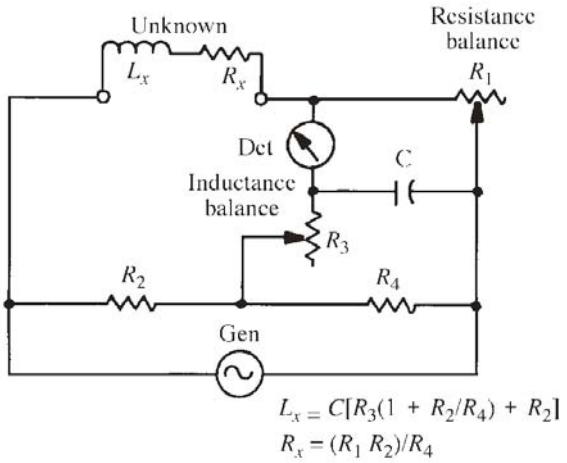
ancillary equipment Equipment that does not directly enter into the operation of a central system. Examples are input/output components of a computer and test instruments attached to a system.

AND circuit In digital systems and other switching circuits, a logic gate whose output is high (logic 1) only when all input signals are high. Otherwise the output is low (logic 0). Compare OR CIRCUIT.



AND circuit

Anderson bridge An ac bridge circuit with six impedances, permitting the value of an unknown inductance to be determined in terms of a standard capacitance.

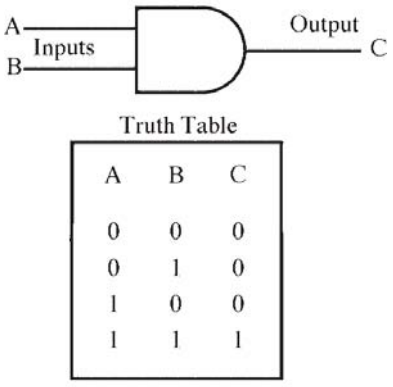


Anderson bridge

AND gate **1.** AND circuit. **2.** In a TV receiver, an AND circuit that holds the keyed-AGC signal off until a positive horizontal flyback pulse and a horizontal sync pulse appear simultaneously at the input.

android A sophisticated robot built in humanoid form. Usually, it propels itself by rolling on wheels or on a track drive. A rotatable head contains position sensors, a machine vision system, and/or a machine hearing system. Mechanical arms are equipped with end effectors to perform various tasks. The most advanced androids have self-contained computer control systems.

anechoic Pertaining to the absence of echoes. Examples: ANECHOIC CHAMBER, *anechoic enclosure,* or *anechoic room.*



Truth Table

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

AND gate

anechoic chamber An enclosure that does not reflect sound waves that approach its walls. Such a chamber is used to test certain audio devices.

anemograph An electromechanical device that produces a recording of wind speed versus time. Generally, it consists of an ANEMOMETER connected to a PEN-AND-INK RECORDER via a suitable electronic interface.

anemometer An instrument that measures or indicates wind speed, or speed and direction (velocity).

angel **1.** An extraneous image, usually of short duration, on a cathode-ray-tube (CRT) display. The term applies particularly to anomalies in a radar image caused by low-atmospheric reflection, birds, or other mobile objects. **2.** Air-deployed metallic debris, also known as *chaff,* designed to create radar echoes as a decoy or diversion tactic.

angle jamming A radar jamming technique in which the return echo is jammed with a signal containing improper azimuth or elevation angle components.

angle modulation Variation of the angle of a sine-wave carrier in response to the modulating source, as in FREQUENCY MODULATION and PHASE MODULATION.

angle noise In radar reception, the interference resulting from variations in the angle at which an echo arrives from the target.

angle of arrival The angle which the line of propagation of an incoming radio wave makes with the surface of the earth. Compare ANGLE OF DEPARTURE.

angle of azimuth The horizontal angle between the viewer and object or target, usually measured clockwise from north.

angle of beam The angle enclosing most of the transmitted energy in the radiation from a directional antenna. It is usually measured between the *half-power points* in the main lobe of the directional pattern. This angle can be measured in the horizontal (azimuth) plane or in the vertical (elevation) plane.

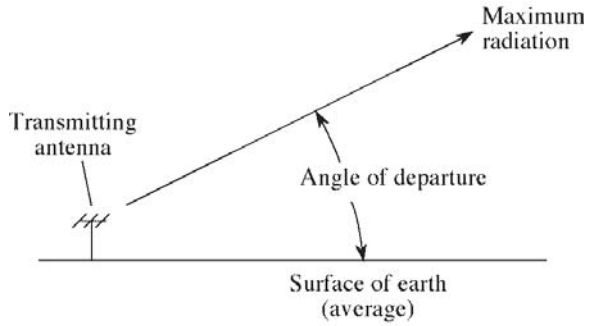
angle of conduction **1.** Also called *angle of flow.* The number of degrees of an excitation-signal cycle during which output (drain, collector or plate) current flows in an amplifier circuit. **2.** The number of degrees of any sine wave at which conduction of a device (e.g., a diode) begins.

angle of convergence **1.** In any graphical representation, the angle formed by any two lines or plots that come together at a point. **2.** The angle formed by the light paths of two photocells focused on the same object.

angle of declination The angle between the horizon and a descending line. Compare ANGLE OF ELEVATION.

angle of deflection In a cathode-ray tube, the angle between the electron beam at rest and a new position resulting from deflection.

angle of departure The angle, relative to the horizon, made by the line of propagation of a transmitted radio wave. Compare ANGLE OF ARRIVAL.



angle of departure

angle of depression See ANGLE OF DECLINATION.

angle of divergence In a cathode-ray tube, the angle formed by the spreading of an undeflected electron beam as it extends from the gun to the screen.

angle of elevation The angle that an ascending line subtends, with respect to the horizon. Compare ANGLE OF DECLINATION.

angle of flow See ANGLE OF CONDUCTION.

angle of incidence The angle, measured relative to the perpendicular (orthogonal) to a surface or boundary, subtended by an approaching ray. Compare ANGLE OF REFLECTION and ANGLE OF REFRACTION.

angle of lag The phase difference (in degrees or radians) whereby one component follows another in time, both components being of the same frequency. Compare ANGLE OF LEAD. Also see PHASE ANGLE.

angle of lead The phase difference (in degrees or radians) whereby one component precedes another in time, both components being of the same frequency. Compare ANGLE OF LAG. Also see PHASE ANGLE.

angle of radiation **1.** The angle, measured with respect to the horizon, at which the principal lobe of an electromagnetic wave leaves a transmitting antenna. **2.** The angle, measured relative to the horizon, of a receiving or transmitting antenna's optimum sensitivity.

angle of reflection The angle, measured relative to the perpendicular (orthogonal) to a surface, subtended by a ray leaving the surface after having been reflected from it. Compare ANGLE OF INCIDENCE.

angle of refraction The angle, measured relative to the perpendicular (orthogonal) to a boundary between two different media, subtended by a ray leaving the boundary after having been refracted thereat. Compare ANGLE OF INCIDENCE.

angle tracking noise Noise in a servo system that results in a tracking error.

angstrom (Anders J. Angstrom, 1814–1874). A unit of length used to describe certain extremely short waves and microscopic dimensions; 1 angstrom equals 10^{-4} microns (10^{-10} meters).

angular deviation loss The ratio of microphone or loudspeaker response on the principal axis of response to the response at a designated angle from that axis. Expressed in decibels.

angular difference See PHASE ANGLE.

angular displacement In an ac circuit, the separation, in degrees, between two waves. See PHASE ANGLE.

angular frequency The frequency of an ac signal, expressed in *radians per second (rad/sec)* and approximately equal to $6.28f$, where f is the frequency in Hertz.

angular length Length, as along the horizontal axis of an ac wave or along the standing-wave pattern on an antenna, expressed as the product of radians and wavelength.

angular-mode keys On a calculator or computer, the DEG, RAD, and GRAD keys for expressing or converting angles in DEGREES, RADIANS, and GRADS, respectively.

angular phase difference For two sinusoidal waves, the phase difference, expressed in degrees or radians.

angular rate In navigation, the rate of bearing change, expressed in degrees or radians.

angular resolution The ability of a radar to distinguish between two targets by angular measurement.

angus pen recorder An instrument that makes a permanent record of the time whenever a channel is used.

anharmonic oscillator An oscillating device in which the force toward the balance point is not linear, with respect to displacement.

anhysteresis The magnetization of a material by a unidirectional field containing an alternating field component of gradually decreasing amplitude.

anhysteretic state The condition of a substance after it has been subjected to a strong magnetic field, the intensity of which alternates in direction and diminishes gradually to zero.

animism A belief or philosophy, held especially in Eastern civilizations, such as Japan, that all things contain an essence of life. This theory renders irrelevant the question of whether or not machines, such as computers and robots can be "alive."

anion A negative ion. Also see ION.

anisotropic Pertaining to the tendency of some materials to display different magnetic and other physical properties along different axes.

ANL Abbreviation of AUTOMATIC NOISE LIMITER.

anneal To heat a metal to a predetermined temperature and let it cool slowly. The operation prevents brittleness and often stabilizes electrical characteristics.

annealed laminations Core laminations for transformers or choke coils that have been annealed.

annealed shield A magnetic shield for cathode-ray tubes, that has been processed by annealing.

annealed wire Soft-drawn wire that has been subjected to annealing.

annotations **1.** Marking on copies of original engineering-installation documents to show changes made during the installation. **2.** Any set of comments or notes accompanying a program, an equipment or system, or a process.

annular **1.** Pertaining to the region between two concentric circles that lie in the same plane; ring-shaped. **2.** Pertaining to two or more concentric circles that lie in a common plane.

annular conductor A number of wires stranded in three concentric layers of alternating twists around a hemp core.

annular transistor A mesa transistor in which the base and collector take the form of concentric rings around a central emitter.

annulling network A subcircuit that shunts a filter to cancel reactive impedance at the extreme ends of the pass band of the filter.

annunciation relay A relay that indicates whether or not a circuit is carrying current.

annunciator A device that produces loud sound and/or conspicuous light to attract attention (e.g., the electronic siren in an automotive security system).

anode **1.** The positive electrode of a vacuum tube or solid-state device (i.e., the electrode toward which electrons move during current flow). **2.** In an electrochemical cell, the electrode that loses electrons by oxidation. This is usually the negative electrode.

anode balancing coil Mutually coupled windings used to maintain equal currents in parallel anodes operating from a common transformer terminal.

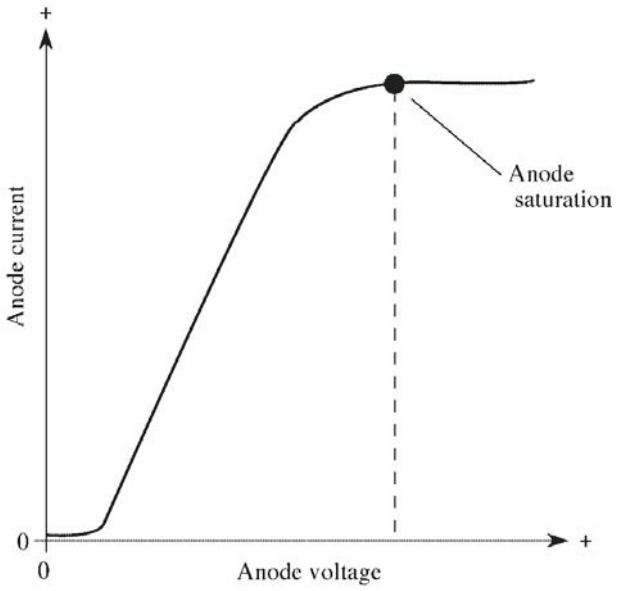
anode current Current flowing in the anode circuit of a device.

anode efficiency Also called *plate efficiency.* In a power amplifier using an electron tube, the ratio P_o/P_i, where P_o is the output power in watts and P_i is the dc anode power input in volt-amperes.

anode power input Symbol, $P_{A(input)}$. The product of anode current and anode voltage.

anode power supply The ac or positive dc power supply unit that delivers current and voltage to the anode of a device.

anode saturation The point beyond which a further increase in anode voltage does not produce an increase in anode current.



anode saturation

anode strap In a multicavity magnetron, a metal strap connecting the anodes.

anode terminal **1.** In a diode, the terminal to which a positive dc voltage must be applied for forward bias. Compare CATHODE TERMINAL. **2.** In a diode, the terminal at which a negative dc voltage appears when the device is used as an ac rectifier. Compare CATHODE TERMINAL. **3.** The terminal that is connected internally to the anodic element of any device.

anode voltage Symbol, E_A or V_A. The difference in potential between the anode and cathode of a device.

anodic Pertaining to the anode of a device, or to anode-like effects.

anodizing An electrolytic process in which a protective oxide film is deposited on the surface of a metallic body acting temporarily as the anode of the electrolytic cell.

anomalous dispersion Dispersion of electromagnetic radiation that is characterized by a decrease in refractive index with increase in frequency.

anomalous propagation **1.** The low-attenuation propagation of UHF or microwave signals through

atmospheric layers. **2.** Unusual, bizarre, or unexplainable electromagnetic-wave propagation (e.g., apparent F-layer ionospheric effects in the FM broadcast band). **3.** Rapid fluctuation of a sonar echo because of variations in propagation.

anoxemia toximeter An electronic instrument for measuring or alerting against the onset of anoxemia (deficiency of oxygen in the blood)—especially in airplane pilots.

AN radio range A navigational facility entailing four zones of equal signal strength. When the aircraft deviates from course, an aural Morse-code signal, A (DIT DAH) or N (DAH DIT) is heard; but when the aircraft is on course, a continuous tone is heard.

ANSI Acronym for *American National Standards Institute.*

AN signal The signal provided by an AN radio range to apprise aircraft pilots of course deviation.

answerback The automatic response of a terminal station to a remote-control signal.

answer cord In a telephone system, the cord used for answering subscribers' calls and incoming trunk calls.

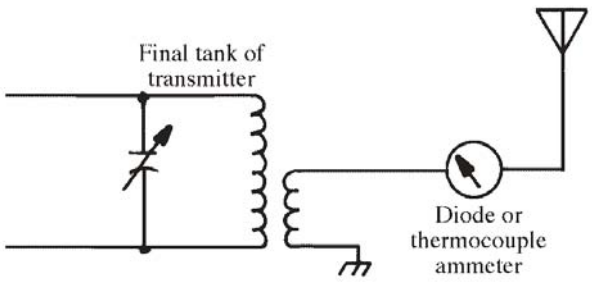
answering machine A device that automatically answers a telephone and records an audio message from the caller.

answer lamp A telephone switchboard lamp that lights when an answer cord is plugged into a line jack; it switches off when the telephone answers and lights when the call is completed.

ant Abbreviation of ANTENNA.

antenna In a communications system, a specialized transducer that converts incoming electromagnetic fields into alternating electric currents having the same frequencies (*receiving antenna*), or converts an alternating current at a specific frequency into an outgoing electromagnetic field at the same frequency (*transmitting antenna*). An antenna can be a simple wire or rod, or a complicated structure. Thousands of geometries and specifications are possible. The optimum antenna type for a given situation depends on the communications frequency, the distance to be covered, and various other factors.

antenna ammeter An RF ammeter, usually of the thermocouple type, employed to measure current flowing to a transmitting antenna.



antenna ammeter

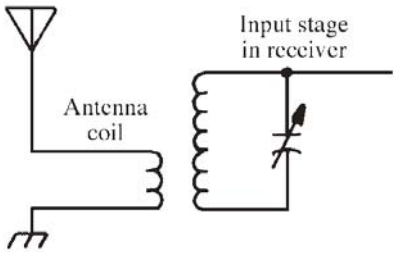
antenna amplifier **1.** A radio-frequency amplifier, often installed at the antenna, used to boost signals before they reach a receiver (also called an *RF preamplifier*). **2.** Occasionally, the first RF amplifier stage of a receiver, also known as the *front end.*

antenna array See ARRAY.

antenna bandwidth The frequency range throughout which an antenna will operate at a specified efficiency without needing alteration or adjustment.

antenna beamwidth A measure of the extent to which a directional antenna focuses a transmitted electromagnetic field, or focuses its response to incoming electromagnetic fields. Expressed as the angle in degrees between opposite *half-power points* in the main lobe of the directional pattern. Usually determined in the horizontal plane, but occasionally in the vertical plane.

antenna coil The primary coil of the input RF transformer of a receiver, or the secondary coil of the output RF transformer of a transmitter.



antenna coil

antenna coincidence The condition in which two directional antennas are pointed directly toward each other.

antenna-conducted interference Extraneous signals generated in a transmitter or receiver and presented to the antenna, from which they are radiated.

antenna core A ferrite rod or slab around which a coil of wire is wound to act as a self-contained antenna, usually in a miniature receiver.

antenna coupler A device consisting of an inductor, RF transformer, or a combination of inductor(s) and capacitor(s), used to match the impedance of an antenna to that of a transmitter or receiver. Also known as a *transmatch* or *antenna tuner.*

antenna coupling Inductive and/or capacitive coupling used to optimize the transfer of energy from an antenna to a receiver, or from a transmitter to an antenna.

antenna current **1.** Radio-frequency current flowing from a transmitter into an antenna. **2.** Radio-frequency current flowing from a receiving antenna into a receiver.

antenna detector A circuit that warns aircraft personnel that they are being observed by radar. It picks up the radar pulses and actuates a warning light or other device.

antenna diplexer A coupling device that permits several transmitters to share one antenna without troublesome interaction. Compare ANTENNA DUPLEXER.

antenna directivity The directional characteristics of a transmitting or receiving antenna, usually expressed qualitatively (e.g., *omnidirectional*, *bidirectional*, or *unidirectional*). A more precise expression is ANTENNA BEAMWIDTH.

antenna director In a directional antenna, a PARASITIC ELEMENT situated in front of the radiator and separated from it by an appropriate fraction of a wavelength. Its function is to intensify radiation in the direction of transmission. Compare ANTENNA RADIATOR and ANTENNA REFLECTOR.

antenna duplexer A circuit or device permitting one antenna to be shared by two transmitters without undesirable interaction.

antenna effect The tendency of wires or metallic bodies to act as antennas (i.e., to radiate or receive radio waves).

antenna efficiency The ratio of radio-frequency energy supplied to a wireless transmitting antenna, to the energy radiated into space. Electrically, the radiation resistance of the antenna (R_R) appears in series with loss resistance (R_L). The efficiency *Eff* of the antenna can be determined by the following formula:

$$Eff = R_R/(R_R + R_L)$$

As a percentage,

$$Eff_{\%} = 100\ (R_R/(R_R + R_L)$$

The efficiency is always less than 1 (100 percent) because, in practice, the loss resistance can never be reduced to zero.

antenna factor A factor (in decibels) added to an RF voltmeter reading to find the true open-circuit voltage induced in an antenna.

antenna field The electromagnetic field immediately surrounding an antenna.

antennafier Low-profile antenna/amplifier device, sometimes used with portable communications systems. Also called an *active antenna.*

antenna front-to-back ratio For a directional antenna, the ratio of field strength in front of the antenna (i.e., directly forward in the line of maximum directivity) to field strength in back of the antenna (i.e., 180 degrees from the front), as measured at a fixed distance from the radiator. It is usually specified in decibels.

antenna gain For a given antenna, the ratio of signal strength (received or transmitted) to that obtained with a comparison antenna, such as a simple dipole. Generally specified in decibels.

antenna ground system The earth, counterpoise, guy wires, radials, and/or various conducting objects in the vicinity of an antenna which, taken together, form the radio-frequency (RF) ground system against which the antenna operates. Some antennas require an extensive ground system to function efficiently; others need no ground system.

antenna/ground system An arrangement embodying both an antenna and a low-resistance connection to the earth, as opposed to an antenna system that involves no connection to earth.

antenna height **1.** The height of an antenna above the surface of the earth immediately beneath the driven element(s). **2.** The height of an antenna above the effective radio-frequency (RF) ground immediately beneath the driven element(s). **3.** The height of an antenna above average terrain, determined against the mean altitude of a number of points on the earth's surface that lie within a certain radius of the antenna structure. Also called *height above average terrain (HAAT).*

antenna impedance The complex-number impedance that an antenna presents to a transmission line. It can vary over a tremendous range, and depends on the antenna type, antenna size, antenna height, operating frequency, and various other factors.

antenna-induced potential Also called *antenna-induced microvolts.* The voltage across the open-circuited terminals of an antenna.

antenna lens Also called *lens antenna.* A radiator designed to focus microwave energy in much the same manner that an optical lens focuses light rays. Lens antennas are made from dielectric materials and/or metals.

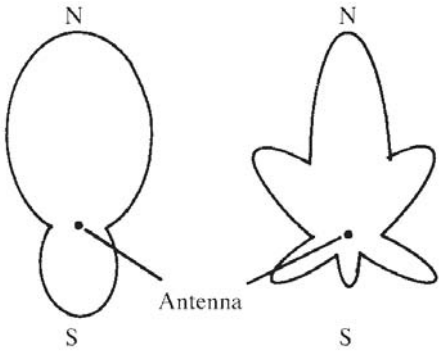
antenna loading **1.** The insertion of inductance in antenna elements to lower the resonant frequency of the system without necessarily making the system physically larger or the elements longer. **2.** The insertion of capacitance in antenna elements to raise the resonant frequency of the system without necessarily making the system physically smaller or the elements shorter.

antenna lobe A well-defined region in the radiation pattern of an antenna in which radiation is most intense, or in which reception is strongest. Also see ANTENNA PATTERN.

antenna matching The technique of establishing a satisfactory relationship between the antenna impedance and the transmission-line or transmitter-output impedance, for maximum transfer of power into the antenna. Also, the matching of antenna impedance to receiver-input impedance, for delivery of maximum energy to the receiver.

antennamitter An antenna/oscillator combination that serves as a low-power transmitter.

antenna pattern A polar plot of antenna performance that shows field strength versus angle of azimuth, with the antenna at the center. It is usually specified in the horizontal plane.



antenna patterns

antenna polarization The orientation of electric lines of flux, with respect to the surface of the earth, for which an antenna is most efficient. A vertical antenna radiates and receives vertically polarized waves. A horizontal antenna radiates and receives horizontally polarized waves broadside to itself, and vertically polarized waves at high elevation angles off its ends. In other directions, the polarization is slanted at various angles.

antenna power Symbol, P_{ant}. The RF power developed in an antenna by a transmitter; P_{ant} equals I^2R, where I is the antenna current and R is the antenna resistance at point I is measured.

antenna power gain The ratio of the maximum effective radiated power (ERP) from a wireless transmitting antenna to the ERP from a reference antenna, expressed in decibels (dB). If the ERP from an antenna under test is P_T watts and the ERP from the reference antenna is P_R watts, then the gain G_{dB} is:

$$G_{dB} = 10 \log_{10} (P_T/P_R)$$

Power gain is always measured in the direction in which the test antenna performs the best. The reference antenna, usually a dipole, is chosen with a gain assumed to be unity, or 0 dB. Gain relative to a dipole is expressed in dBd (decibels relative to a dipole). Alternatively, the reference antenna can be an isotropic radiator, in which case the gain is expressed in dBi (decibels relative to an isotropic radiator). Gain figures in dBd and dBi differ by a constant amount as follows:

$$G_{dBi} = 2.15 + G_{dBd}$$

antenna preamplifier A highly sensitive amplifier used to enhance the gain of a receiver. It is usually used at the very high frequencies and above.

antenna radiation The propagation of radio waves by a transmitting antenna.

antenna radiator The element of an antenna that receives RF energy from the transmitter and radiates waves into space. Also known as the *driven element.* Compare ANTENNA DIRECTOR and ANTENNA REFLECTOR.

antenna range **1.** The frequency band, communication distance characteristically covered, or other continuum of values that specify the operating limits of an antenna. **2.** The region immediately surrounding an antenna in which tests and measurements usually are made. Sometimes called ANTENNA FIELD.

antenna reflector In a directional antenna, a PARASITIC ELEMENT situated behind the radiator and separated from the latter by an appropriate fraction of a wavelength. Its function is to intensify radiation in the direction of transmission. Compare ANTENNA DIRECTOR and ANTENNA RADIATOR.

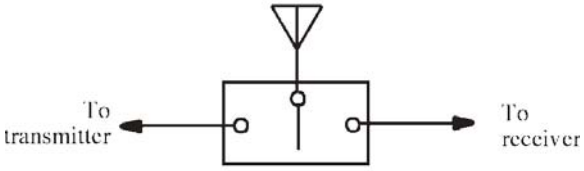
antenna relay In a radio station, a low-loss, heavy-duty relay that enables the antenna to be switched between transmitter and receiver.

antenna resistance The resistive component of ANTENNA IMPEDANCE.

antenna resonant frequency The frequency, or narrow band of frequencies, at which an antenna's impedance appears resistive.

antenna stage **1.** The first RF amplifier stage of a receiver. **2.** Occasionally, the final RF amplifier of a transmitter.

antenna switch In a radio station, a low-loss, heavy-duty switch that enables the antenna to be connected to transmitter, receiver, or safety ground.



antenna switch (single-pole, double-throw)

antenna system Collectively, an antenna and all of the auxiliary electrical and mechanical devices needed for its efficient operation, including couplers, tuners, transmission lines, supports, insulators, and rotator.

antenna terminals **1.** The points at which a transmission line is attached to an antenna. **2.** The signal input terminals of a receiver. **3.** The signal output terminals of a transmitter.

antennaverter An antenna and converter combined into a single circuit, intended for connection to the antenna terminals of a receiver to allow operation on frequencies outside the band for which the receiver has been designed.

antenna wire **1.** The radiator element of a wire-type antenna. **2.** A strong solid or stranded wire (e.g., hard-drawn copper, copper-clad steel, or phosphor-bronze) used for antennas.

anthropomorphism The perception, by people, of machines as having human qualities. This can

lead to emotional attachment to hardware, such as computers and robots. The more sophisticated the apparatus, in general, the more powerful this perception can become.

antialiasing filter A low-pass or bandpass filter that limits the bandwidth of an input signal to prevent *aliasing* and its effects. See ALIASING, **1**.

anticapacitance switch A switch whose members are thin blades and stiff wires widely separated to minimize capacitance between them.

anticathode The target electrode of an X-ray tube.

Anticipatory Sciences A group of *futurists*, people who attempt to predict the course of technology. Some futurists believe that progress will continue until, for example, homes become fully automated and artificial intelligence reaches a level comparable to human intelligence. Other futurists believe that such things are highly improbable.

anticlutter circuit A supplementary circuit in a radar receiver that minimizes the effect of extraneous reflections that would obscure the image of the target.

anticlutter gain control In a radar receiver, a circuit that automatically raises the gain of the receiver slowly to maximum after each transmitter pulse to reduce the effect of clutter-producing echoes.

anticoincidence Noncoincidental occurrence of two or more signals. Compare COINCIDENCE.

anticoincidence circuit In computers and control systems, a circuit that delivers an output signal only when two or more input signals are not received simultaneously. Compare COINCIDENCE CIRCUIT. Also see NAND CIRCUIT.

anticoincidence operation An exclusive-OR operation.

anticollision radar A vehicular radar system that is used to minimize the probability of a collision with another vehicle, whether or not that other vehicle has a similar system.

antiferroelectric **1.** Pertaining to the property wherein the polarization curve of certain crystalline materials shows two regions of symmetry. **2.** A material that exhibits the aforementioned property.

antiferromagnetic Pertaining to the behavior of materials in which, at low temperatures, the magnetic moments of adjacent atoms point in opposite directions.

antihunt The condition in which *hunting* is counteracted, usually by removing overcorrection in automatic control or compensation systems.

antihunt circuit **1.** A circuit that minimizes or eliminates hunting. Also see ANTIHUNT. **2.** In a television (TV) receiver, a circuit that stabilizes an automatic frequency control (afc) system.

antijamming Pertaining to communications systems that are resistant to, or that counteract, the effects of *jamming.*

antilogarithm Abbreviated, antilog or $\log^{-1}$. The number corresponding to a given logarithm. For example, log 10,000 = log 10^4 = 4, and thus antilog 4 = 10^4 = 10,000.

antilogous pole In a PYROELECTRIC MATERIAL, the end that becomes negatively charged as the temperature rises.

antimagnetic Pertaining to materials having extremely low RETENTIVITY.

antimatter Pertaining to particles that are the counterparts of conventional particles (i.e., positrons instead of electrons, antineutrons instead of neutrons, and antiprotons instead of protons). When a particle meets its antiparticle, the two annihilate, releasing energy. Also see ANTIPARTICLE.

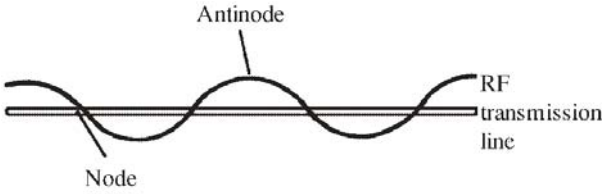
antimicrophonic See NONMICROPHONIC.

antimony Symbol, Sb. A metalloidal element. Atomic number, 51. Atomic weight, 121.76. Often used as n-type dopant in semiconductor manufacture.

antineutrino The antiparticle of the NEUTRINO, emitted as a result of radioactive decay.

antineutron An uncharged particle with a mass equal to that of the neutron, but with a magnetic moment in the direction opposite that of the neutron.

antinode A point of maximum amplitude in a standing wave.



antinode

antinoise carrier-operated circuit A circuit that cuts off the audio output of a receiver while the station transmitter is in use. This can be accomplished in the automatic-gain-control (AGC) circuit of the receiver, or in the speaker or audio line. The circuit is actuated by energy from the transmitted signal.

antinoise microphone Any microphone that discriminates against acoustic noise (e.g., a *lip microphone* or *throat microphone*).

antinucleon A particle with the mass of a nucleon, but with the opposite electrical charge and direction of magnetic moment. Compare NUCLEON.

antioxidant A material, such as a lacquer coat or an inactive oxide layer, that prevents or slows oxidation of a material exposed to air.

antiparticle A subatomic particle opposite in character to conventional particles, such as electrons, neutrons, protons. Antiparticles constitute *antimatter.* Also see ANTINEUTRINO, ANTINEUTRON, ANTINUCLEON, ANTIPROTON, and POSITRON.

antiphase The property of being in phase opposition (180 degrees out of phase).

antipincushioning magnets In some television (TV) receivers, a pair of corrective magnets in the deflection assembly on the picture tube that eliminate *pincushion distortion* (disfigurement of the raster so that it resembles a pincushion—a rectangle with its sides bowed in).

antiproton A subatomic particle with a mass equal to that of the proton, but with opposite electrical charge.

antiquark An ANTIPARTICLE of a QUARK.

antirad substance A material that protects against damage caused by atomic radiation.

antiresonance **1.** Parallel resonance. **2.** The condition of being detuned from a resonant frequency.

antiresonant circuit See PARALLEL-RESONANT CIRCUIT.

antiresonant frequency **1.** The resonant frequency of a parallel-resonant circuit. **2.** In a piezoelectric crystal, the frequency at which impedance is maximum (as in a parallel-resonant circuit).

antisidetone Pertaining to the elimination in telephone circuits of interference between the microphone and earphone of the same telephone.

antistickoff voltage The low voltage applied to the coarse synchro control transformer rotor winding in a dual-speed servo system to eliminate ambiguous behavior in the system.

antitransmit/receive switch Abbreviated *ATR.* In a radar installation, an automatic device to prevent interaction between transmitter and receiver.

antivirus program A computer program or utility designed to detect and eliminate viruses and Trojan horses in a computer system.

antivoice-operated transmission Radio communications that use a voice-activated circuit as a transmitter interlock during reception on the companion receiver.

apc **1.** Abbreviation of *automatic picture control.* **2.** Abbreviation of AUTOMATIC PHASE CONTROL.

aperiodic Characterized by a lack of predictable repetitive behavior. For example, the *sferics* or "static" electromagnetic interference caused by lightning.

aperiodic current The unidirectional current that follows an electromagnetic disturbance in an LCR circuit, in which R is equal to or higher than the critical circuit resistance.

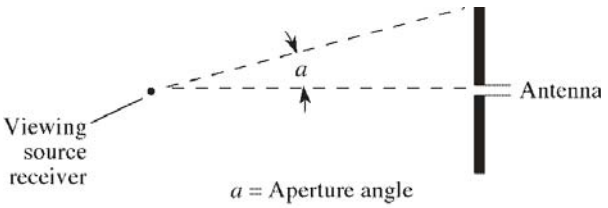
aperiodic damping Damping of such a high degree that the damped system, after disturbance, comes to rest without oscillation or hunting.

aperiodic discharge A discharge in which current flowing in an LCR circuit is unidirectional, rather than oscillatory. For this condition, $1/LC$ is less than or equal to $R^2/4L^2$.

aperiodic function A nonrepetitive function (e.g., a hyperbolic trigonometric function).

aperture **1.** The larger, normally open end of a horn antenna or horn loudspeaker. **2.** An opening in an opaque disk or mask that passes a predetermined amount of light or other radiant energy. **3.** The portion of a directional antenna through which most of the radiated energy passes.

aperture angle For an antenna or telescope or microscope, the half angle formed by the radius of the detecting instrument, as viewed from the source.



aperture angle

aperture antenna An antenna whose beamwidth depends on the size of a horn, reflector, or lens.

aperture compensation In a television (TV) camera, the minimizing of APERTURE DISTORTION by widening the video-amplifier passband.

aperture distortion In a television (TV) camera tube, a form of distortion that occurs when the scanning beam covers several mosaic elements simultaneously. This condition, caused by excessive beam thickness, results in poor image resolution.

aperture mask In a three-gun color picture tube, a thin, perforated sheet mounted behind the viewing screen to ensure that a particular color phosphor will be excited only by the beam for that color. Also called *shadow mask.*

aperture synthesis In telescopes, a method of obtaining high resolution using several small antennas separated by great distances. The small antennas are moved around to simulate the resolving power of a much larger antenna that would, in practice, be impossible or impractical to construct.

aphelion **1.** The point at which a solar-orbiting satellite attains its highest altitude. It occurs once for every complete orbit. At this point, the satellite travels slower 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 most distant point.

APL Abbreviation for *A Programming Language.* A high-level computer language designed for ease of use, and characterized by the requirement for a special character set.

apl **1.** Abbreviation of *average picture level.* **2.** Abbreviation of *automatic phase lock.*

A plus Also, A+. The positive terminal of an A battery. Also, pertaining to the part of a circuit connected to that terminal.

apogee **1.** The point at which an earth-orbiting satellite attains its highest altitude. It occurs once for every complete orbit. At this point, the satellite travels slower 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 most distant point.

A power supply A term sometimes used to denote the unit that supplies energy to a vacuum-tube filament. Compare B POWER SUPPLY.

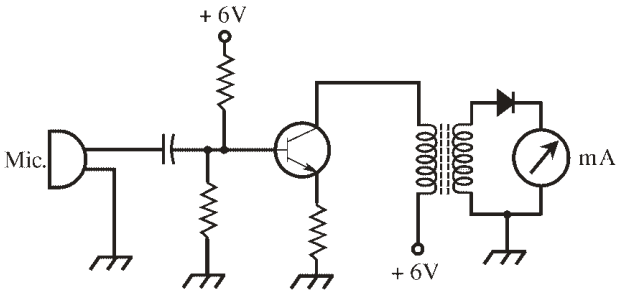
apparent bearing In radio-direction finding, the uncorrected direction from which a signal appears to arrive.

apparent power In an ac circuit, the power value obtained by multiplying the current by voltage (*P* equals *IE*), with no consideration of the effects of phase angle. Compare TRUE POWER.

apparent power loss The loss in an ammeter or voltmeter, caused by the imperfection of the instrument. At full scale, the ammeter has a certain voltage across its terminals; the apparent power loss is the current multiplied by this voltage. A voltmeter carries a small current; the apparent power loss is the product of the current and the indicated voltage.

appearance potential The potential through which an electron must move to produce a certain ion from the atom with which it is associated.

applause meter An instrument consisting essentially of a microphone, audio amplifier, and indicating meter (reading directly in sound level). It is so called because of its familiar use in measuring audience response, as indicated by loudness of applause.



applause meter

Applegate diagram For a velocity-modulated tube, a plot of the positions of electron bunches in the drift space versus time.

Appleton layer Collectively, the F1 and F2 layers of the ionosphere, at a height between 150 and 400 kilometers above the surface of the earth.

apple tube A color picture tube, used in television, with the red, blue, and green phosphor in vertical strips.

appliance Electrical equipment in general. This might include any home-operated device.

application A task or job for which an electronic device or system is used. It especially pertains to personal-computer software that has practical usefulness.

application factor A factor involved in determining the failure rate of a circuit or system affected by unusual operating conditions.

application schematic diagram A diagram of pictorial symbols and lines that illustrate the interrelationship of functional circuit blocks in a specific program mode.

applicators **1.** In dielectric heating, the electrodes between which the dielectric body is placed and the electrostatic field developed. **2.** In medical electronics, the electrodes applied to a patient undergoing diathermy or ultrasonic therapy.

applied voltage The voltage presented to a circuit point or system input, as opposed to the voltage drop resulting from current flow through an element.

applique circuit A circuit for adapting equipment to a specialized job.

approach-control radar A radar installation serving a ground-controlled approach (GCA) system.

approximate data **1.** Data obtained through physical measurements. Such data can never be exact; all measurements are subject to error. **2.** Loosely estimated data or imprecise calculations.

AQL Abbreviation of ACCEPTABLE QUALITY LEVEL. A statistically defined quality level, defined in terms of percent defective, accepted on an average of 95 percent of the time.

Aquadag A tradename for a material that consists of a slurry of fine particles of graphite. Aquadag forms a conductive coating on the inside and outside walls of some cathode-ray tubes.

aqua pura Pure water; in most instances, distilled water. Formula, H_2O. Pure water is a nonconductor with a dielectric constant of about 81.

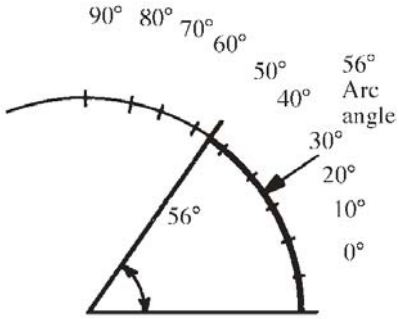
Ar Symbol for ARGON.

arbitrary function fitter A circuit or device, such as a potentiometer, curve changer, or analog computer element, providing an output current or voltage that is some preselected function of the input current or voltage.

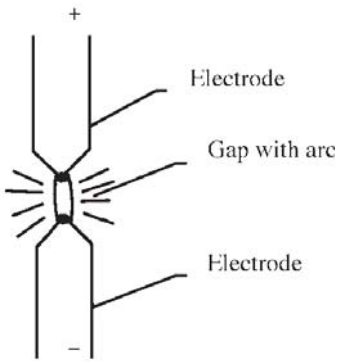
arc **1.** A luminous sustained discharge between two electrodes. Because it is sustained, rather than intermittent, an arc is distinguished from a spark discharge, the latter being a series of discharges (sparks)—even when it appears continuous. **2.** In graphical presentations, a section of curved line, as of a circle.

arc angle The angle in degrees traced out by a circular arc if the center point of the circle is considered to be the vertex of an angle formed by two rays intersecting the arc at designated points.

arc cosecant Abbreviated arc csc or $\csc^{-1}$. **1.** The inverse of the *cosecant* function. **2.** The angle, in



arc angle



arc lamp

radians or degrees, corresponding to a given cosecant.

arc cosine Abbreviated arc cos or $\cos^{-1}$. **1.** The inverse of the *cosine* function. **2.** The angle, in radians or degrees, corresponding to a given cosine.

arc cotangent Abbreviated arc cot or $\cot^{-1}$. **1.** The inverse of the *cotangent* function. **2.** The angle, in radians or degrees, corresponding to a given cotangent.

arc failure **1.** Damage to, and/or failure of, insulation or a dielectric as a result of ARCOVER. **2.** Failure of make-and-break contacts through damage caused by arcover.

arc function An *inverse trigonometric function.* See ARC COSECANT, ARC COSINE, ARC COTANGENT, ARC SECANT, ARC SINE, and ARC TANGENT.

arc furnace A high-temperature electric furnace in which heat is produced by one or more electrical arcs.

architecture The functional design elements of a computer—especially the components of the *central processing unit (CPU)* and the manner in which these elements interact.

archived file A computer file stored on some backup medium, such as magnetic tape, diskette, or CD-ROM (compact disk, read-only memory), rather than being held on the hard disk. Such a file will be apart from the operating system's catalog of current files, but can be reconstituted as needed.

archives A complete, periodically updated set of ARCHIVED FILES.

arcing See ARCOVER.

arcing contacts Make-and-break contacts between which an arc occurs when they are separated.

arcing ring A metal ring placed around an insulator in a high-voltage electrical system. This keeps an arc from charring or breaking the insulator.

arcing time The elapsed time between the breaking of contacts and the end of the arc between the contacts.

arc lamp An electric lamp in which a brilliant arc jumps between the tips of two rods (originally carbon).

arc length The length along a given arc, usually a part of the circumference of a circle. If the circle has circumference C and the arc measures x degrees, then the arc length is $Cx/360$ units.

arc minute See MINUTE.

arc oscillation Oscillations that can occur when opening relay contacts arc.

arcover The occurrence of an electrical ARC between electrodes, contacts, or capacitive plates.

arcover voltage The voltage at which disruptive discharge occurs, typically accompanied by an arc.

arc resistance The ability of a material, usually a dielectric, to resist damage from arcing. This property is commonly expressed as the length of time between the start of the arc and the establishment of a conductive path through the material.

arc secant Abbreviated arc sec or $\sec^{-1}$. **1.** The inverse of the *secant* function. **2.** The angle, in radians or degrees, that corresponds to a given secant.

arc second See SECOND.

arc sensor A device for detecting visible arcs and excessive reflected power in microwave systems.

arc sine Abbreviated arc sin or $\sin^{-1}$. **1.** The inverse of the *sine* function. **2.** The angle, in radians or degrees, that corresponds to a given sine.

arc suppression Extinguishing an arc discharge. Disruptive arcs in electronic circuits are suppressed by means of auxiliary diodes or resistor-capacitor networks.

arc-suppressor diode A semiconductor diode used to prevent arcing between make-and-break contacts.

arc tangent Abbreviated arc tan or $\tan^{-1}$. **1.** The inverse of the *tangent* function. **2.** The angle, in radians or degrees, corresponding to a given tangent.

arcthrough The puncturing of a material by an arc.

area code In the United States, a three-digit number that indicates the location, according to specified assigned districts, of a telephone sub-

scriber. When making a long-distance call, the area code of the desired station must be given in addition to the seven-digit telephone number.

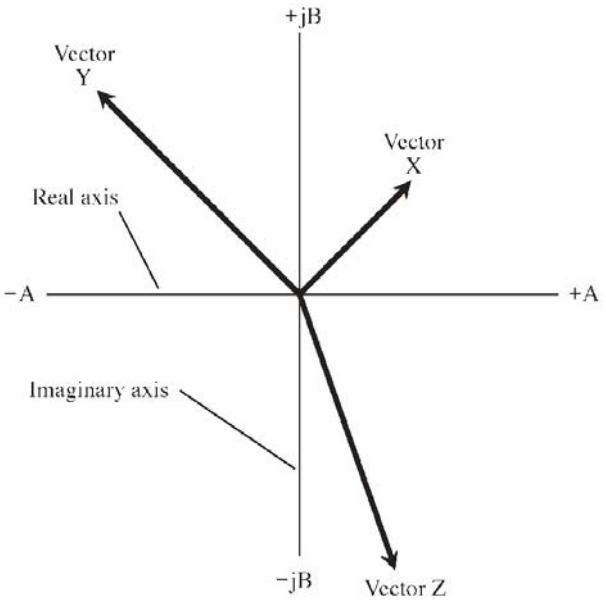
area protection Coverage of a defined region, in terms of area or volume, by an alarm system.

area redistribution A scheme to determine the effective duration of an irregularly shaped pulse. A rectangle is constructed whose height is equal to the peak height of the pulse, as displayed on an oscilloscope. The rectangle width is adjusted until the area of the rectangle is the same as the area under the curve representing the pulse. The width of the rectangle then represents the effective duration of the pulse.

area search The scanning of a large group of computer records for those of a major category or class.

area sensor A transducer, used with an alarm system, that protects a defined region or volume, such as an office or bedroom.

Argand diagram Named after Jean Robert Argand, (1768-1822) of Geneva, for his work on the graphical representation of complex numbers. A graphical illustration of a complex number in the form $A + jB$, where the real-number (A) axis is perpendicular to the imaginary-number (jB) axis. The value j is the square root of -1, the unit imaginary number. The axes are perpendicular, usually with the A axis horizontal. The length of the line from the point (0,0) to the point (A,jB) is the amplitude of the vector $\mathbf{X} = A + jB$. The direction is specified as the angle, in degrees or radians, of the vector measured counterclockwise from the A axis.



Argand diagram

argon Symbol, Ar. An inert gaseous element. Atomic number, 18. Atomic weight, 39.94. Argon, present in small amounts in the earth's atmosphere, is used in various specialized devices, such as lasers.

argon laser A laser whose tube is filled with argon gas. It generates coherent light at specific wavelengths that are characteristic of elemental argon.

argument **1.** The direction angle of a polar vector. **2.** An independent variable whose value determines the value of a function.

arithmetic address An address obtained by performing an arithmetic operation on another address.

arithmetic and logic unit Abbreviation, ALU. The part of a digital computer containing the circuits that perform calculations and logic operations; distinguished from mass storage, input/output, and peripheral units.

arithmetic circuit Also called *arithmetic element.* In a digital computer, a circuit that is involved in the execution of calculations. Included are adders, storage registers, accumulators, subtracters, and multipliers.

arithmetic mean The average of a group of quantities, obtained by dividing their sum by the number of quantities.

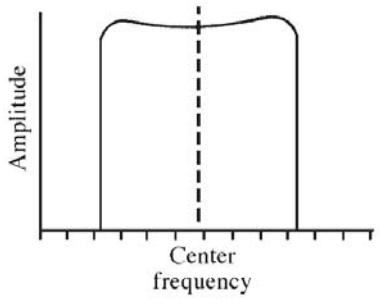
arithmetic operation In digital computer practice, a numerical process performed: addition, subtraction, multiplication, division, comparison.

arithmetic progression A mathematical series in which each term following the first is obtained by adding a constant quantity to the preceding one. For example, S = 1, 2, 3, 4, . . . *n*. Compare GEOMETRIC PROGRESSION.

arithmetic shift In a digital computer, the multiplication or division of a quantity by a power of the base used in the notation.

arithmetic sum The sum of two or more quantities disregarding their signs. Compare ALGEBRAIC SUM.

arithmetic symmetry A filter response that is exactly symmetrical about the center frequency when the frequency scale is linear.



arithmetic symmetry

arm **1.** Any of the distinct branches of a circuit or network. Also called *leg.* **2.** A movable element in a device, usually containing a contact for switching.

armature **1.** The rotating member of a motor. **2.** The rotating member of some types of electro-mechanical generator. **3.** The movable member of a relay, bell, buzzer, or gong. **4.** The movable member of an actuator. **5.** The soft-iron *keeper* placed across the poles of a permanent magnet to conserve power.

armature coil A coil of insulated wire wound on a ferromagnetic core to provide the electromagnetic properties of an armature. In a motor or generator, the armature coil is distinguished from the FIELD COIL.

armature core The ferromagnetic core upon which the armature coil of a motor or generator is wound.

armature gap **1.** In a motor or generator, the space between an armature core and the pole of a field magnet. **2.** In a relay, the space between the armature and the relay-coil core.

armature hesitation A momentary delay in the movement of a relay.

armature-hesitation contact chatter Undesired (usually rapid, repetitive) making and breaking of relay contacts. Generally caused by armature hesitation.

armature-impact contact chatter Undesired (usually rapid, repetitive) making and breaking of relay contacts, caused by *contact bounce* when the armature strikes the relay core (closure) or backstop (opening).

armature relay A relay that uses an electromagnet to pull a lever toward or away from a set of fixed contacts.

armature travel The distance traveled by an armature during relay operation.

armor A protective metal cable covering.

Armstrong FM system (Edwin H. Armstrong, 1890–1954). A phase-shift method of frequency modulation. See PHASE MODULATION.

armature voltage control A means of controlling motor speed by changing the applied armature winding voltage.

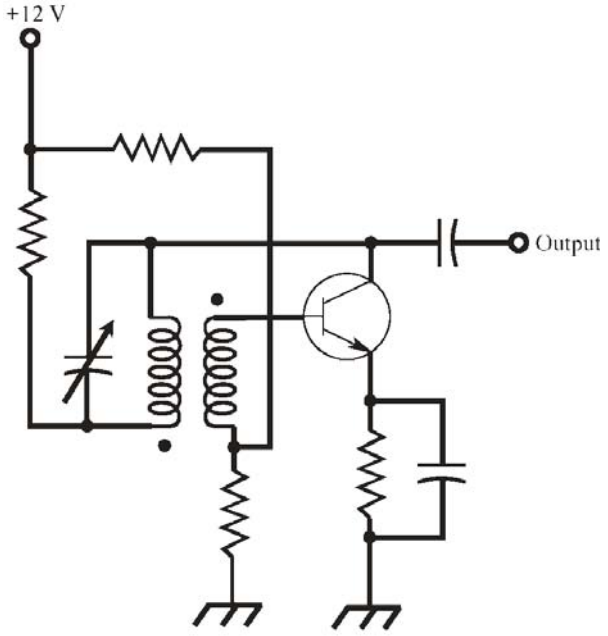
armchair copy An amateur radio term for reception of exceptionally clear signals.

arming the oscilloscope sweep Enabling an oscilloscope to trigger on the next pulse by closing a switch.

Armstrong oscillator (Edwin H. Armstrong, 1890–1954). An oscillator circuit that uses inductive feedback between the output and input. Either the output coil or the input coil can be tuned to set the oscillator frequency. The amount of positive feedback is controlled by varying the coupling between the coils.

Armstrong superheterodyne circuit See SUPERHETERODYNE CIRCUIT.

Armstrong superregenerative circuit See SUPERREGENERATIVE CIRCUIT.



Armstrong oscillator

ARPA Acronym for *Advanced Research Projects Agency,* a subsidiary of the U.S. Department of Defense.

array **1.** A directive antenna that consists of an assembly of properly dimensioned and spaced elements, such as radiators, directors, and reflectors. **2.** A coordinated group or matrix of components, such as diodes, resistors, memory cells, etc., often enclosed in one capsule. **3.** Subscripted variables representing data arranged so that a program can examine the array and extract data relevant to a particular subscript.

array device A group of similar or identical components that are connected together in a certain fashion, to perform a specific task.

arrester **1.** A device used to protect an installation from lightning. It consists of a varistor or an air gap connected between an antenna or power line and an earth ground. The device passes little or no current under ordinary conditions, but passes heavy current to ground during a lightning stroke. Also called LIGHTNING ARRESTER. **2.** A self-restoring protective device used to reduce voltage surges on power lines.

ARRL Abbreviation for *American Radio Relay League.*

arrowhead A wideband, log-periodic antenna with linear polarization.

ARS Abbreviation of *Amateur Radio Service.*

arsenic Symbol, As. A metalloidal element. Atomic number, 33. Atomic weight, 74.91. Arsenic is familiar as an n-type dopant in semiconductor processing.

ARSR Abbreviation of *air route surveillance radar.*

articulation A measure of the effectiveness of voice communications, expressed as the percentage of speech units understood by the listener when the effect of context is negligible.

artificial antenna See DUMMY ANTENNA.

artificial ear A microphone-type sensor, equivalent to the human ear, used to measure sound pressures.

artificial echo **1.** In radar practice, the reflections of a transmitted pulse returned by an artificial target. **2.** A signal from a pulsed radio-frequency (RF) generator, delayed to simulate an echo.

artificial ground The effective ground provided by the radials or disk of a ground-plane antenna, as opposed to actual ground (the earth itself). Compare TRUE GROUND.

artificial horizon In aircraft instrumentation, a device that displays lines showing the position of the aircraft in flight, with reference to the horizon.

artificial intelligence Abbreviation, AI. **1.** A specialized field of computer science overlapping with electronics, biology, physiology, and other sciences, concerning attempts to develop advanced computer systems that can emulate the processes of the human mind. **2.** The ability of a computer to learn from its mistakes, refine its own processes, and perhaps ultimately reason in a humanlike manner.

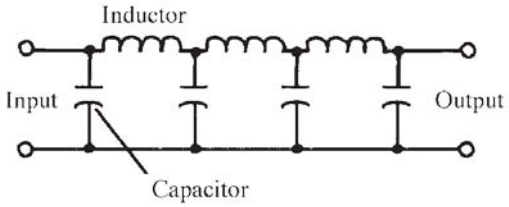
artificial ionization An artificial reflecting layer that is created in the atmosphere to provide a skip condition.

artificial language A language that is not commonly used, but has been devised for efficiency in a particular situation—especially in a computer system.

artificial life **1.** The ultimate endpoint of ARTIFICIAL INTELLIGENCE, wherein machines acquire qualities, such as wisdom and the capability to feel emotions. The state of the art is currently nowhere near this point. **2.** A hypothetical machine or set of machines with lifelike qualities, including human-level intelligence, wisdom, and emotion.

artificial stimulus An electronic method of robot guidance and navigation using radar, sonar, vision systems, edge detection, and/or beacons.

artificial transmission line A network of capacitors and inductors with characteristics similar to those of the more bulky transmission line it replaces in tests and measurements. It also serves as a time-delay or phase-shift device and as a pulse-forming network.



artificial transmission line

artificial voice A device used to test and calibrate noise-canceling microphones, consisting essentially of a small loudspeaker that has a baffle whose acoustical properties simulate those of the human head.

artos stripper A machine that cuts and strips wire for the fabrication of multiconductor cables.

artwork **1.** In the manufacture of printed circuits, the scaled drawings from which the mask or etch pattern is obtained photographically. **2.** Collectively, the illustrations depicting an electronic circuit, device, or system.

As Symbol for ARSENIC.

ASA Abbreviation of AMERICAN STANDARDS ASSOCIATION.

asbestos A nonflammable fibrous material consisting of calcium and magnesium silicates that is used for high-temperature insulation.

A-scan A radar-screen presentation in which the horizontal time axis displays distance or range, and the vertical axis displays the amplitude of signal pulse and echo pulses.

ascending node For a satellite orbiting the earth or another planet, any point at which the groundtrack crosses the equator as it moves from the southern hemisphere into the northern hemisphere. This node generally changes for each succeeding orbit, because the earth or planet rotates underneath the orbit of the satellite. Compare DESCENDING NODE.

ascending pass For a specific point on the earth's surface, the time during which an artificial communications satellite is accessible when its latitude is moving northward. The duration of accessibility depends on the altitude of the satellite, and on how close its groundtrack comes to the earth-based point. Compare DESCENDING PASS.

ASCII Acronym (pronounced "*ask*-ee") for *American Standard Code for Information Interchange.*

ASI Abbreviation for *American Standards Institute.*

A-scope A radar system that displays an A-SCAN.

Askarel A synthetic, nonflammable liquid dielectric.

aspect ratio The width-to-height ratio of a video image, generally three units high by four units wide.

asperities On the surface of an electrode, tiny points at which the electric field is intensified and from which discharge is highly probable.

ASR **1.** Abbreviation of AIRBORNE (or AIRPORT) surveillance radar. **2.** Abbreviation of AUTOMATIC SEND/ RECEIVE.

ASRA Acronym for *automatic stereophonic recording amplifier.*

assemble **1.** To gather subprograms into a complete digital computer program. **2.** To translate a

Symbols for ASCII teleprinter code

First four signals	*Last three signals*							
	000	*001*	*010*	*011*	*100*	*101*	*110*	*111*
0000	NUL	DLE	SPC	0		P	/	p
0001	SOH	DC1	!	1	A	Q	a	q
0010	STX	DC2	"	2	B	R	b	r
0011	ETX	DC3	#	3	C	S	c	s
0100	EOT	DC4	$	4	D	T	d	t
0101	ENQ	NAK	%	5	E	U	e	u
0110	ACK	SYN	&	6	F	V	f	v
0111	BEL	ETB	'	7	G	W	g	w
1000	BS	CAN	(	8	H	X	h	x
1001	HT	EM	)	9	I	Y	i	y
1010	LF	SUB	*	:	J	Z	j	z
1011	VT	ESC	+	;	K	[	k	{
1100	FF	FS	,	<	L	/	l	/
1101	CR	GS	–	=	M	]	m	}
1110	SO	RS	.	>	N		n	~
1111	SI	US	|	?	O	-	o	DEL

ACK: acknowledge
BEL: bell
BS: back space
CAN: cancel
CR: carriage return
DC1: device control no. 1
DC2: device control no. 2
DC3: device control no. 3
DC4: device control no. 4
DEL: delete
DLE: data link escape
ENQ: enquiry
EM: end of medium
EOT: end of transmission
ESC: escape
ETB: end of transmission block
ETX: end of text
FF: form feed
FS: file separator
GS: group separator
HT: horizontal tab
LF: line feed
NAK: do not acknowledge
NUL: null
RS: record separator
SI: shift in
SO: shift out
SOH: start of heading
SPC: space
STX: start of text
SUB: substitute
SYN: synchronous idle
US: unit separator
VT: vertical tab

symbolic program language into a machine (binary) language program by substituting operation codes and addresses.

assembly **1.** A finished unit that can be either a practical working model or a dummy, a prototype, or a final model; an integrated aggregation of subunits. **2.** A low-level computer source-code language that uses crude mnemonics that are easier to remember than the *machine-language* equivalents.

assembly language A source code that uses mnemonic instructions. (See ASSEMBLY, **2.**)

assembly program The program that operates on a symbolic-language program to produce a machine language program in the process of assembly. Also called *assembler.*

assembly robot A form of *industrial robot* that puts hardware together. Such a robot is generally a component of an *automated integrated manufacturing system (AIMS).* The robot can do repetitive work at high speed and precision for long periods of time.

assign To reserve part of a computing system for a specific purpose, normally for the duration of a program run.

assigned frequency The radio carrier frequency or band of frequencies designated for a transmitting station by a licensing authority. Also see RADIO SPECTRUM.

associative memory Computer memory in which locations are identified by content, rather than by specific address.

assumed decimal point A decimal point that does not occupy an actual computer storage space, but is used by the computer to align values for calculation; the decimal point is assumed to be at the right unless otherwise specified.

astable Having two temporary states; BISTABLE.

astable circuit A circuit that has two unstable states, and whose operation is characterized by alternation between those states at a frequency determined by the circuit constants.

astable multivibrator A free-running multivibrator. The common circuit uses two bipolar or field-effect transistors, their inputs and outputs being cross coupled. Conduction switches alternately between the two.

astatic **1.** Without fixed position or direction. **2.** In a state of neutral equilibrium.

astatic galvanometer A galvanometer with a movable element consisting of two identical magnetized needles mounted nonparallel on the same suspension. Each needle is surrounded by a coil. The coils are wound in opposite directions, and are connected in series to the current source. A large permanent magnet provides the field against which the needle assembly rotates. The instrument functions independently of the geomagnetic field.

astatine Symbol, At. A radioactive elemental halogen produced from radioactive decay. Atomic number, 85. Atomic weight, 210. Formerly called *alabamine.*

A station One of the two stations in the transmitting system of LORAN (long-range navigation).

astigmatism A focusing fault in a cathode-ray tube (CRT), in which electrons in different axial planes focus at different points.

ASTM Abbreviation for *American Society for Testing and Materials.*

astrionics The design, production, and application of electronic devices and systems for use in space vehicles and space navigation.

astronomical unit Abbreviation, AU. A unit of distance equal to 1.496×10^8 kilometers (9.296×10^7 miles). Approximately equal to the mean distance between the earth and the sun.

A supply See A POWER SUPPLY.

asymmetrical cell A photocell exhibiting ASYMMETRICAL CONDUCTIVITY.

asymmetrical communications **1.** Two-way communications in which the volume of transmitted data is much greater in one direction than in the other. **2.** Two-way communications in which the speed of transmitted data is much greater in one direction than in the other. Compare SYMMETRICAL COMMUNICATIONS.

asymmetrical conductivity A condition in which a device conducts well in one direction, but poorly in the other direction. A rectifier diode is a common example of a component that exhibits this effect.

asymmetrical distortion In a binary system, lengthening or shortening of one of the states, by comparison to the theoretical or ideal duration.

asymmetrical FET A FIELD-EFFECT TRANSISTOR in which the source and drain cannot be interchanged without degrading performance.

asymmetrical multivibrator An unbalanced multivibrator (i.e., one in which the circuit halves are not identical). If the time constants of the halves are different, the output pulses will be short and widely separated.

asymmetrical sideband See VESTIGIAL SIDEBAND.

asymmetrical sideband transmission See VESTIGIAL SIDEBAND TRANSMISSION.

asymmetrical wave A wave whose upper (positive half-cycle) and lower (negative half-cycle) portions have different amplitudes or shapes. Also called *asymmetric wave.*

asymmetry control An adjustment in a device intended for measuring the pH (acidity/alkalinity). This corrects the inaccuracies that results from the differences between the electrodes.

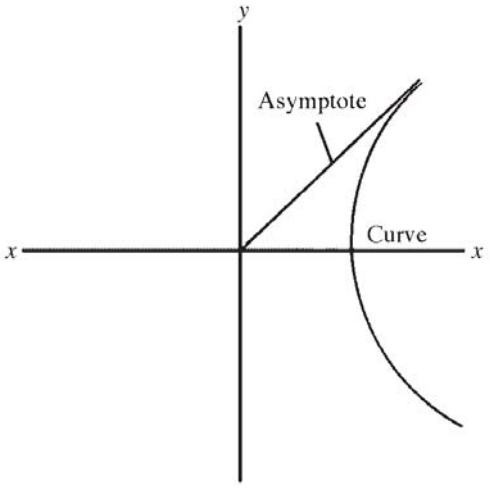
asymptote In analytical geometry, a fixed straight line or ray L with a special relationship to a curve or part of a curve K that recedes to infinity. As the distance from the origin (0,0) increases without limit, the separation between K and L approaches zero, but K and L never actually meet.

asymptotic breakdown voltage A voltage that will cause *dielectric breakdown* if applied continuously for a sufficiently long time.

asymptotic expression An expression having a very small error in terms of percentage.

asynchronous **1.** Not synchronous, i.e., nonrecurrent (as in out-of-phase waves). **2.** A mode of computer operation in which the completion of one operation starts another.

asynchronous device A device not regulated by the system in which it is used, as far as its operating frequency or rate is concerned.



asymptote

asynchronous input In digital circuitry, any flip-flop input at which a pulse can affect the output independently of the clock.

asychronous motor An ac motor whose speed is not proportional to the supply frequency.

asynchronous transmission Data transmission in which each character or symbol begins with a start signal and ends with a stop signal. This eliminates the need for the data to be sent at a uniform speed.

asynchronous vibrator In a vibrator-type portable power supply, a vibrator that only makes and breaks the primary circuit of the step-up transformer. This is in contrast to the synchronous vibrator, which also makes and breaks the secondary circuit in synchronism with the primary. Also called NONSYNCHRONOUS VIBRATOR.

AT A quartz crystal cut wherein the angle between the x-axis and the crystal face is 35 degrees.

At Symbol for astatine.

AT-cut crystal A piezoelectric crystal cut at a 35-degree angle, with respect to the optical axis of the quartz. The frequency of such a crystal does not appreciably change with variations in temperature.

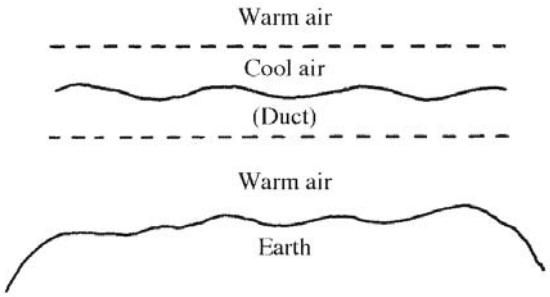
atmosphere **1.** The gas surrounding a planet, particularly the air sheathing the earth. **2.** Abbreviation, atm. A unit of pressure equal to 1.013×10^6 dynes per square centimeter (about 14.7 pounds per square inch).

atmospheric absorption **1.** The conversion of electromagnetic energy into heat, with resulting loss, as the energy passes through the earth's atmosphere. The extent of this effect depends on the wavelength. **2.** See ABSORPTION LOSS, **2.**

atmospheric absorption noise Noise, principally above 1 GHz, resulting from atmospheric absorption (see ABSORPTION LOSS, **2**).

atmospheric bending The refraction or reflection of electromagnetic waves by the troposphere or ionosphere. See ATMOSPHERIC REFLECTION.

atmospheric duct A tropospheric stratum, often associated with temperature inversions, lake effects, or weather fronts, through which electromagnetic energy at ultra-high and microwave frequencies is efficiently propagated for long distances.



atmospheric duct

atmospheric electricity Static electricity present in the atmosphere, which evidences itself in disturbance of radio communications and in displays of lightning.

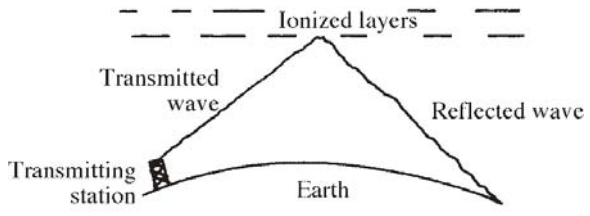
atmospheric noise Receiver noise resulting from ATMOSPHERIC ELECTRICITY. Also called *sferics* or *static.*

atmospheric pressure Abbreviation, atm press. **1.** The pressure exerted by the earth's atmosphere, as indicated by a barometer at sea level; normally between 29 and 31 inches of mercury. **2.** A pressure of 1.013×10^6 dynes per square centimeter. See ATMOSPHERE, **2.**

atmospheric radio wave See SKYWAVE.

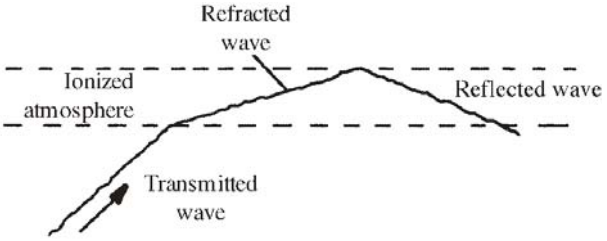
atmospheric radio window The band of frequencies (approximately 10 MHz to 10 GHz), including radio waves that can penetrate the earth's troposphere and ionosphere.

atmospheric reflection The return of a radio wave to earth, resulting from reflection by an ionized portion of the atmosphere.



atmospheric reflection

atmospheric refraction **1.** Downward bending of radio waves as a result of variations in the dielectric constant of the troposphere. **2.** Downward bending of radio waves in the ionosphere, resulting in long-range propagation at high frequencies.



atmospheric refraction

atmospheric scatter **1.** The scattering of very-high frequency (VHF) and ultra-high frequency (UHF) radio waves by the lower atmosphere. **2.** Communication via scattering of VHF and UHF radio waves in the lower atmosphere.

atmospherics See ATMOSPHERIC NOISE.

atom **1.** The smallest material particle that displays the unique characteristics and properties of an element. Atoms consist of a dense, positively charged central nucleus, around which less-massive, negatively charged electrons "swarm" at definite levels called *shells.* Also see BOHR ATOM and RUTHERFORD ATOM. **2.** In a computer-compiling operation, an operator or operand.

atomechanics The physics of electron movement.

atomic battery A battery in which atomic energy is converted into electrical energy.

atomic charge The electrification (i.e., the electron charge) exhibited by an ion.

atomic clock Also called *atomic time standard.* A highly accurate electronic clock, driven by the characteristic oscillations of certain atoms.

atomic energy Energy released by the FUSION or FISSION of atomic nuclei. Also see ATOMIC POWER.

atomic fission See FISSION.

atomic frequency The natural vibration frequency of an atom.

atomic fusion See FUSION.

atomic pile See REACTOR, **2.**

atomic mass unit Abbreviated amu. A unit that expresses the relative mass of an elemental *isotope.* One amu is equal to 1/12 of the atomic mass of carbon 12 (C12). A neutron has a mass of roughly one amu.

atomic migration The transfer or "wandering" of a valence electron between or among atoms in a single molecule.

atomic number The number of protons in the nucleus of an atom. Also, the number of electrons if the atom is electrically neutral. For example, the atomic number for copper is 29, indicating 29 protons in the nucleus. An electrically neutral atom of copper has 29 electrons. The atomic number uniquely identifies an element.

atomic radiation The emission of radiant energy by radioactive substances.

atomic reactor See REACTOR, **2.**

atomic theory The scientific theory that all matter is composed ultimately of *atoms,* which are the smallest particles retaining the identity of an element. Atoms combine to form *molecules*, the smallest particles that retain the identity of a compound. Atoms themselves contain minute *subatomic particles*, some of which carry electric charges. See BOHR ATOM and RUTHERFORD ATOM.

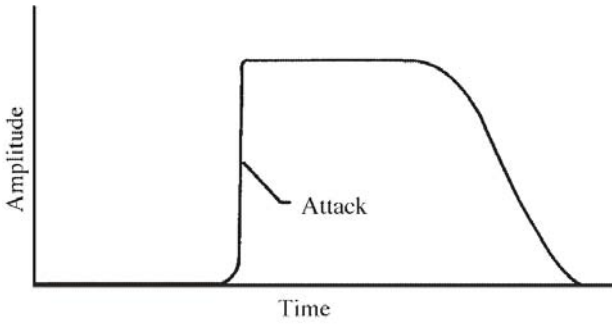
atomic time **1.** A means of time determination that makes use of the resonant vibrations of certain substances, such as cesium. **2.** Synchronized astronomical time, as determined by an ATOMIC CLOCK.

atomic unit of energy In a hydrogen atom, the potential energy of the electron in the lowest-energy shell, as averaged over a certain length of time. The shell represents the mean energy of the electron.

atomic weight **1.** The mass of a particular atom in ATOMIC MASS UNITS (amu). **2.** A number characterizing the average mass of individual atoms for a specific isotope of an element. Thus, carbon 12 (C12) has an atomic weight of 12, oxygen 16 (O16) has an atomic weight of approximately 16, and uranium 238 (U238) has an atomic weight of about 238.

atomistics The science of the atom and atomic energy. Also called *atomics.*

attack **1.** The rise of a pulse from zero to maximum amplitude. **2.** The time required for a pulse to rise from zero to maximum amplitude. **3.** The initialization of a circuit voltage or current for a certain purpose, such as an automatic gain control. **4.** The rise of a musical note from zero to full volume.



attack

attack time The time required for an applied signal that suddenly increases in amplitude to reach 63.2 percent of its final, stable value.

attemperator An automatic temperature-controlling device; a *thermostat.*

attention display A computer-generated chart or graph, displayed as an alert signal concerning a particular situation.

attenuate To reduce in amplitude.

attenuation A reduction of signal amplitude.

attenuation characteristic Also called *attenuation constant.* **1.** In an amplifier, network, or component, the decrease in signal amplitude as a function of frequency, usually expressed in decibels per octave. **2.** In a transmission line, the decrease in signal amplitude per unit length. Usually expressed in decibels per 100 feet, decibels per mile, or decibels per kilometer.

attenuation constant See ATTENUATION CHARACTERISTIC.

attenuation distortion A type of distortion characterized by variation of attenuation with frequency within a given frequency range.

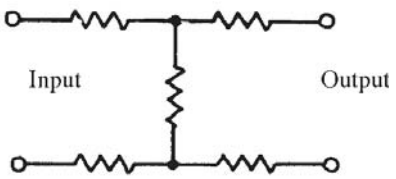
attenuation equalizer An equalizer that stabilizes the transfer impedance between two ports at all frequencies within a specified frequency band.

attenuation-frequency distortion Distortion characterized by the attenuation of the frequency components in a complex waveform. Frequency-sensitive RC networks (such as a Wien bridge) exhibit this type of distortion when they attenuate a fundamental and each harmonic unequally.

attenuation network A combination of components (R, C, or L singly or in any necessary combination) that provide constant signal attenuation with negligible phase shift throughout a frequency band.

attenuation ratio The ratio indicating a relative current, voltage, power or energy decrease. For example, for voltage, $E_{input}/E_{output} = 6/2 = 3{:}1 = 3$.

attenuator A device for reducing signal amplitude in precise, predetermined steps, or smoothly over a continuous range. A network of resistors, capacitors, or both. The simplest attenuator consists of one or more noninductive resistors.



attenuator

attitude The position of an aircraft or space vehicle relative to a (usually terrestrial) reference point, often determined with electronic instruments.

atto- Abbreviated, a. A prefix meaning 10^{-18} or multiplication by 10^{-18}.

attofarad Abbreviation, aF. An extremely small unit of low capacitance; 1 aF equals 10^{-18} F.

attracted-disk electrometer A device to measure potential difference consisting of two parallel metal disks—one of which is connected to a tension spring. The force between the disks indicates the magnitude of the electric field.

attraction The drawing together or pulling toward, as in the attraction between electric charges or magnetic poles. Dissimilar charges and poles attract each other (electric plus to minus, magnetic north to south). Compare REPULSION.

ATV Abbreviation of *amateur television*, used in the Amateur Radio Service.

AU Abbreviation of ASTRONOMICAL UNIT.

Au Symbol for GOLD.

audibility The quality of being detectable by the human ear. In a healthy listener, the *threshold of audibility* is extremely low; at the threshold, the pressure of a sound wave varies from normal by approximately 10^{-4} pascal. The frequency range of human audibility extends roughly from 20 Hz to 20 kHz.

Sound	*Audibility (dB)*
Threshold of hearing	0
Whisper	10–20
Electric fan at 10 feet	30–40
Running water at 10 feet	40–60
Speech at 5 feet	60–70
Vacuum cleaner at 10 feet	70–80
Passing train at 50 feet	80–90
Jet at 1000 feet altitude	90–100
Rock band on stage	110–120
Air hammer at 5 feet	130–140

audibility table

audibility curve A graph (such as the *Fletcher-Munson curve*) that depicts the range of human hearing in terms of frequency versus the sound pressure at the threshold of AUDIBILITY.

audible Detectable by the human ear.

audible alarm device An ANNUNCIATOR that produces an easily identifiable sound in response to an ALARM CONDITION in a security system.

audible frequency See AUDIO FREQUENCY.

audible tone A vibration of air molecules that can be detected by the human ear, and with periodic properties, such as a sine-wave vibration.

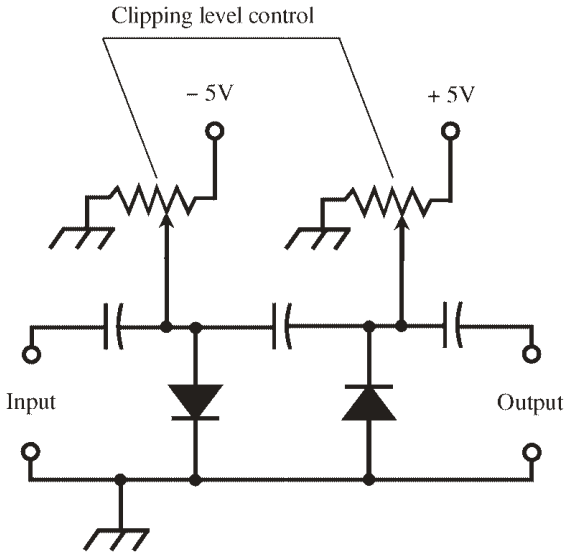
audio **1.** Pertaining to the spectrum of frequencies corresponding to the human hearing range (about 20 Hz to 20 kHz), or to equipment or performance associated with that spectrum. **2.** Any disturbance, such as a current or compression wave, falling within the range of about 20 Hz to 20 kHz. **3.** AUDIO FREQUENCY.

audio amplifier See AUDIO-FREQUENCY AMPLIFIER.

audio band The range (band) of audio frequencies.

audio channel **1.** The portion of a complex signal or waveform used to convey audio information exclusively. **2.** The audio-frequency section of a transmitter or receiver (as opposed to the radio-frequency section). **3.** A radio channel of fixed frequency that is reserved for voice communications.

audio clipping Brute-force limiting of the amplitude of an audio signal, usually accomplished using semiconductor diodes to prevent the positive and negative peak amplitudes from exceeding a certain level.



audio clipping

audio component The audio-frequency portion of any wave or signal.

audio converter A circuit in which a received radio-frequency (RF) signal is heterodyned with a local RF oscillator signal to produce an audio-frequency (AF) beat-note output. The beat note is then amplified by an AF amplifier. It is used especially by amateur radio operators in the reception of continuous-wave (CW) radiotelegraphy, radioteletype, and packet radio at high frequencies.

audio frequency A frequency lying within the audible spectrum. Abbreviated AF. See AUDIO-FREQUENCY SPECTRUM.

audio-frequency amplifier An amplifier that operates in part or all of the frequency range 20 Hz to 20 kHz. High-fidelity amplifiers function over a somewhat wider range (e.g., 10 Hz to 50 kHz).

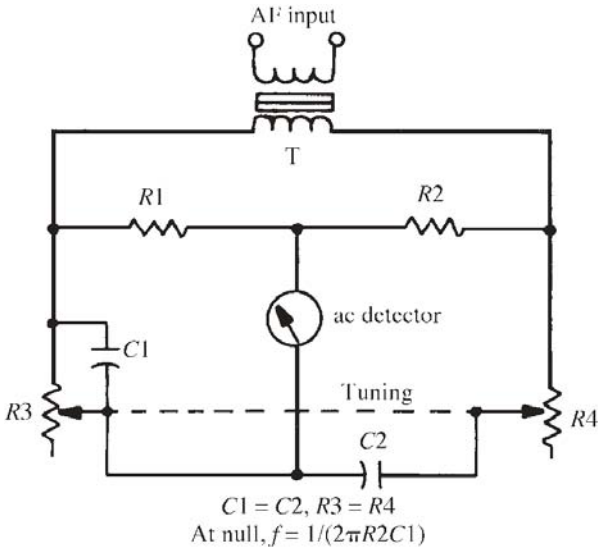
audio-frequency choke An inductor (usually having a ferromagnetic core) that blocks audio-frequency current, but passes direct current.

audio-frequency feedback **1.** Electrical FEEDBACK (positive and/or negative) that affects audio-frequency circuits. **2.** ACOUSTIC FEEDBACK.

audio-frequency filter A filter of any type that operates on any part of the frequency range 20 Hz to 20 kHz.

audio-frequency meter An instrument to measure frequencies in the audio-frequency spectrum (approximately 20 Hz to 20 kHz). Three types are commonly used:

- ***Analog*** Gives direct indications of frequency on the scale of a D'Arsonval meter; the usual range is 20 Hz to 100 kHz.
- ***Digital*** Gives direct indications of frequency by means of readout lamps; the usual range is 1 Hz to 15 MHz. This instrument is useful also as a radio-frequency meter.
- ***Bridge*** Consists of a frequency-sensitive bridge, such as a Wien bridge, with a null-indicating meter. The operator balances the bridge and reads the unknown frequency from the dial of the balance control.



audio-frequency meter

audio-frequency noise Any electrical noise signal causing interference within the audio-frequency spectrum.

audio-frequency oscillator See AUDIO OSCILLATOR.

audio-frequency peak limiter Any circuit or device, such as a biased diode, that performs the function of audio limiting.

audio-frequency-shift keying Abbreviation, AFSK. Frequency-shift keying that is done at audio frequencies (below approximately 20 kHz) rather than at radio frequencies. There are two audio sine-wave signals, one for logic 1 (*high* or *mark*) pulses and the other for the logic 0 (*low* or *space*) pulses. This scheme is commonly used with telephone modems where the signal bandwidth is severely limited by circuit characteristics. At typical data speeds in twisted-pair telephone lines (usually 28.8 or 57.6 kbps), signals of this type sound like a hiss or roar. Compare FREQUENCY-SHIFT KEYING.

audio-frequency-shift modulator A modulator for audio-frequency-shift keying of a signal.

audio-frequency spectrum The band of frequencies extending from roughly 20 Hz to 20 kHz. High-fidelity component specifications extend this range somewhat in both directions (e.g., from 10 Hz to 50 kHz).

audio-frequency transformer Abbreviation, AF transformer. A device used for the purpose of matching impedances at frequencies within the range of human hearing (up to approximately 20 kHz). This ensures the most efficient possible transfer of power between stages of audio amplification, between an amplifier and a speaker or headset, or between a microphone and an audio preamplifier. These transformers are available with various power ratings and impedance-matching ratios. Some devices are tailored to have a certain attenuation-versus-frequency response. At audio frequencies, transformers are physically similar to the alternating-current transformers used in power supplies. They are wound on laminated or powdered-iron cores. Compare RADIO-FREQUENCY TRANSFORMER.

audio-frequency transistor A transistor that is usually used only at audio frequencies.

audiogram A graph used to rate hearing, used by audiologists and audiometrists.

audio image In a direct-conversion receiver, a response to a signal on one side of (above or below) the local-oscillator (LO) frequency, when the operator is listening to a signal on the other side of the LO frequency. These responses are reduced or eliminated in single-signal receivers.

audio-level meter An ac meter for monitoring signal amplitude in an audio-frequency system. It can indicate in volts, decibels, volume units (VU), or arbitrary units, and is often permanently connected in the circuit.

audio limiter A limiter or clipper operated in the audio-frequency (AF) channel of a receiver or transmitter to hold the output-signal amplitude constant, or to minimize the effect of noise peaks.

audiologist A person skilled in testing hearing (i.e., in using audiometers and other electronic instruments) and evaluating their indications for the fitting of hearing aids.

audiometer An instrument used for hearing tests, which consists of a specialized audio-frequency (AF) amplifier with calibrated attenuators, output meter, and signal source.

audiometrist A person skilled in the use of audiometers and other electronic instruments that measure sound and human hearing, and who deals with attendant health and behavior problems. Compare ACOUSTICIAN and AUDIOLOGIST.

audio mixer An amplifier circuit for blending two or more audio-frequency (AF) signals, such as those delivered by microphones or receivers.

audio oscillator **1.** An oscillator that delivers an output signal in the frequency range 20 Hz to 20 kHz. **2.** An audio-frequency (AF) signal generator. Some instruments of this type operate above and below the limits of the common audio-frequency spectrum (e.g., 1 Hz to 1 MHz).

audio output The output of an audio-frequency oscillator or amplifier. It can be measured in terms of peak or rms volts, amperes, or watts.

audiophile A sound-reproduction hobbyist.

audio power Alternating-current power at frequencies roughly between 20 Hz and 20 kHz. When used in connection with transmitters and other modulated radio-frequency (RF) equipment, the term refers to modulator power output.

audio response unit A device that links digitized responses, held in computer storage, to a telephone set or line to answer incoming calls and inquiries.

audio signal generator See AUDIO OSCILLATOR, **2.**

audio spectrum The range of sine-wave frequencies detectable by the human ear when they occur as acoustic vibrations. This range is about 20 Hz to 20 kHz.

audio squelch A squelch circuit that operates only on the audio channel of a receiver.

audio system **1.** The portion of any electronic assembly that is used to process sound. **2.** Special computer equipment capable of storing and processing digitized audio-frequency (AF) data.

audiotape Magnetic tape for the recording and reproduction of data in the audio-frequency (AF) range.

audio taper In potentiometers, a semilogarithmic variation of resistance versus rotation. Used in volume and tone controls for audio circuits. At midposition (the halfway point), the counterclockwise portion of the device has about 1/10 the resistance of the clockwise portion. A listener will hear sound at half-volume because of the logarithmic nature of the human audibility curve.

audio-visual Pertaining to a combination of sound and sight (e.g., television and sound motion pictures).

auditory backward inhibition A subjective phenomenon, in which a sound is erased from the memory of a listener by a second sound arriving about 60 milliseconds later.

auditory inhibition The tendency of sound waves to be partially or totally canceled by the ears/mind of a listener, depending on the waves' intensity, relative phase, and/or direction of impact.

auditory mirage See ACOUSTIC MIRAGE.

audit trail A history of the processes relating to a record, transaction, or file in a computer system. Created during the routine processing of data, the trail is stored as a file. The audit trail allows auditing of the system or the subsequent recreation of files.

augend In a calculation, the number to which another is to be added. Compare ADDEND.

augend register In a digital computer, the register that stores the augend. Compare ADDEND REGISTER.

aural Pertaining to sound actually heard, as opposed to sound that exists only as audio-frequency currents or waves.

aurora A phenomenon sometimes called the *northern lights* or *southern lights*, as seen in the night sky. In the Northern Hemisphere, it is known as *Aurora Borealis*; in the Southern Hemisphere, it is called *Aurora Australis*. It generally occurs a few hours after a solar flare, when charged particles, emitted from the sun, arrive at the earth, and are accelerated in the vicinity of the the geomagnetic poles.

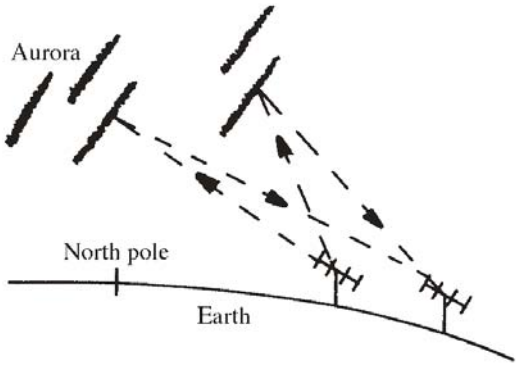
auroral absorption Radio wave absorption by an aurora.

auroral flutter Rapid fading of a signal at high or very high frequencies, so-called because it often imparts a fluttering quality to the signal that is caused by phase distortion and Doppler shift when the waves are reflected from the aurora.

auroral interference **1.** Interference to high-frequency radio propagation and also occasionally to medium-frequency and low-frequency propagation, caused by the activity of the aurora. **2.** Auroral flutter on a signal.

auroral opening A condition in which radio communication becomes possible via AURORAL PROPAGATION. It can occur when communication between two points is normally impossible at a certain frequency. Auroral openings allow long-distance communication well into the very-high-frequency (VHF) spectrum.

auroral propagation Reflection of radio signals from aurora that occur during geomagnetic storms. Theoretically, auroral propagation is possible when the aurora are active, between any two points on the earth's surface from which the same part of the aurora lie on a line of sight. This type of propagation seldom occurs when one end of the



auroral propagation

circuit is at a latitude less than 35 degrees north or south of the equator. Auroral propagation can take place at frequencies well above 30 MHz. It is characterized by deep, rapid fading and random phase modulation of reflected signals.

auroral reflection The return of electromagnetic waves that have been beamed toward an aurora. Most often observed between 15 MHz and 150 MHz.

authorized access switch A device that disables a security system in a defined region or volume so that authorized personnel can enter without triggering an alarm condition.

authorized channel The carrier frequency or band assigned to a transmitting station by a licensing authority. Also see RADIO SPECTRUM.

autoalarm A device that is actuated from a received signal to alert a radio or computer network operator to the existence of a message.

autobaud **1.** In digital communications, a function that allows the equipment to adjust itself to the speed of the terminal. **2.** Any digital communications equipment capable of automatically adjusting to the speed of the terminal.

autocondensation The application of radio-frequency (RF) energy to the human body for medical purposes. The living organs serve as an impedance or load, across which the RF is applied.

autoconduction The application of radio-frequency (RF) currents into the body, by placing the living organ inside a coil and supplying the coil with RF. Used for medical purposes.

autocorrelation function A measure of the similarity between delayed and undelayed versions of a signal, expressed as a delay function.

autodyne reception Radio reception of cw signals by means of an oscillating detector. This is in contrast to heterodyne reception, in which a local oscillator (LO) generates an audio beat note with the cw signal in a separate detector.

autoionization A two-phase process of atomic ionization. The atom is excited beyond its ionization potential, and then it is allowed to deionize, causing the emission of an electron. The result is a positively charged atom (positive ion).

automated communications The transfer of data without the use of operating personnel; generally done with computers connected to communications equipment.

automated guided vehicle Abbreviation, AGV. A robot cart that runs without a driver. It uses an electric engine and is guided by the magnetic field produced by a current-carrying wire embedded in the floor or pavement. Alternatively, the robot can run on a track.

automated home A residence in which many, or most, of the routine chores are done by computers and/or robots. Examples of such tasks are dishwashing, doing the laundry, mowing the lawn, blowing snow, and vacuuming the floors.

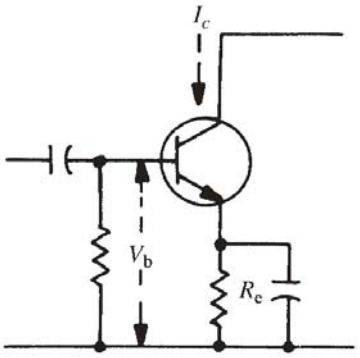
automated integrated manufacturing system Acronym, AIMS. An assembly line or factory that uses robots, often controlled by one or more computers, to perform specific tasks that result in the production of various hardware items.

automatic Self-regulating, independent of human intervention. Some periodic adjustment might be needed.

automatic base bias A method of obtaining base bias in a bipolar transistor, where a resistor develops a voltage drop because of the current flowing through it. The resistor is usually placed in the emitter circuit, raising the emitter above ground potential.

automatic bass compensation Also called *bass boost.* In audio high-fidelity systems, a resistor-capacitor (RC) network that increases the relative amplitude of the bass at low volume levels. This compensates for the ear's inefficiency at low frequencies. The function can be automatically actuated by the setting of the volume control, or it can be switched manually on and off.

automatic bias In an amplifier, dc base/gate/grid bias obtained from the voltage drop produced by collector/drain/plate current flowing through a resistor common to the input and output. This resistor is usually shunted by a capacitor and placed in the emitter/source/cathode circuit.



automatic bias

automatic brightness control A circuit that uses the same principles used in AUTOMATIC GAIN CONTROL (AGC) to hold steady the average brightness of a television (TV) picture.

automatic carriage Typewriters, automatic key punches, and other devices that can control automatically the spacing and feeding of paper, cards, and forms.

automatic check **1.** In a digital computer, the automatic inspection of operation and performance by a self-contained subsystem. **2.** The circuit or device for performing this inspection.

automatic chrominance control In a color television (TV) receiver, a subcircuit that controls the

gain of the chrominance bandpass amplifier by automatically adjusting its bias.

automatic circuit breaker Any device that opens a circuit automatically when the flow of current becomes excessive. The breaker generally resets automatically after a specified length of time, or after power has been temporarily removed from the circuit.

automatic coding The use of a computer to determine the steps for solving a problem, before the actual program for the problem is written. This can help software engineers develop long and/or complex computer programs.

automatic contrast control A circuit that automatically adjusts the gain of the video IF and RF stages of a television (TV) receiver to preserve good picture contrast.

automatic controller In servo systems, any of several circuits or devices that samples a variable signal, compares it with a standard (reference) signal, and delivers a control or correction signal to an actuator.

automatic crossover **1.** Current limiting in a power supply. **2.** A device that switches a circuit from one operating mode to another automatically when conditions change in a predetermined manner.

automatic current limiter A circuit or device for holding the output current of a power supply to a safe value during overload.

automatic current regulator A circuit or device that holds the output current of a generator or power supply to a predetermined value, in spite of wide variations in load resistance.

automatic cutout A device that shuts down a circuit or system when the safe limits of operation are exceeded. A circuit breaker is an example of such a device, as is a thermostat in a power amplifier.

automatic data processing Abbreviation, ADP. The use of computers and accessories for calculations and tabulations using data gathered automatically by the system.

automatic degausser A system for automatically demagnetizing the picture tube in a color television (TV) receiver.

automatic dialing unit Abbreviated, ADU. A device that automatically generates dialing digits. Many telephone sets have these devices, some of which can be programmed for several different telephone numbers, including country codes and area codes.

automatic dictionary A computer system component that substitutes codes for words and phrases in information retrieval systems. In language-translating systems, it provides word-for-word substitutions.

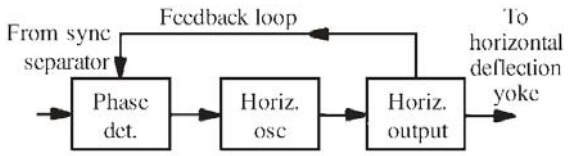
automatic direction finder Abbreviated ADF. A specialized receiver/antenna combination for automatically showing the direction from which a signal arrives.

automatic error correction A technique of correcting transmission errors using error-detecting and error-correcting codes and, usually, automatic retransmission.

automatic exchange A transmission exchange in which interterminal communications are accomplished without operators.

automatic focusing A method of focusing a picture tube automatically, in which a resistor connects the focusing anode to the cathode; thus, no external focusing voltage is necessary.

automatic frequency control Abbreviation, AFC. A system that keeps a circuit automatically tuned to a desired signal frequency. A detector (such as a discriminator) operated from the tuned circuit delivers a dc output voltage only when the circuit is operating above or below the signal frequency; otherwise, it has zero dc output. The dc output, when present, alters the capacitance of a varactor in the tuned circuit to retune the stage to the desired frequency.



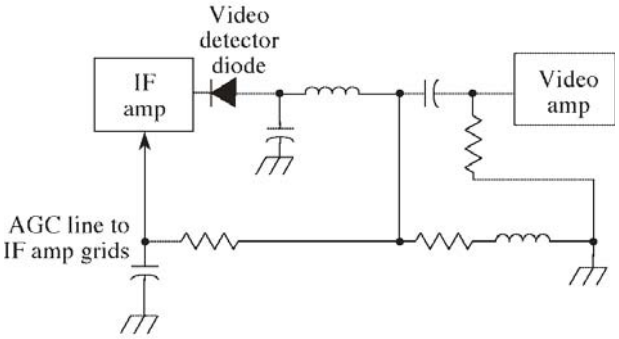
automatic frequency control (used in typical TV receiver)

automatic gain control Abbreviated AGC. A system that holds the output of a receiver or amplifier substantially constant despite input-signal amplitude fluctuations. A rectifier samples the ac signal output and delivers a dc signal proportional to that output. The dc signal is filtered, and the smoothed-out voltage is applied in correct polarity as bias to one or more preceding stages to reduce their gain. The stronger the signal entering the system, the greater the reduction in gain. As a result, weak signals are amplified much more than strong ones. Various forms of this scheme are used in many types of amplifiers and communications systems.

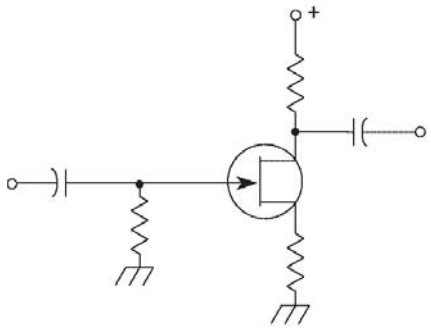
automatic gate bias A method of obtaining gate bias in a FET, where a resistor develops a voltage drop because of the current flowing through it. The resistor is usually placed in the source circuit, raising the source above ground potential.

automatic height control In a television (TV) receiver, a system that automatically maintains the height of the picture, despite signal-amplitude fluctuations, power-line voltage changes, and gain variations.

automatic intercept A telephone answering machine. It allows messages to be recorded when the subscriber is not able to answer the telephone.



automatic gain control (used in typical TV receiver)



automatic gate bias

automatic interrupt A program interruption caused by hardware or software acting in response to some event independent of the program.

automatic level compensation See AUTOMATIC GAIN CONTROL.

automatic level control Abbreviation, ALC. **1.** A circuit that adjusts the input gain of a magnetic-tape recording device to compensate for changes in the loudness of the sound reaching the microphone. **2.** A form of AUTOMATIC GAIN CONTROL used in single-sideband (SSB) radio transmitters to maintain linearity while increasing the level of the average power relative to the peak power.

automatic line feed In the digital transmission of printed matter, the automatic insertion of a line feed (LF) character immediately following every carriage return (CR) character.

automatic modulation control Abbreviation, AMC. In a frequency-modulated (FM) radio transmitter, a form of AUTOMATIC GAIN CONTROL that regulates the gain of the audio amplifiers to compensate for fluctuating audio input amplitude. This prevents overdeviation while optimizing signal intelligibility.

automatic noise limiter Abbreviation, ANL. Any of several circuits for clipping noise peaks exceeding a predetermined maximum received-signal amplitude.

automatic phase control In a color television (TV) receiver, a circuit that synchronizes the burst signal with the 3.58-MHz color oscillator.

automatic pilot An electronic device, often computer-controlled, that automatically keeps a ship, airplane, or space vehicle on course.

automatic polarity In an electronic metering device, a means of automatically switching the input polarity of the instrument when the input signal polarity is shifted. Also called *bipolar operation.*

automatic programming See AUTOMATIC CODING.

automatic protective device A circuit or device (such as a fuse, circuit breaker, limiter, or regulator) that protects another circuit or device by automatically removing, reducing, or increasing the current or voltage during overload or underload.

automatic radio compass See AUTOMATIC DIRECTION FINDER.

automatic ranging In a metering device, the automatic adjustment or optimization of the full-scale range to compensate for large changes in the input parameter.

automatic regulation **1.** *Voltage regulation.* In a power supply, the automatic holding of the output voltage to a constant value, despite variations in the input voltage or load resistance. **2.** *Current regulation.* In a power supply, the automatic holding of the output current to a constant value, despite variations in the input voltage or load resistance.

automatic relay The relaying of messages automatically from one station to another via intermediate points, without the need for human operators.

automatic repeater station A station that receives signals and simultaneously retransmits them, usually on a different frequency.

automatic reset **1.** The self-actuated restoration of a circuit or device to a given state (e.g., the state of rest). **2.** A circuit or device that restores another circuit or device to a given state.

automatic scanning **1.** The automatic (usually repetitive) tuning or adjustment of a circuit or system throughout a given frequency range. In a radio receiver, the system can be programmed to pause or stop at occupied channels, passing over vacant ones; or it can be programmed to pause or stop at vacant channels, passing over occupied ones. **2.** The repetitive sweep of a cathode-ray-tube (CRT) electron beam.

automatic scanning receiver Also called PANORAMIC RECEIVER. A radio receiver that is automatically tuned (usually repetitively) over a frequency band. Such a receiver either homes in on a signal when one is found, or displays on a cathode-ray-tube (CRT) screen the distribution of signals in the band.

automatic secure voice communications A wideband and narrowband voice-digitizing application

to a security network that provides encoded voice communications.

automatic send/receive set A teletypewriter or terminal that is capable of receiving and transmitting.

automatic sensitivity control **1.** A self-actuating circuit using principles similar to those used in AUTOMATIC GAIN CONTROL. It varies the sensitivity of the radio-frequency (RF) and intermediate-frequency (IF) sections of a receiver in inverse proportion to the strength of a received signal. **2.** In a bridge null detector, a circuit similar to the one described in **1**, which operates ahead of the detector, varying the sensitivity of the latter automatically.

automatic sequencing The ability of a digital computer to perform successive operations without additional instructions from the operator.

automatic short-circuiter A device that automatically short-circuits the commutator bias in some single-phase commutator motors.

automatic short-circuit protection A circuit that allows the output of a power supply to be short-circuited without damage to the components in the supply. It usually consists of a current-limiting device.

automatic shutoff A switching arrangement that automatically shuts off a device or circuit under certain specified conditions.

automatic switch center A telephone-switching network that routes calls to their destinations without the need for a human operator.

automatic target control For a vidicon television camera tube, a circuit that automatically adjusts the target voltage in proportion to brightness of the scene.

automatic telegraph reception Telegraph reception providing a direct printout of the received information, without intervention by an operator.

automatic telegraph transmission Telegraph transmission originating from tapes, disks, or other records, rather than from a hand-operated key.

automatic telegraphy Communications that utilize automatic telegraph transmission and reception.

automatic time switch A time-dependent circuit or device that opens or closes another circuit at the end of a predetermined time interval.

automatic tracking A method of keeping a radar beam automatically fixed on a target.

automatic trip A circuit breaker that automatically opens a circuit.

automatic tuning A process whereby a circuit tunes itself to a predetermined frequency upon receiving a command signal.

automatic voltage regulator A circuit that keeps the output of a power supply constant, despite the load resistance or input voltage to the supply.

automatic volume control Abbreviated AVC. The use of AUTOMATIC GAIN CONTROL in an audio amplifier system.

automatic zero In an electronic meter, a means of automatically setting the indicator to zero in the absence of an input signal.

automation **1.** The control of machines or processes by self-correcting electronic systems. See ROBOT. **2.** The use of robots and/or computers, rather than human beings, to perform repetitive tasks. **3.** The use of robots and/or computers to assist human beings in industrial, office, governmental, and educational work.

automaton A simple robot that performs a task or set of tasks without artificial intelligence (AI). These machines have existed for decades. Compare ANDROID.

automonitor In digital computer operations, to require the machine to supply a record of its information-handling operations. Also, the program for such instructions.

automotive battery A set of four or eight rechargeable lead-acid cells connected in series and housed in a common enclosure. The electrolyte is a free-flowing liquid acid. Provides approximately 6 volts (four cells) or 12 volts (eight cells) under no-load conditions when fully charged. The high mass results in large energy-storage capacity. These batteries must be handled with care and always kept in an upright position to prevent spillage of the acid. See LEAD-ACID BATTERY, LEAD-ACID CELL.

autonomous robot A self-contained robot with an independent computerized control system. It moves under its own power, usually by rolling on wheels or a track drive. Compare INSECT ROBOT.

autopatch A remotely controllable device that interconnects a radio-communications system into a telephone network.

autopilot A self-correcting control and guidance device for the automatic management of an aircraft or missile.

autoranging See AUTOMATIC RANGING.

autosyn A device or system that operates on the principle of the synchronous ac motor, in which the position of the rotor in one motor (the transmitter) is assumed by the rotor in a distant motor (the receiver) to which the first is connected.

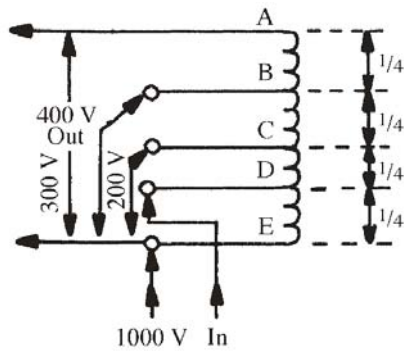
auto tracking A method of controlling the output voltages of many different power supplies simultaneously.

autotransducter A type of magnetic amplifier whose power windings serve also as control windings.

autotransformer A single-winding transformer in which the primary coil is a fraction of the entire winding for voltage step-up, or the secondary coil is a fraction of the entire winding for voltage step-down.

auxiliary circuit A circuit that is supplementary to the main system.

auxiliary contacts In switches and relays, contacts that are supplementary to the main contacts and are usually actuated with them.



autotransformer

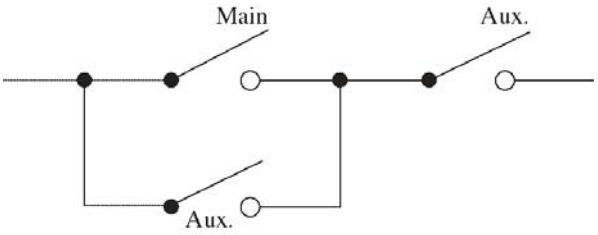
auxiliary equipment **1.** Also known as *peripherals.* An apparatus not directly governed by the central processing unit of a digital computer, such as a printer or personal robot. **2.** Peripheral equipment in any system. **3.** Backup equipment.

auxiliary memory In a digital computer, a unit that is supplementary to the main memory, which it augments.

auxiliary receiver Also called *standby receiver.* In a radio communications system, a receiver that is available for use if the main receiver fails.

auxiliary relay **1.** A standby relay. **2.** A relay whose operation supports that of another relay. **3.** A relay that is actuated by the operation of another relay.

auxiliary switch **1.** A standby switch. **2.** A switch wired in series or parallel with another switch. **3.** A switch that is operated by another switch.



auxiliary switch, 2

auxiliary transmitter Also called *standby transmitter.* In a radio communications system, a transmitter that is available for use if the main transmitter fails.

a/v Abbreviation of AUDIO-VISUAL.

aV Abbreviation of *attovolt.*

availability The proportion of time during which an apparatus is operating correctly. It is usually given as a percentage.

available conversion gain The ratio of the input power to the output power of a transducer or converter. It is generally given in decibels.

available gain The ratio P_o/P_i, where P_i is the available power at the input of a circuit and P_o is the available power at the output.

available line The percentage of the length of a facsimile scanning line that is usable for picture signals.

available power The mean square of the open-circuit terminal voltage of a linear source divided by four, times the resistive component of the source impedance. The available power is the maximum power delivered to a load impedance, equal to the conjugate of the internal impedance of the power source.

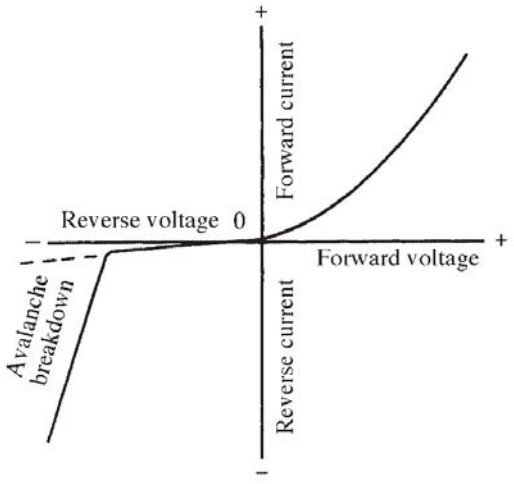
available power gain In a power transistor, the ratio of available transistor output power to the power available from the generator. It depends on the generator resistance, but not on the transistor load resistance.

available signal-to-noise ratio The ratio P_s/P_n, where P_s is the available signal power at a given point in a system and P_n is the available random-noise power at that point.

available time **1.** The time during which a computer is available and ready for immediate use. **2.** The amount of time a computer is available to an individual.

avalanche The phenomenon in semiconductors operated at high reverse bias voltage, whereby carriers acquire sufficient energy to produce new electron-hole pairs as they collide with atoms. The action causes the reverse current to increase sharply.

avalanche breakdown In a semiconductor P-N junction, a condition that occurs when the reverse bias voltage exceeds a certain value. If the electric field in the vicinity of the junction becomes strong enough, charge carriers are dislodged from the atoms and the carriers (electrons and holes) flow freely across the P-N junction in the opposite direction from normal. The mini-



avalanche breakdown

mum reverse-bias voltage required to cause this phenomenon varies among different kinds of diodes. Some diodes are manufactured to have precise avalanche voltages. See ZENER DIODE.

avalanche conduction In a semiconductor junction, the enhanced reverse-bias conduction caused by a condition of AVALANCHE.

avalanche current The high current that flows through a semiconductor junction when AVALANCHE occurs.

avalanche diode See ZENER DIODE.

avalanche impedance The reduced impedance of a diode during avalanche.

avalanche noise Electrical noise generated in a junction diode operated at the point at which avalanche just begins.

avalanche transistor A transistor that operates at a high value of reverse-bias voltage, causing the pn junction between the emitter and base to conduct because of avalanche breakdown.

avalanche voltage In a semiconductor P-N junction, the minimum applied reverse-bias voltage that produces AVALANCHE BREAKDOWN.

AVC Abbreviation of *automatic volume control.*

avdp Abbreviation for *Avoirdupois*, a weight-measurement scheme that is used in English-speaking countries and is based on the pound.

average absolute pulse amplitude The average (disregarding algebraic sign) of the absolute amplitudes of a pulse, taken over the duration of the pulse.

average brightness The average brilliance of a television (TV) picture, cathode-ray-tube (CRT) computer display, or oscilloscope image.

average calculating operation The operating time considered typical for a computer calculation (i.e., one that is longer than an addition and shorter than a multiplication); it is frequently taken as the average of nine additions and one multiplication.

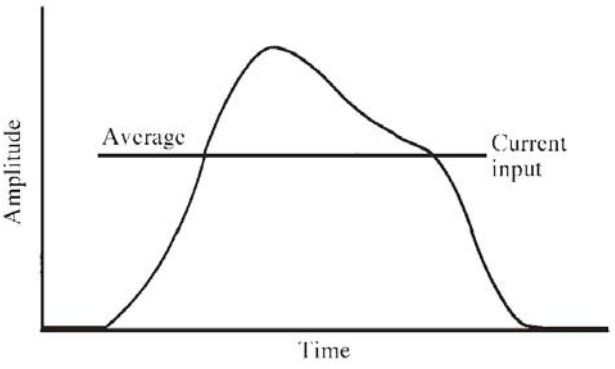
average current Abbreviation, I_{avg}. The average value of alternating current flowing in a circuit. Taking polarity into account, this value is zero for a pure sine wave. For other waveforms, it can vary. When polarity is not considered, the sine-wave value of I_{avg} is equal to 0.637 times I_{pk}, the peak value of current; $I_{avg} = 0.637\ I_{pk}$.

average life See MEAN LIFE.

average noise figure The ratio of the total noise output from a circuit to the thermal noise output at 290 degrees Kelvin. It is usually expressed in decibels, with the noise taken at all frequencies.

average power The average value of power in an ac circuit. In a resistive circuit, it is the square of the effective (rms) current times the resistance; $P_{avg} = (I_{rms})^2R$ (for sine waves).

average pulse amplitude Also called *effective pulse amplitude.* The value obtained by integrating the pulse amplitude, with respect to time, from the start of the pulse to its end, then dividing this integral by the pulse duration.



average pulse amplitude

average rectified current Abbreviation, I_{avg}. The average value of rectifier output current before filtering. For a full-wave rectifier with a sine wave input and a resistive load, I_{avg} is equal to the maximum current I_m multiplied by 0.637.

average rectified voltage Abbreviation, E_{avg}. The average value of rectifier output voltage before filtering. For a full-wave rectifier with a sine-wave input and a resistive load, E_{avg} is maximum voltage E_m multiplied by 0.637.

average value **1.** The *arithmetic mean* of two or more quantities. **2.** The *geometric mean* of two or more quantities. **3.** The *harmonic mean* of two or more quantities. **4.** In ac operation, the average current, voltage, or power.

average voltage Abbreviation, E_{avg}. The average value of ac voltage in a circuit. Taking polarity into account, this value is zero for a pure sine wave. For other waveforms, it can vary. When polarity is not considered, the sine-wave value of E_{avg} is equal to 0.637 times E_{pk}, the peak value of voltage.

avg Abbreviation of *average.*

aviation channels Frequency channels assigned to the AVIATION SERVICES.

Aviation services The radio-communication services used by aeronautical-mobile and radio navigation personnel.

avigation Acronym for *aviation navigation.* Aircraft navigation by means of electronic equipment.

avionics Acronym for *aviation electronics.* The design, production, and application of electronic devices and systems for use in aviation, navigation, and astronautics.

Avogadro's constant (Amedeo Avogadro, 1776–1856.) Symbol, NA. The number of molecules in a kilogram-molecular weight of any substance; NA equals 6.025×10^{26} (kg-mole)$^{-1}$.

A voltage The filament voltage in a vacuum-tube circuit.

aW Abbreviation of *attowatt.*

AWG Abbreviation of AMERICAN WIRE GAUGE.

AX.25 A signal format used in some digital communications systems, notably amateur *packet radio.*

axial leads The centrally located leads emanating from the ends of cylindrical components, such as resistors and diodes.

axial ratio The ratio of the minor to major axes of a waveguide's polarization ellipse.

axis **1.** A coordinate in a graphical presentation or display (e.g., horizontal and vertical axes in a rectangular coordinate system). **2.** The real or imaginary straight line around which a body rotates, or the line that passes through the center of a symmetrical arrangement (line of symmetry).

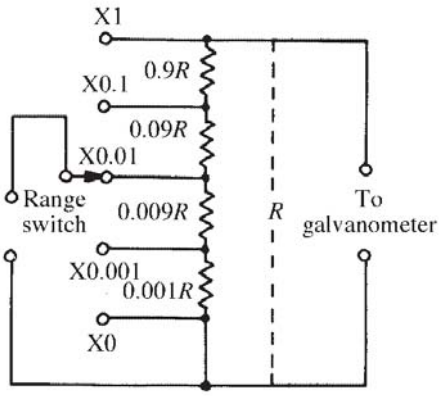
axis of abscissas The horizontal axis (x-axis) of a rectangular-coordinate graph or screen. Compare AXIS OF ORDINATES.

axis of imaginaries The vertical axis of the complex plane in which rectangular vectors lie. Compare AXIS OF REALS.

axis of ordinates The vertical (y-axis) of a rectangular-coordinate graph or screen. Compare AXIS OF ABSCISSAS.

axis of reals The horizontal axis of the complex plane in which rectangular vectors lie. Compare AXIS OF IMAGINARIES.

Ayrton-Mather galvanometer shunt A step-adjustable universal shunt resistor for varying the sensitivity of a galvanometer. It has the virtue of keeping the galvanometer critically damped. The shunt is also useful in multirange milliammeters, microammeters, and ammeters. The sensitive meter movement is never without a shunting resistor during range switching.

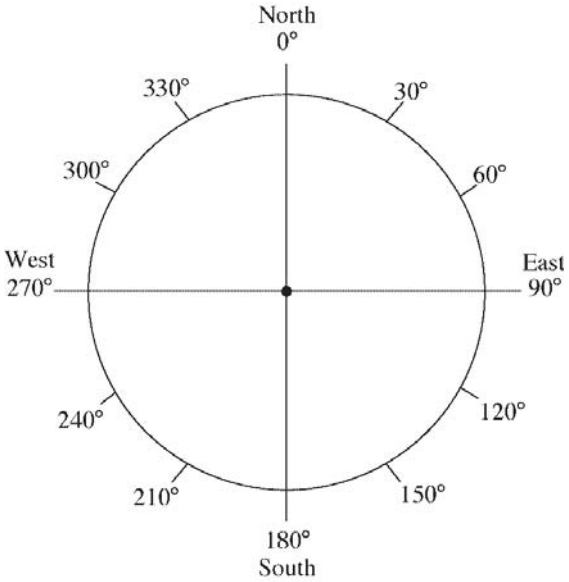


Ayrton-Mather galvanometer shunt

Ayrton-Perry winding A noninductive winding comprising two inductors conducting current in opposite directions; the opposing flow cancels the magnetic field.

azel display A plan-position display that incorporates two different radar traces on a single cathode-ray tube (CRT), one giving bearing, the other elevation.

azimuth Also called *compass direction.* Angular measurement in the horizontal plane, clockwise from north. It is important in radio and television communications, navigation, direction finding, land surveying, and radar.



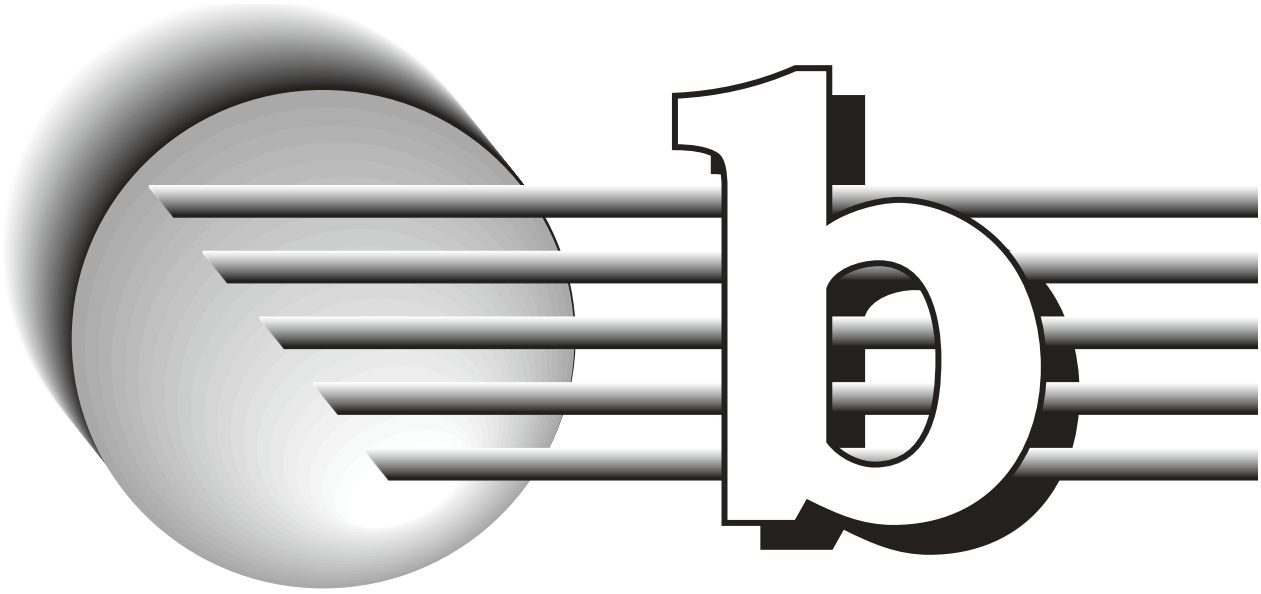
azimuth

azimuth alignment In a tape recorder, the alignment of record and playback head gaps so that their centerlines are parallel.

azimuth blanking In a radar system, blacking-out of the image as the antenna sweeps across a specified range of azimuth angles. Effectively eliminates nuisance echoes from stationary, permanent objects (such as tall buildings or communications towers).

azimuth resolution In a radar system, the minimum azimuth separation of two targets whose range (distance from the station) are equal that is required for the system to show two echoes, rather than one. It is generally measured in degrees.

azusa An electronic tracking system, in which a single station provides slant range and two direction cosines for a distant airborne object. This accurately defines the coordinates of the distant object in three-dimensional space.



B **1.** Symbol for SUSCEPTANCE. **2.** Symbol for FLUX DENSITY. **3.** Abbreviation of BATTERY. **4.** Symbol for BORON. **5.** Symbol for base of transistor (see BASE, **1**). **6.** Abbreviation of BASS. **7.** Abbreviation of BEL. **8.** Anode voltage or main operating voltage in any circuit (when used with sign). Also see B VOLTAGE.

b **1.** Symbol for SUSCEPTANCE. **2.** Symbol for base of transistor (see BASE, **1**). **3.** Abbreviation of BASS. **4.** Symbol for BARN.

B&S See AMERICAN WIRE GAUGE.

B5-cut crystal A piezoelectric plate cut from a quartz crystal in such a way that the face of the plate is at an angle, with respect to the z-axis of the crystal. This type of crystal has good frequency stability under conditions of changing temperature.

BA Abbreviation of BATTERY. Also see B and BAT.

Ba Symbol for BARIUM.

babbit A relatively soft, tin-base alloy of various compositions. One composition contains 7.4% antimony, 3.7% copper, and 88.9% tin.

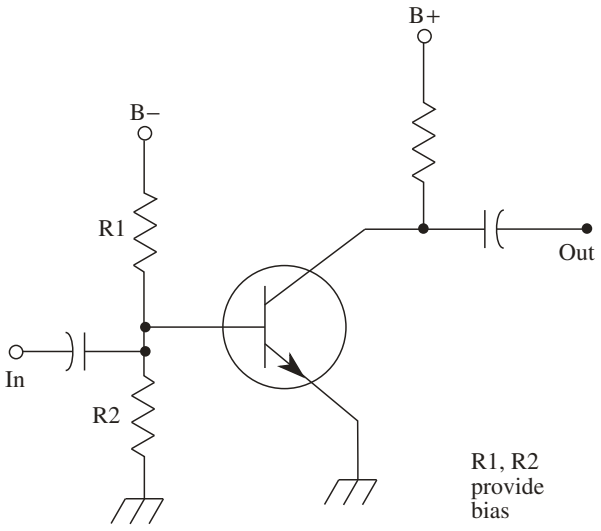
babble Interference caused by *crosstalk* from a number of channels.

babble signal A jamming signal containing babble components. See BABBLE and JAMMING.

BABS Abbreviation of BLIND-APPROACH BEACON SYSTEM.

baby monitor A short-range radio transmitter and receiver that can be used to listen at a distance to the sounds in an infant's room. The transmitter contains a sensitive microphone, a whip antenna, and a power supply. The unit can be placed on a table or desk, or even on the floor near the baby's crib. The receiver is similar to a handheld "walkie-talkie." It is battery-powered and can be carried around. It has an inductively loaded, short "rubber duckie" antenna similar to the antennas on cordless telephone sets. The receiver can pick up signals from the transmitter at distances of up to about 200 feet. The radio-frequency signals pass easily through walls, ceilings, and floors.

back bias **1.** A feedback signal (negative or positive). **2.** Reverse bias (also see BIAS). **3.** A reverse bias voltage, obtained from a voltage divider connected between a voltage source and ground.



back bias, 3

backbone A form of transmission line with capacitive connections between the generator and the load.

back conduction Conduction of current in the reverse direction, as across a semiconductor junction that is reverse-biased.

back contact A contact that closes a circuit when a relay, switch, or jack is in its normal rest position.

back current Symbol, I_b. The normally small current flowing through a reverse-biased pn semiconductor junction. Also called *reverse current* and *inverse current.* Compare FORWARD CURRENT.

back diode A semiconductor diode that is normally back-biased (reverse-biased).

back echo An echo resulting from the rear lobe of an antenna radiation pattern.

back emf See BACK VOLTAGE.

Back-Goudsmit effect See ZEEMAN EFFECT.

background **1.** The context or supporting area of a picture (e.g., the background of a television picture). **2.** Background noise.

background control In a color television receiver, a potentiometer used to set the dc level of the color signal at one input of the three-gun picture tube.

background count Residual response of a radioactivity counter in an environment as free as practicable of radioactivity. This background is caused largely by cosmic rays and inherent radioactivity of surrounding buildings and other bodies.

background job A low-priority, relatively long-running computer program that can be interrupted so that a higher-priority program can be run.

background noise Electrical noise inherent to a particular circuit, system, or device that remains when no other signal is present.

background processing In a computer, the running of programs having low priority.

background radiation Nuclear radiation from materials in the environment. Also see BACKGROUND COUNT.

background response The response of a radiation detector to background radiation.

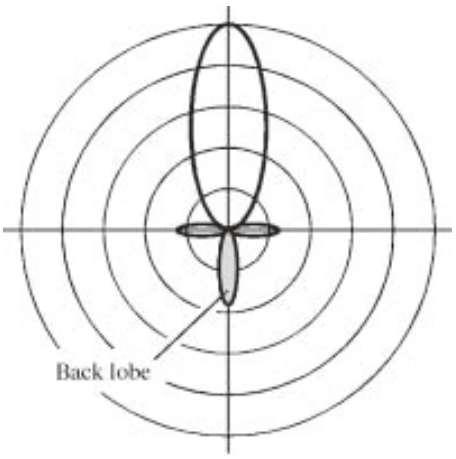
backing store In a computer, a device that stores large amounts of information. In most small computers, this is done via MAGNETIC DISK and/or MAGNETIC TAPE. A backing store can also be an optical storage medium, such as CD-ROM (compact disk, read-only memory).

backlash **1.** Slack or lag in action of moving parts. Example: delay between initial application of a force (such as that required to turn a knob) and movement of a part or device (e.g., a potentiometer or variable capacitor). **2.** On a mechanical analog tuning dial, an arc within which slack or lag is discernible.

backloaded horn A loudspeaker enclosure in which the front of the speaker cone feeds sound directly into the listening area, and the rear of the cone feeds sound into the same area through a folded horn.

backloading In a cascaded series of amplifiers, the tendency of loading effects to be passed to earlier stages. A change in the output impedance of a final amplifier circuit, for example, could also result in a change in the output impedance of the driver circuit, and perhaps even in a change in the output impedance of the predriver.

back lobe In the pattern of a directional antenna, the lobe directly opposite the major lobe, representing the radiation or response in or from a direction 180 degrees from that in which the gain is greatest.



back lobe

backplate A flat electrode in a television (TV) camera tube that receives the stored-charge image via capacitive coupling.

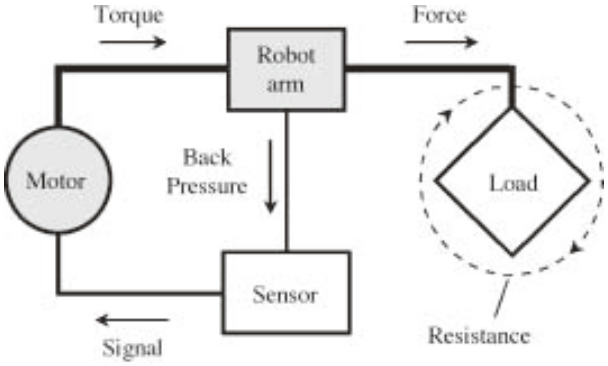
back porch In a television (TV) horizontal sync pulse, the time interval between the end of the rise of the blanking pedestal and the beginning of the rise of the sync pulse. That portion of the flat top of the blanking pedestal behind the sync pulse. Compare FRONT PORCH.

back-porch effect In transistor operation, the continuation of collector-current flow for a short time after the input signal has fallen to zero.

back-porch tilt The departure of the top edge of a back porch from true horizontal.

back pressure sensor A device that detects and measures the torque that a motor is applying, and produces a signal whose amplitude is proportional to the torque. This signal can be used for various purposes. In a robotic device, for example, the sensor output can be fed back to the motor control to limit the applied force.

back resistance Symbol, R_b. The resistance of a reverse-biased pn semiconductor junction. Also called REVERSE RESISTANCE.



back pressure sensor

back scatter Scattering of a wave back toward a radio transmitter from points beyond the skip zone. This phenomenon is caused by ionospheric reflection. Compare FORWARD SCATTER.

backstop A contact or barrier (such as a screw or post) that serves to limit the BACKSWING of the armature of a relay.

backswing **1.** The tendency of a pulse to overshoot, or reverse direction after completion. Backswing is measured in terms of the overshoot amplitude as a percentage of the maximum amplitude of the pulse. **2.** The extent to which a relay armature moves back from a contact when the relay contacts are open.

back-to-back connection The connection of diodes or rectifiers in reverse parallel (i.e., the anode of one to the cathode of the other) across a signal line to pass both half cycles of ac in certain control circuits.

back-to-back sawtooth A symmetrical sawtooth wave in which the rise slope is equal to the fall slope. Also called *triangular wave* and *pyramidal wave.*

backup **1.** An element, such as a circuit component, that is used to replace a main component, in case of main-component failure. **2.** Any process or scheme that serves to maintain operation of a system in case of main-component failure. **3.** A battery that maintains volatile memory data stored in one or more integrated circuits. **4.** A computer file, or set of files, stored in a nonvolatile medium, such as diskettes or magnetic tape, to prevent catastrophic data loss in the event of hard-disk failure. **5.** A battery or alternative power source that keeps an alarm system operational in the event of a utility power failure.

backup battery **1.** In a computer or microcomputer-controlled electronic device, a source of voltage to preserve volatile memory data if the power is removed. **2.** A battery used for powering a system in the event that the main power source should fail.

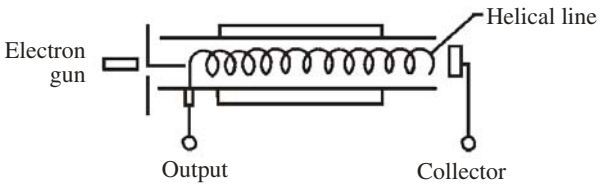
backup facility In an electrical or communications system, a facility that is intended for use when the primary, or main, facility is not operational.

back voltage **1.** Voltage induced in an inductor by the flow of current through the inductor, so called because its polarity is opposite to that of the applied voltage. Also called *counter emf.* **2.** A voltage used to obtain bucking action (e.g., the voltage used to zero the meter in an electronic voltmeter circuit). **3.** Reverse voltage applied to a semiconductor junction.

backwall In a pot core, the plate or disk that connects the sleeve and center post to close the magnetic circuit.

backward diode A semiconductor diode manufactured in such a way that its high-current flow occurs when the junction is reverse biased. Such a diode is also a negative-resistance device.

backward-wave oscillator Abbreviation, BWO. A microwave oscillator tube similar to the *traveling-wave tube.* Like the traveling-wave tube, the BWO contains a helical transmission line. In the electron beam, electron bunching results from interaction between the beam and the electromagnetic field, and reflection occurs at the collector. The wave moves backward from collector to cathode, and oscillation is sustained because the backward wave is in phase with the input. Output is taken from the cathode end of the helix.



backward-wave oscillator

back wave The oscillator signal present in an amplifier-keyed, continuous-wave (CW), Morse-code transmitter. Normally, this signal is at the same frequency as the transmitter output, but is not sufficiently strong to be radiated over the air.

back-wave radiation The condition wherein a back wave is strong enough to be heard on a continuous-wave (CW) keyed signal at the receiving station. This results from ineffective amplifier keying.

baffle A board on which a loudspeaker is mounted to separate acoustic radiation from the back of the cone from radiation emanating from the front. The baffle improves bass response by increasing the wavelength (lowering the frequency) at which phase cancellation occurs.

baffle plate **1.** See BAFFLE. **2.** A metal plate mounted in a waveguide to reduce the cross-sectional area.

bail A wire loop or chain that holds one member of a two-member assembly to prevent loss (e.g., the short chain holding the dust cap of a jack).

Bakelite The trade name for a specialized plastic dielectric material. Its chemical composition is *phenol-formaldehyde* resin.

baker An obsolete phonetic alphabet code word for letter B. BRAVO is commonly used instead.

baking-out In the process of evacuating a system, the procedure of heating the system to a high temperature to drive out gases occluded in the glass and metal parts.

balance **1.** See BRIDGE. **2.** To null a bridge or similar circuit. **3.** To equalize loads, voltages, or signals between two circuits or components. **4.** In a high-fidelity stereo sound system, a control or set of controls that adjusts the relative loudness of the left and right channels. **5.** Alignment of a *balanced modulator* for minimum carrier output amplitude. **6.** A condition in which two branches of a circuit have identical impedances, relative to ground.

balance coil **1.** A type of autotransformer that enables a three-wire ac circuit to be supplied from a two-wire line. A series of taps around the center of the winding enables the circuit to be compensated for unequal loads. **2.** See BALANCING COIL.

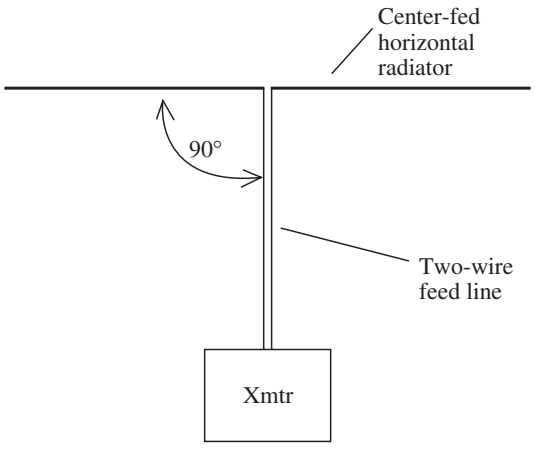
balance control A variable component, such as a potentiometer or variable capacitor, that is used to balance bridges, null circuits, or loudspeakers.

balanced Having identical impedances, with respect to ground.

balanced amplifier Any amplifier with two branches that have identical impedances, with respect to ground. Usually, the two branches are in phase opposition (180 degrees out of phase).

balanced antenna An antenna system where two halves are exact replicas of each other, geometrically and electrically. Such an antenna normally must either be fed with a balanced transmission line or with a coaxial cable and balun.

balanced antenna system A balanced antenna, fed with a balanced transmission line, that has currents of equal magnitude in each side. An example is a half-wave dipole at uniform height above electrical ground, fed at the center with parallel-wire line. It is important that the transmission line runs away from the antenna at a right angle for at least ¼ wavelength, preferably ½ wavelength or more, to prevent line imbalance caused by currents induced from the radiated field.



balanced antenna system

balanced bridge Any four-leg bridge circuit in which all legs are identical in all electrical respects.

balanced circuit **1.** A circuit that has its electrical midpoint grounded, as opposed to the *single-ended circuit*, which has one side grounded. **2.** A bridge circuit in the condition of null.

balanced converter See BALUN.

balanced currents Currents with the same value. In the two conductors of a balanced transmission line, these currents are equal in amplitude and opposite in phase at every point along the line.

balanced delta A set of coils or generators in a three-phase system, connected so that the currents in any two coils differ in phase by 120 degrees.

balanced detector A symmetrical demodulator, such as a full-wave diode detector or a discriminator.

balanced electronic voltmeter An electronic voltmeter circuit in which two matched transistors are connected in a four-arm bridge arrangement. The drift in one half of the circuit opposes that in the other half; the resulting drift of the zero point is virtually eliminated.

balanced filter A filter consisting of two identical sections, one in each branch of a balanced system, such as a parallel-wire transmission line.

balanced input An input circuit whose electrical midpoint is grounded. Compare SINGLE-ENDED INPUT.

balanced input transformer An input transformer in which the center tap of the primary winding is grounded.

balanced line A pair of parallel wires that possesses a uniform characteristic impedance. The two conductors are of the same material and have identical diameters. The distance between them is constant. In a balanced two-wire line, the currents in the two conductors are of equal amplitude and opposite phase.

balanced lines In high-fidelity audio systems, a cable that consists of two parallel conductors surrounded by a single braid. The parallel wires carry the audio-frequency (AF) signals, and the braid is grounded for shielding.

balanced loop antenna A loop antenna with a grounded electrical midpoint, determined by the junction of two identical series-connected capacitors shunting the loop.

balanced low-pass filter A low-pass filter used in a balanced system or balanced transmission line.

balanced method A system of instrumentation in which a zero-center scale is used. The reading can be either side of the zero reading.

balanced modulator A symmetrical modulator circuit using bipolar transistors, field-effect transistors, an integrated circuit, or diodes as principal components, that delivers an output signal containing the sidebands, but not the carrier. It is commonly used to generate a double-sideband (DSB) signal that can be filtered to obtain a single-sideband (SSB) signal.

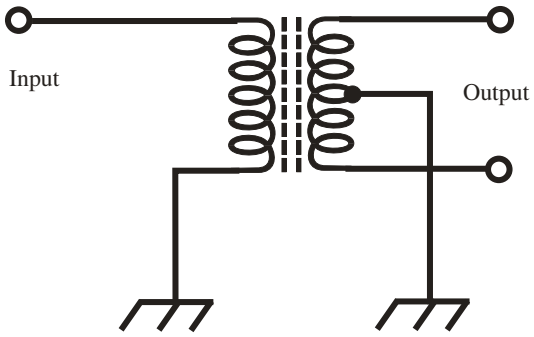
balanced multivibrator A switching oscillator circuit in which the two halves are identical in configuration, and as nearly identical as practicable in performance.

balanced network Any network intended to be used with a balanced system or balanced transmission line. It is characterized by a pair of terminals, each of which shows the same impedance with respect to ground.

balanced oscillator A PUSH-PULL OSCILLATOR.

balanced output Output balanced against ground (e.g., where the electrical midpoint of the output circuit is grounded).

balanced output transformer **1.** A push-pull output transformer with a center-tapped primary winding. **2.** An output transformer with a grounded center tap on its secondary winding.



balanced output transformer, 2.

balanced probe A probe, such as one for an electronic voltmeter or oscilloscope, that has a balanced input and (usually) a single-ended output.

balanced-tee trap A wavetrap constructed in a T configuration, with a resonant section in each conductor of a balanced transmission line.

balanced telephone line A telephone transmission line that has two sides, similar to a balanced radio-frequency transmission line. Either side has the same impedance, with respect to ground.

balanced termination A load device (or the practice of using such a device) in which the sections provide identical termination for each of the sections or conductors of a balanced system, such as a balanced line.

balanced-to-unbalanced transformer See BALUN.

balanced transmission line See BALANCED LINE.

balanced varactor tuning A two-varactor, back-to-back circuit for adjusting the value of a capacitor using an applied dc voltage. This arrangement has an advantage over a single-varactor (unbalanced) circuit, because high-tuned-circuit Q is maintained and harmonic generation is reduced.

balanced voltages In any symmetrical system, such as a balanced line or push-pull circuit, two or more input or output voltages that are adjusted to have the same amplitude and (usually) opposite phase.

balanced-wire circuit A circuit or conductor system with identical halves that are symmetrical, with respect to ground and to other conductors.

balancing circuit See BUCKING CIRCUIT.

balancing coil In a receiver, a center-tapped antenna coil that is balanced to ground to eliminate MARCONI EFFECT.

ballast **1.** A component that is used to stabilize the current flow through, or operation of, a circuit, stage, or device. **2.** An iron-core choke connected in series with one of the electrodes in a fluorescent or other gas-discharge lamp.

ballast resistor **1.** A nonlinear inductive power resistor whose voltage-current (EI) characteristic is such that current through the resistor is independent of voltage over a useful range. This feature enables the ballast resistor to act as an automatic voltage regulator when it is simply connected in series with a power supply and load. **2.** A small (usually high-resistance) resistor operated in series with a glow lamp, such as a neon lamp, to prevent overload.

ballast transformer A misnomer often used in place of BALLAST, **2.**

ballistic galvanometer An undamped galvanometer that is used particularly to observe electric charges by noting the single throw resulting from the momentary flow of current through the galvanometer coil.

ballistics The electronics-supported science concerned with the motion of projectiles and similar bodies in air or space.

balloon antenna A vertical antenna consisting of a wire or wires held aloft by a captive balloon. Occasionally, used by radio amateurs and shortwave listeners at low and medium frequencies. A potentially dangerous antenna because of large static-electric buildup, a tendency to attract lightning, the possibility of its breaking loose, and the risk of accidental contact with high-voltage power lines.

balop Contraction of BALOPTICON.

balopticon An opaque-picture projecting system in which the picture is viewed by a television (TV) camera, such as a vidicon, and displayed by a picture tube. Also called *balop.*

balun A specialized impedance-matching radio-frequency (RF) transformer. It is a wideband device,

usually providing a 1:1 or 1:4 impedance ratio and available in several different forms. It is so called because it has an unbalanced input suitable for coaxial transmission lines, and a balanced output suitable for dipole, Yagi, and quad antennas.

banana jack The female half of a two-part quick-connector combination. Splicing of a circuit is completed by inserting a BANANA PLUG into this jack.

banana plug The male half of a two-part quick-connector combination, with sides usually composed of flat springs that ensure contact with the female BANANA JACK into which it is inserted.

banana jack and plug

band **1.** A continuous range of radio or television communications frequencies or wavelengths, usually designated by the lowest and highest frequencies, or the approximate wavelength (e.g., the 20-meter amateur radio band). **2.** A set of discrete radio or television frequency channels within a specified range (e.g., the standard AM broadcast band). **3.** A range of wavelengths for infrared, visible, ultraviolet, X-ray, or gamma-ray energy. **4.** A range of energy levels. **5.** A colored stripe on a resistor or capacitor that forms part of the code that indicates component value and tolerance.

band center **1.** In a given radio or television communications band, the arithmetic mean of the lowest and highest frequencies. **2.** In a given band, the geometric mean of the longest and shortest wavelengths.

band-elimination filter See BAND-REJECTION FILTER.

band gap In any atom, the difference in electron energy between the conduction and valence bands.

bandpass **1.** The frequency limits between which a BANDPASS FILTER or BANDPASS AMPLIFIER transmits ac energy with negligible loss. **2.** The ability to allow passage of signals at a given frequency or band of frequencies while blocking other signals. Compare BANDSTOP.

bandpass amplifier An amplifier that is tuned to pass only those frequencies between preset limits.

bandpass coupling A coupling circuit with a flat-topped frequency response so that a band of frequencies, rather than a single frequency, is coupled into a succeeding circuit. Also see BANDPASS, **1.**

bandpass filter Any resonant circuit, or combination of resonant circuits, designed to discriminate against all frequencies except a specific frequency f_0, or a band of frequencies between two limiting frequencies f_0 and f_1. In a parallel inductance-capacitance (LC) circuit, the device exhibits high impedance at the desired frequency or frequencies and a low impedance at unwanted frequencies. In a series configuration, the filter has a low impedance at the desired frequency or frequencies and a high impedance at unwanted frequencies. Compare BAND-REJECTION FILTER, HIGH-PASS FILTER, LOW-PASS FILTER.

bandpass flatness The degree to which a bandpass device's attenuation-versus-frequency curve is a straight line with zero slope within the passband.

band pressure level The net acoustic pressure of a sound source within a specified frequency range (band).

band-rejection filter Also called a *band-stop filter*. Any resonant circuit, or combination of resonant circuits designed to discriminate against a specific frequency f_0, or a band of frequencies between two limiting frequencies f_0 and f_1. In a parallel inductance-capacitance (LC) circuit, the device exhibits high impedance at the desired frequencies, and a low impedance at the unwanted frequency or range of frequencies. In a series configuration, the filter has a low impedance at the desired frequencies and a high impedance at the unwanted frequency or range of frequencies. Compare BANDPASS FILTER, HIGH-PASS FILTER, LOW-PASS FILTER, NOTCH FILTER.

band selector Any switch or relay that facilitates switching the frequency of a radio transmitter, receiver, or transceiver among various bands.

bandset capacitor In some older communications receivers, a variable capacitor is used to preset the tuning range in each band to correspond to graduations on the tuning dial. This capacitor is a trimmer or padder operated in conjunction with the main tuning capacitor.

bandspreading In some older communications receivers, the process of widening the tuning range within a given frequency band to cover the entire dial. Otherwise, the band would occupy only a portion of the dial, and tuning would be difficult. It is usually accomplished with a BANDSPREAD TUNING CONTROL whose range is preset via the main tuning control and/or a BANDSET CAPACITOR.

bandspread tuning control An analog adjustment in some older communications receivers that allows continuous tuning over a desired band of frequencies. This control is separate from the main tuning control.

bandstop **1.** The frequency limits between which a BAND-REJECTION FILTER blocks, or greatly attenuates, ac energy. **2.** The ability to suppress or block signals of a given frequency or band of frequencies, while allowing signals of other frequencies to pass with little or no attenuation. Compare BANDPASS.

bandstop filter See BAND-REJECTION FILTER.

band suppression **1.** The property of blocking, or greatly attenuating, signals within a specific frequency band. **2.** The frequency limits between which a device or circuit rejects or blocks ac energy, while passing energy at other frequencies with negligible loss.

band-suppression filter See BAND-REJECTION FILTER.

bandswitch A low-reactance selector switch (usually rotary) that facilitates changing the tuning range of a radio receiver, transmitter or transceiver from one band of frequencies to another.

bandswitching In a receiver, transmitter, or test instrument, the process of switching self-contained tuned circuits to change from one frequency spectrum to another within the range of the device's intended operation.

bandwidth **1.** For a communications or data signal, a measure of the amount of spectrum space the signal occupies. Usually, it is given as the difference between the frequencies at which the signal amplitude is nominally 3 dB down with respect to the amplitude at the center frequency. These frequencies represent the half-power points of the amplitude-versus-frequency function. In general, the bandwidth increases as the data rate (in bits per second, baud, or words per minute) increases. **2.** Also called NECESSARY BANDWIDTH. The minimum amount of spectrum space normally required for effective transmission and reception of a communications or data signal. **3.** See BANDPASS, **1.**

bank A collection of usually similar components used in conjunction with each other, usually in a parallel configuration. Some examples are resistor bank, lamp bank, and transformer bank.

banked transformers Parallel-operated transformers.

bankwound coil A coil wound in such a way that most of its turns are not side by side, thus reducing the inherent distributed capacitance.

bar **1.** Abbreviation, b. The cgs unit of pressure, in which 1 b = 10^5 pascals per square centimeter. **2.** A horizontal or vertical line produced on a television (TV) screen by a bar generator and used to check linearity. **3.** A thick plate of piezoelectric crystal. **4.** A solid metal conductor, usually uninsulated, of any cross section. **5.** A silicon ingot from which semiconductor devices can be fabricated.

BAR Abbreviation of BUFFER ADDRESS REGISTER.

bar code A printed pattern that contains data that can be recovered by laser scanning. It is commonly used for the pricing and identification of store merchandise. It can also be used by an assembly or maintenance robot as an aid to identifying tools.

bar-code reader A laser scanning device that recovers the data from a tag that contains a BAR CODE. The laser beam moves across the tag. The beam is reflected from the white regions between the lines, but is absorbed by the dark lines themselves. This produces modulation of the reflected beam by the data contained in the tag.

bare conductor A conductor with no insulating covering, a common example being bare copper wire.

bar generator A special type of radio-frequency signal generator that produces horizontal or vertical bars on the screen of a television receiver. It is used in adjustment of horizontal and vertical linearity.

bar graph A graphical presentation of data, in which numerical values are represented by horizontal bars of width that correspond to the values. This type of graph is nonstandard in the sense that the ordinate is horizontal, whereas it is usually vertical. Compare COLUMNAR GRAPH.

bar-graph meter See BAR METER.

barium Symbol, Ba. An elemental metal of the alkaline-earth group. Atomic number, 56. Atomic weight, 137.36. It is present in some compounds used as dielectrics (e.g., barium titanate).

barium-strontium oxides The combined oxides of barium and strontium used as coatings of vacuum-tube cathodes to increase electron emission at relatively low temperatures.

barium strontium titanate A compound of barium, strontium, oxygen, and titanium that is used as a ceramic dielectric material. It exhibits ferroelectric properties and is characterized by a high dielectric constant.

barium titanate Formula, $BaTi0_2$. A ceramic used as the dielectric in ceramic capacitors. It exhibits high dielectric constant and some degree of ferroelectricity.

Barkhausen effect The occurrence of minute jumps in the magnetization of a ferromagnetic substance as the magnetic force is increased or decreased over a continuous range.

Barkhausen interference Interference that results from oscillation because of the BARK-HAUSEN EFFECT.

bar magnet A relatively long permanent magnet in the shape of a bar with a rectangular or square cross section.

bar meter A digital meter that displays a quantity, such as signal strength, incrementally, using a set of LEDs or LCDs arranged in a straight line. Its main advantage is that it has no moving parts, yet (unlike direct-readout digital meters) gives the viewer some impression of the way a rapidly fluctuating quantity changes. Its chief

bar meter

disadvantage is that it does not provide a precise indication.

barn Symbol, b. A non-SI unit of nuclear cross section equal to 100 square femtometers or 10^{-24} square centimeters. This unit is approved as compatible with SI (International System of Units).

Barnett effect The development of a small amount of magnetization in a long iron cylinder that is rotated rapidly about its longitudinal axis.

barograph A recording barometer, using either a drum recorder (pen recorder) or a computer to store the data as a function of atmospheric pressure versus time.

barometer An instrument for measuring atmospheric pressure.

barometer effect A relation that appears to exist between the intensity of *cosmic rays* and the atmospheric pressure. It is an inverse relation; that is, increasing pressure seems to correlate with reduced intensity of cosmic rays. It is said to be approximately to 1 or 2% per centimeter of mercury.

barometric pressure The atmospheric pressure, usually given in inches of mercury. The average barometric pressure at the surface of the earth is just under 30 inches of mercury.

bar pattern A series of spaced lines or bars (horizontal, vertical, or both) produced on a television picture screen by means of a BAR GENERATOR. It is useful in adjusting horizontal and vertical linearity of the picture.

barrage array An antenna array in which a string of collinear elements are vertically stacked. The end quarter wavelength of each string is bent in to meet the end quarter wavelength of the opposite radiator to improve balance.

barrage jamming The jamming of many frequencies, or an entire band, at the same time.

barrell distortion Television picture distortion consisting of horizontal and vertical bulging.

barrier **1.** The carrier-free space-charge region in a semiconductor pn junction. **2.** An insulating partition placed between two conductors or terminals to lengthen the dielectric path.

barrier balance The state of near equilibrium in a semiconductor pn junction (after initial junction forming), entailing a balance of majority and minority charge carrier currents.

barrier capacitance **1.** The capacitance in a bipolar transistor between the emitter and collector. It varies with changes in applied voltage, and also with the junction temperature. **2.** The capacitance across any pn junction that is reverse-biased.

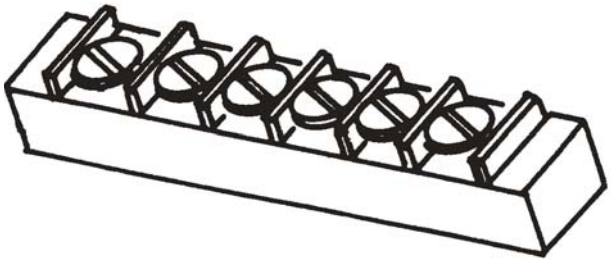
barrier height The difference in voltage between opposite sides of a barrier in a semiconductor material.

barrier layer See BARRIER, **1.**

barrier-layer cell A photovoltaic cell, such as the copper oxide or selenium type, in which photons striking the barrier layer produce the potential difference.

barrier potential The apparent internal dc potential across the barrier (see BARRIER, **1**) in a pn junction.

barrier strip A terminal strip having a barrier (see BARRIER, **2**) between each pair of terminals.



barrier strip

barrier voltage The voltage required for the initiation of current flow through a pn junction.

Bartlett force See EXCHANGE FORCE.

baryon A subatomic particle made up of three quarks.

base **1.** In a bipolar transistor, the intermediate region between the emitter and collector, which usually serves as the input or controlling element of transistor operation. **2.** A substance that dissociates in water solution and forms hydroxyl (OH) ions. For example, sodium hydroxide. **3.** The constant figure upon which logarithms are computed (10 for common logs, 2.71828 for natural logs). **4.** The radix of a number system (e.g., base 10 for the decimal system, base 8 for the octal system, base 16 for the hexadecimal system, and base 2 for the binary system). **5.** A fixed nonportable radio communications installation.

base address The number in a computer address that serves as the reference for subsequent address numbers.

baseband The frequency band of the modulating signal in a communications, broadcast, or data transmitter. For voice communications, this is generally the range of voice frequencies necessary for intelligible transmission. For high-fidelity music broadcasting, it is approximately the range of human hearing. For fast-scan television, it ranges up to several megahertz. It can be restricted or expanded, depending on the nature of the transmitted signal. See BASEBAND FREQUENCY RESPONSE.

baseband frequency response **1.** The amplitude-versus-frequency characteristic of the audio-frequency (AF) or composite video section of a transmitter that defines the BASEBAND, or range of modulating frequencies. **2.** The range of frequencies over which a radio transmitter can be modulated to convey information. For single sideband (SSB), it is approximately 300 Hz to 3 kHz; for high-fidelity, frequency-modulated (FM) music

transmission, it is about 10 Hz to 20 kHz or 30 kHz; for fast-scan television, it consists of frequencies up to several megahertz. This range is determined by bandpass and/or lowpass filters in the AF or composite video section of the transmitter.

base bias The steady dc voltage applied to the base electrode of a transistor to determine the operating point along the transistor characteristic curve.

base-bulk resistance The resistance of the semiconductor material in the base layer of a bipolar transistor.

base-charging capacitance In the common-emitter connection of a bipolar transistor, the internal capacitance of the base-emitter junction.

base current Symbol, I_B. Current flowing through the base electrode of a bipolar transistor. Also see AC BASE CURRENT and DC BASE CURRENT.

base electrode See BASE, **1.** Also called *base element.*

base element **1.** Base electrode. **2.** One of the basic metals, such as iron or tin, that are not generally considered precious (as opposed to NOBLE).

base-e logarithm See NAPIERIAN LOGARITHM.

base film The plastic substrate of a magnetic recording tape.

base frequency **1.** The frequency of the principal, or strongest, component in a complex signal or waveform; also called *basic frequency.* **2.** The frequency of operation of a base-station transmitter when the receiver is tuned to a second channel.

base-input circuit A common-collector circuit, common-emitter circuit, or emitter follower.

base insulator A stout dielectric insulator, used to support a heavy conducting element and keep the conductor isolated from other possible conductors or conductive paths.

base line In visual alignment procedures involving an oscilloscope and radio-frequency (RF) sweep generator, a zero-voltage reference line developed by the generator as a horizontal trace on the oscilloscope screen.

baseline stabilizer A clamping circuit that holds the reference voltage of a waveform to a predetermined value. Also called DC RESTORER.

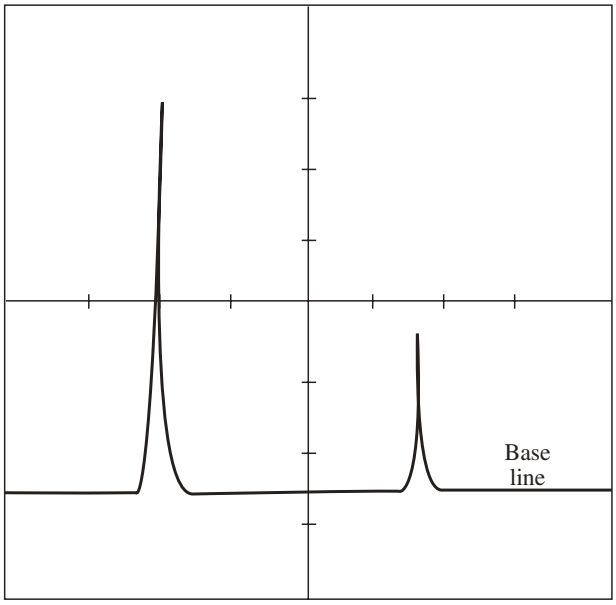
base-loaded antenna A usually vertical antenna or radiating element, the electrical length of which is adjusted by means of a loading coil or tuned circuit in series with, and positioned at the bottom of, the antenna or radiator.

base material In printed circuits, the dielectric material used as a substrate for the metal pattern. Also called *base medium.*

base notation The numbering or radix system used in any application (as octal, decimal, binary, or hexadecimal).

base number See BASE, **4.**

base pin One of the straight prong-like terminals on an electrical or electronic component; it is used to provide support for the device and to allow a physical connection between the socket terminal, into which it fits, and one of the internal electrodes of the device.



base line

base plate The chassis plate upon which components are mounted before wiring.

base potential See BASE VOLTAGE.

base region See BASE, **1.**

base resistance Symbol, R_B. Resistance associated with the base electrode of a bipolar transistor. Also see AC BASE RESISTANCE and DC BASE RESISTANCE.

base resistor The external resistor connected to the base of a bipolar transistor. In the common-emitter circuit, the base resistor is analogous to the gate resistor of a field-effect transistor (FET) circuit.

base spreading resistance Symbol, r_{BB}. In a bipolar transistor, the bulk-material resistance of the base region between the collector junction and emitter junction.

base station The head station or fixed home station in a communication network.

base-10 logarithm Abbreviation, $\log_{10}$. A logarithm based on the decimal number 10. If $\log_{10}(x) = y$, then $10^y = x$. Base-10 logarithms are commonly used in engineering. Compare NAPIERIAN LOGARITHM.

base voltage Symbol, V_B. The voltage at the base electrode of a bipolar transistor. Also see AC BASE VOLTAGE and DC BASE VOLTAGE.

BASIC Acronym for BEGINNER'S ALL-PURPOSE SYMBOLIC INSTRUCTION CODE, a relatively primitive, but versatile and easy-to-learn computer language developed at Dartmouth College.

basic frequency **1.** The FUNDAMENTAL FREQUENCY of a signal, as opposed to one of its harmonics. **2.** See BASE FREQUENCY, **1.**

basic protection Devices and procedures essential to minimize the risk of damage to electronic equipment, and/or injury or death to its operators, as a result of lightning. Hardware provisions include a substantial earth ground, heavy-gauge grounding wire, lightning arrestors for antennas, and transient suppressors for power connections. The safest procedure is to disconnect and ground all antennas, and unplug all equipment from utility outlets, during electrical storms and/or when the apparatus is not in use. Radio communications equipment with outdoor antennas, in particular, should not be operated during thunderstorms.

basket The structure that supports the cone in an acoustic loudspeaker.

basket-weave coil A type of single-layer inductor in which adjacent turns do not parallel each other around the circumference, but zigzag oppositely as a strand does in the woven pattern of a basket. This reduces distributed capacitance.

bass Low audio frequencies (AF) corresponding to low-frequency musical notes or sounds.

bass boost **1.** The special emphasis given to low audio frequencies (the bass notes) by selective circuits in audio systems. **2.** The technique of increasing the loudness of the bass, relative to the higher audio frequencies, to render a more faithful reproduction of sound at low volume levels.

bass compensation See BASS BOOST, **2.**

bass control **1.** A manually variable potentiometer for adjusting bass boost of an amplifier or sound system. **2.** The arrangement of components that are required to achieve amplitude variation of bass in an audio signal.

bass port In a loudspeaker, a hole in the cabinet that enhances the low-frequency (bass) sound output. Used in high-fidelity audio systems.

bass-reflex enclosure A loudspeaker cabinet with a critically dimensioned duct or port that allows back waves to be radiated in phase with front waves, thus averting unwanted acoustic phase cancellation.

bass-reflex loudspeaker A loudspeaker mounted in a bass reflex enclosure. Also see ACOUSTICAL PHASE INVERTER.

bass-resonant frequency The low frequency at which a loudspeaker or its enclosure displays resonant vibration.

bass roll-off **1.** The attenuation of the low-frequency (bass) component in a high-fidelity audio signal. **2.** A control that allows adjustable attenuation of the low-frequency component in a high-fidelity audio signal.

bass suppression In speech transmission, the removal of all frequencies below about 300 Hz, on the assumption that those frequencies contribute little to intelligibility. This suppression permits the speech level to be increased without overmodulating a transmitter. It also allows smaller audio transformers to be used because transformer core size must increase as the frequency it passes decreases.

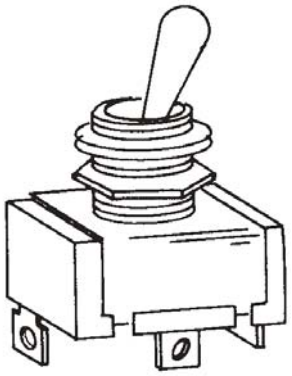
bassy In audio and high-fidelity applications, a sound in which the low-frequency components, below about 500 Hz, are overly predominant.

BAT Abbreviation of BATTERY.

batch fabrication process The manufacture of devices in a single batch from materials of uniform grade. Particularly, the manufacture of a large number of semiconductor devices from one batch of semiconductor material by means of carefully controlled, identical processes.

batch processing In digital-computer operations, the processing of quantities of similar information during a single run.

bat-handle switch A toggle switch, the lever of which is relatively long and thick, and is shaped like a baseball bat.



bat-handle switch

bathtub capacitor A (usually oil-filled) capacitor housed in a metal can that looks like a miniature bathtub.

bathyconductorgraph An instrument that is used to measure the electrical conductivity of seawater.

bathythermograph An instrument that plots a graph of temperature versus depth in a body of water, such as a lake or an ocean.

batten Supporting bars or braces that hold a loudspeaker in place within its cabinet, and/or that hold the cabinet panels in place.

battery Abbreviations, B, BA. BAT. A device consisting of two or more interconnected electrochemical or photovoltaic cells that generate dc electricity. The cells can be connected in series to supply a desired voltage, in parallel to supply a desired current-delivering capability, or in series-parallel to obtain a desired voltage and current-delivering capability. Also see CELL, EDISON BATTERY, LEAD-ACID BATTERY, PHOTO-

VOLTAIC CELL, PRIMARY BATTERY, and STORAGE BATTERY.

battery acid **1.** A chemical acid, such as sulfuric acid, used as the electrolyte of a battery. **2.** Colloquially, any cell or battery electrolyte, whether acid, base, or salt.

battery capacity The current-supplying capability of a battery, usually expressed in ampere-hours (Ah).

battery cell See CELL, **1.**

battery charger **1.** A specialized dc power supply, usually embodying a stepdown transformer, rectifier, and filter. It is used to charge a storage battery from an ac power line. **2.** A motor-generator combination used to charge a storage battery from an ac power line. **3.** A combination of solar cells, generators, or other voltaic transducers, that are used to charge a storage battery with dc obtained from a nonelectrical energy source.

battery clip **1.** A heavy-duty metallic clamp that is used for quick, temporary connection to a large cell terminal, such as that of a lead-acid storage battery. **2.** A small connector of the snap-fastener type, used for quick connection to a small power source, such as a transistor-radio battery.

battery eliminator A specialized dc power supply, usually embodying a transformer, rectifier, and filter, that permits battery-powered equipment to be operated from an ac power line.

battery holder **1.** A case or container of any kind for holding a cell or battery. **2.** A shelf for holding a cell or battery. **3.** A small, metal bracket-type device for holding a cell or battery between two contacts.

battery life **1.** The ampere-hour or watt-hour capacity of a battery. **2.** The number of times that a rechargeable electrochemical battery can be cycled before it becomes unusable. **3.** The nominal length of time (e.g., hours, days, or weeks) that an electrochemical battery will function effectively in a given application before it must be discarded or recharged.

battery memory See MEMORY DRAIN.

battery receiver A usually portable radio or television receiver operated from self-contained batteries.

battery substitute See BATTERY ELIMINATOR.

bat wing On a television (TV) or frequency-modulation (FM) broadcast receiving antenna, a metallic element with a shape that resembles that of a bat's wing.

baud A unit of communications processing speed in telegraphy and digital data communications systems. Often confused with *bits per second* (bps). Baud refers to the number of times per second that a signal changes state. The speed in bps is generally higher than the speed in baud, sometimes by a factor of several times. Compare BITS PER SECOND.

Baudot code A machine communications code that uses five parallel binary digits of equal length, the interpretation of which depends on the history of the previous transmission or an additional case bit.

baud rate **1.** A colloquial expression for data speed in BAUD. **2.** Colloquial, and technically inaccurate, expression for data speed in BITS PER SECOND.

Baume (Antione Baume, 1728–1804). Abbreviation, Be. Pertaining to the *Baume scales* for hydrometers. The two such scales are for liquids heavier than water and for liquids lighter than water.

bay One of several sections of a directional antenna array.

bayonet base The insertable portion of a plug-in component (e.g., a lamp) that has a projecting pin that fits into a slot or keyway in the shell of the socket into which the component is inserted.

bayonet socket A socket with a suitably slotted shell for receiving the bayonet base of a plug-in component.

bazooka A linear BALUN, in which a quarter wavelength of metal sleeving surrounds a coaxial feeder, and is shorted to the outer conductor of the feeder to form a shorted quarter-wave section.

bb Abbreviation of BLACKBODY.

BBC Abbreviation of *British Broadcasting Corporation.*

BBM Abbreviation of BREAK BEFORE MAKE.

b-box The index register of a computer.

BC Abbreviation of BROADCAST.

BCD Abbreviation of BINARY-CODED DECIMAL.

BCFSK Abbreviation of BINARY CODE FREQUENCY-SHIFT KEYING.

B channel One of the channels of a two-channel stereophonic system. Compare A CHANNEL.

BCI Abbreviation of BROADCAST INTERFERENCE.

BCL Amateur radio abbreviation of BROADCAST LISTENER.

BCN Abbreviation of BEACON.

BCO Abbreviation of BINARY-CODED OCTAL.

BCST Abbreviation of BROADCAST.

BDC Abbreviation of BINARY DECIMAL COUNTER.

B display A radar display in which the target is represented by a bright spot on a rectangular-coordinate screen. Compare A DISPLAY and J DISPLAY.

Be Symbol for BERYLLIUM.

Be Abbreviation of BAUME.

beacon **1.** A beam of radio waves, or a radio signal, that is used for navigation and/or direction finding. **2.** A transmitter that radiates a beam of radio waves, or a radio signal, as an aid in navigation and/or direction finding. **3.** A signal transmitted continuously on a specific frequency, to help radio operators ascertain propagation conditions. **4.** A station or transmitter that generates and radiates a signal to help radio operators determine propagation conditions. **5.** In robotics, a device or system that aids in navigation. For example, tricorner reflectors can be positioned in strategic locations, and a mobile robot equipped with a

scanning infrared laser. The robot controller determines the distance to any given reflector by measuring the time required for the laser beam to return. In this way, two mirrors can allow the robot to locate its position in two dimensions; three mirrors can facilitate position determination in three-dimensional space.

beacon direction finder A direction finder using a signal received from a beacon station.

beacon receiver A receiver that is specially adapted for the reception of beacon signals (see BEACON, **1** and **3**).

beacon station **1.** A station broadcasting beacon signals (see BEACON, **1** and **3**) for direction finding, navigation, and/or determination of radio-wave propagation conditions. **2.** Sometimes, a radar transmitting station.

beacon transmitter A transmitter specially adapted for the transmission of beacon signals (see BEACON, **1** and **3**).

bead **1.** A small ferromagnetic ring that is used as a passive decoupling choke by slipping it over the input power leads of a circuit or stage, or around a coaxial transmission line. **2.** A magnetic memory element in a ferrite-core matrix.

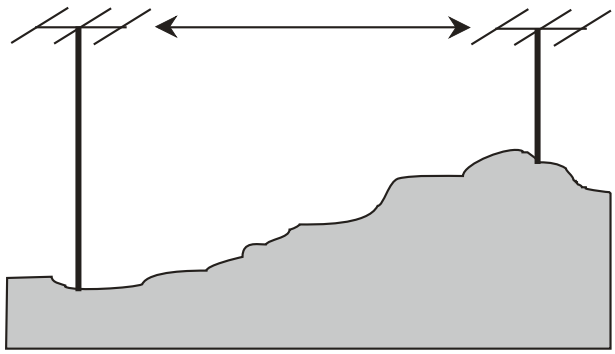
beaded coax A low-loss, coaxial transmission line, in which the inner conductor is separated from the outer conductor by means of spaced dielectric beads.

beaded support A plastic or dielectric bead that is used to support the inner conductor of an air-insulated transmission line of coaxial construction.

bead thermistor A thermistor consisting essentially of a small bead of temperature-sensitive resistance material into which two leads are inserted.

beam **1.** The more-or-less narrow pattern of radiation from a directional antenna. **2.** A directional antenna—especially a YAGI ANTENNA. **3.** The stream or cloud of electrons emitted by the cathode in an electron tube—especially a BEAM POWER TUBE.

beam alignment **1.** The lining-up of a directional transmitting antenna with a directional receiving antenna for maximum signal transfer. **2.** In a television (TV) camera tube, the lining-up of the electron beam so that it is perpendicular to the target. **3.** In a cathode-ray tube, the positioning of the electron rays so that they converge properly on the screen, regardless of the deflection path.



beam alignment

beam angle In the radiation from an antenna, the direction of most intense radiation, the side limits of which are determined by the points at which the field strength drops to half the value in the principal direction.

beam antenna **1.** A multielement directional antenna, consisting of a half-wave driven dipole and one or more parasitic elements. See YAGI ANTENNA. **2.** Any directional antenna used for transmitting and receiving radio-frequency (RF) signals.

beam bender **1.** In a television (TV) picture tube, the ion-trap magnet. **2.** Deflection-plate correction device or circuit.

beam bending Deflection of an electron beam by electric or magnetic fields.

beam blanking See BLANK, **2.**

beam convergence The meeting, at a shadow-mask opening, of the three electron beams in a three-color television picture tube. See BEAM ALIGNMENT, **3.**

beam coupling A method of producing an alternating current between two electrodes by passing a density-modulated beam of electrons between the electrodes. This, in effect, demodulates the electron beam, recovering the information.

beam crossover Either of the half-power points in the beam of a directional antenna, usually in the horizontal plane. The reference point is considered to be the direction of maximum radiation.

beam current The current represented by the flow of electrons in the beam of a cathode-ray tube.

beam cutoff In an oscilloscope or television picture tube, the complete interruption of the electron beam, usually as a result of highly negative control-grid bias.

beam deflector A deflection plate in an oscilloscope tube.

beam efficiency In a cathode-ray tube, the ratio of the number of electrons generated by the gun to the number reaching the screen. The efficiency is high in electromagnetic-deflection tubes and lower in electrostatic-deflection tubes.

beam lead In an integrated circuit, a relatively thick and strong lead that is deposited in contact with portions of the thin-film circuit. It provides stouter connections than continuations of the thin film would provide.

beam-lead isolation In an integrated circuit, reduction of distributed capacitance and other interaction through use of beam leads.

beam modulation See INTENSITY MODULATION.

beam parametric amplifier A PARAMETRIC AMPLIFIER in which the variable-reactance component is supplied by a modulated electron beam.

beam-positioning magnet In a three-gun color television picture tube, a permanent magnet that is used to position one of the electron beams correctly, with respect to the other two.

beam power tube A tetrode or pentode vacuum tube, in which special deflector plates concentrate the electrons into beams in their passage from cathode to plate. The beam action greatly increases plate current at a given plate voltage. It is used in some radio-frequency (RF) power amplifiers.

beam-rider control system A missile-guidance system in which a control station sends a radio beam to a missile. The beam is moved in such a way that as the missile stays within the beam, it hits the target.

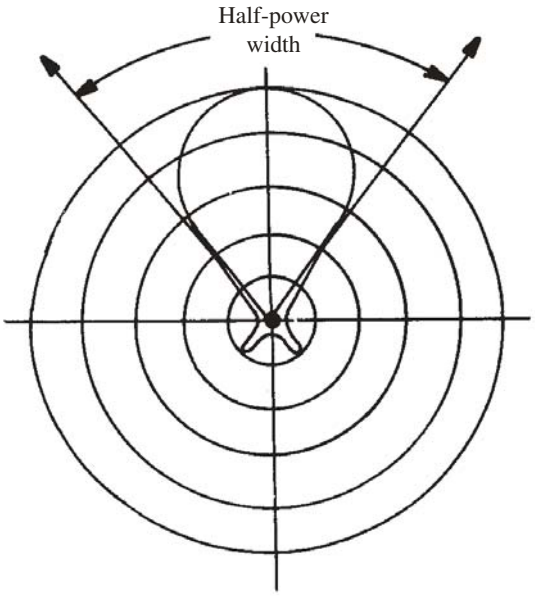
beam-rider guidance **1.** An aircraft landing guidance system, in which the aircraft follows a radio beam in its glide path. **2.** The circuitry in a guided missile using a beam-rider control system.

beam splitter A device used to divide a light beam (as by a transparent mirror) into two components, one transmitted and the other reflected; hence, a BEAM-SPLITTING MIRROR.

beam splitting In radar, a method of calculating the mean azimuth of a target from the azimuth at which the target is first revealed by one scan, and the azimuth at which the target information ceases.

beam-splitting mirror In an oscilloscope-camera system, a tilted, transparent mirror that allows rays to pass horizontally from the oscilloscope screen to the camera and to be reflected vertically to the viewer's eye.

beamwidth of antenna The angular width of the main lobe of the pattern of radiation from a directional antenna. Generally, it is measured between the half-power points in the horizontal plane. Occasionally, it is measured in the vertical plane.



beamwidth of antenna

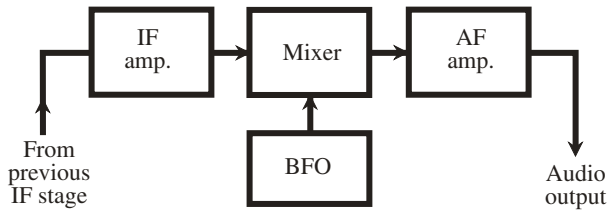
bearing The direction of an object or point expressed in degrees within a 360° horizontal clockwise boundary, with the center of the circle serving as the observation point.

bearing resolution In radar operations, the minimum horizontal separation of two targets, in degrees, that permits the individual targets to be displayed as two echoes, rather than one.

beat Any one of the series of pulsations constituting a beat note, which results from heterodyning one signal against another.

beat frequency Either of two frequencies f_{C1} and f_{C2} resulting from the mixing of two signals of different frequencies f_A and f_B. Frequency f_{C1} is the sum of the two input frequencies; $f_{C1} = f_A + f_B$. Frequency f_{C2} is the difference; $f_{C2} = f_A - f_B$ when f_A is the higher of the two input frequencies.

beat-frequency oscillator Abbreviation, BFO. An oscillator used to set up audible beat frequencies with an incoming received signal and installed in the intermediate-frequency (IF) stages of a superheterodyne communications receiver. For single-sideband (SSB) reception, the BFO is set at the frequency of the received suppressed carrier. In continuous-wave (CW) Morse code reception, the BFO is set at a frequency that differs from that of the incoming signal by about 400 to 1000 Hz. The resulting tone has an audio frequency equal to the difference between the BFO frequency and the received signal carrier frequency. For reception of frequency-shift-keyed (FSK) signals, the BFO is set to such a frequency that the resulting audio beat notes are appropriate for the mark and space inputs of a terminal unit or modem.



beat-frequency oscillator

beating **1.** Also called *heterodyning.* The combination of signals of different frequencies resulting in sum and difference frequencies. **2.** The fluttering noise heard when two audio tones, very close in frequency and very similar in amplitude, are emitted at the same time.

beat marker In the visual (oscilloscopic) alignment of a tuned circuit, a marker pip that results from the beat note between the sweep-generator signal and the signal from a marker oscillator.

beat note The sum or difference frequency that results from the heterodyning of two signals or, under some conditions, of more than two signals.

beat-note reception **1.** Reception in which a radio-frequency carrier is made audible by heterodyning it with a beat-frequency oscillator (BFO) to produce an audible beat note. **2.** Superheterodyne reception (see SUPERHETERODYNE CIRCUIT).

beat tone A beat note in which the frequency is within the range of hearing.

beaver tail A flat or elongated radar beam, wide in the azimuth plane. Primarily used to determine the altitude of a target. The beam is moved up and down to find the target elevation.

Becquerel effect A phenomenon in which a voltage is produced when radiant energy, such as infrared, visible light, ultraviolet, or X-rays, falls on one electrode in an electrolytic cell.

bedspring A directional antenna consisting of a broadside array with a flat reflector and one or more helical driven elements.

beep A test or control signal, usually of single tone and short duration.

beeper **1.** A pocket- or hand-carried transceiver—especially one for maintaining two-way contact with personnel who are away from their base. **2.** An acoustic transducer that produces a beep in response to an input signal.

beetle A urea formaldehyde plastic used as a dielectric material and as a container material.

bel Abbreviation, B. The basic logarithmic unit (named for Alexander Graham Bell) for expressing gain or loss ratios. One bel is equivalent to a power gain of 10. Also see DECIBEL.

bell An electric alarm device consisting of a metallic gong that emits a ringing sound when it is struck by an electrically vibrated clapper.

Bellini-Tosi direction finder A direction finder in which the sensing element consists of two triangular vertical antennas crossed at right angles, the antennas being open at the top and accordingly not acting as conventional coil antennas.

bell-shaped curve A statistical curve (so called from its characteristic shape) that exhibits a *normal distribution* of data. Typically, the curve describes the distribution of errors of measurement around the real value.

bell transformer A (usually inexpensive) stepdown transformer that operates an electric bell or similar alarm or signaling device from the ac power line.

bell wire Insulated 18-gauge (AWG) solid copper wire, so called because of its principal early use in the wiring of electric-bell circuits.

belt generator Also known as a *Van de Graaff generator.* A very-high-voltage electrostatic generator, a principal part of which is a fast-traveling endless belt of dielectric material. At the lower end, charges of one sign are sprayed on the belt at 10 to 100 kV dc and are carried to the inside of a hollow metal sphere at the upper end, where they are removed and spread to the surface of the sphere, which they raise to a potential up to several million volts.

benchmark A test standard to measure product performance.

benchmark routine A routine designed to evaluate computer software and/or hardware, producing a good indication of how well the software or hardware will perform in real-life situations. In particular, tests *instructions per second* and *throughput*, thereby producing an indication of the overall computer power in applications, such as word processing, database, spreadsheet, graphics, animation, and mathematical calculations.

bench test An extensive checkout of a piece of equipment in the test laboratory—either to find an intermittent problem, or to check for reliability.

bend An angular shift in the lengthwise direction of a waveguide.

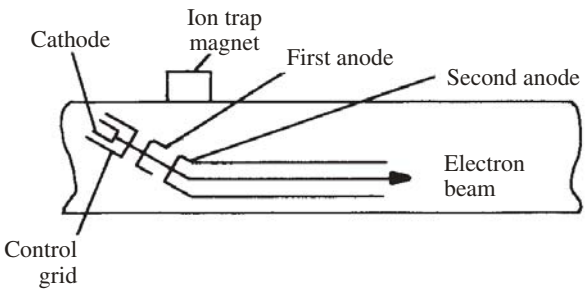
bending effect **1.** The downward refraction of a radio wave by the ionosphere. **2.** The low-atmosphere turning of a radio wave downward by temperature discontinuity and atmospheric inversions.

Benito A continuous-wave method of measuring the distance of an aircraft from the ground, involving the transmission of an audio-modulated signal from ground and the retransmission back to ground by the aircraft. The phase shift between the two signals is proportional to the distance to the aircraft.

bent antenna An antenna that has its driven element bent, usually near the ends and at right angles, to conserve space.

bent gun A television picture tube neck arrangement having an electron gun that is slanted to direct the undesired ion beam toward a positive electrode, but which allows the electron beam to pass to the screen. This prevents the ion beam from "burning" a permanent spot on the phosopor of the screen.

Be0 Formula for beryllium oxide. Also see BERYLLIA.



bent gun

berkelium Symbol, Bk. A radioactive elemental metal produced artificially. Atomic number, 97. Atomic weight, 247.

beryllia Formula, Be0. Beryllium oxide, used in various forms as an insulator and structural element (as in resistor cores).

beryllium Symbol, Be. An elemental metal. Atomic number, 4. Atomic weight, 9.01218. Beryllium is present in various dielectrics and alloys used in electronic components.

Bessel functions Sophisticated mathematical functions for dealing with periodic electronic phenomena in which the waveform often displays decrement. Also called *cylindrical functions.*

beta Symbol, β. The current gain of a common-emitter bipolar transistor stage. It is the ratio of the induced change of collector current to the applied change of base current: $\beta = dIC/dIB$.

beta circuit The output-input feedback circuit in an amplifier.

beta cutoff frequency The frequency at which the current amplification of a bipolar transistor falls to 70.7% of its low-frequency value.

beta particles Minute radioactive subatomic bits identical to the electron or positron, and emitted by some radioactive materials. Also see BETA RAYS.

beta rays Rays emitted by the nuclei of radioactive substances, consisting of a stream of beta particles (i.e., electrons or positrons) that move at velocities up to 299.8 million meters per second. Compare ALPHA PARTICLE and GAMMA RAYS.

beta-to-alpha conversion For a bipolar transistor, the conversion of current amplification expressed as beta (β) to current amplification expressed as alpha (α): $\alpha = \beta/(\beta + 1)$.

betatron A particle accelerator in which injected electrons are given extreme velocity by being propelled in circular paths in a doughnut-shaped glass container. The term comes from the fact that high-speed electrons constitute BETA PARTICLES.

beta videocassette recorder The earliest scheme for videocassette recording, developed by Sony corporation in the 1970s. Compare *VHS videocassette recorder.*

beta zinc silicate phosphor Formula, (Zn0 + $Si0_2$):Mn. A phosphorescent substance used to coat the screen of a cathode-ray tube. The fluorescence is green-yellow.

BeV Abbreviation of *billion electronvolts.* Also see ELECTRONVOLT, GEV, MEV, and MILLION ELECTRONVOLTS. This abbreviation has been supplanted by the SI (International System of Units) abbreviation GeV, for GIGAELECTRONVOLTS.

bevatron An accelerator (see ACCELERATOR, **1**) similar to the synchrotron, which accelerates particles to levels greater than 10 GeV.

Beverage antenna (Harold H. Beverage.) A nonresonant, directional long-wire antenna, erected a few feet above ground and run in a straight line for one to several wavelengths. It is generally used for reception at low and medium frequencies, the best response is to vertically polarized signals arriving from one or both directions in line with the wire. It can be left unterminated for bidirectional response, or it can be terminated at its far end by a noninductive resistor of about 600 ohms for a unidirectional response.

beyond-the-horizon propagation See FORWARD SCATTER.

bezel A faceplate for an electronic instrument, usually having a fitted rim and cutouts for knobs, switches, jacks, etc.

BFO Abbreviation of BEAT-FREQUENCY OSCILLATOR.

BG Abbreviation of BIRMINGHAM WIRE GAUGE. Also abbreviated BWG.

B-H curve A plot showing the *B* and *H* properties of a magnetic material. Magnetizing force *H* is plotted along the horizontal axis, and flux density *B* is plotted along the vertical axis.

B-H loop See BOX-SHAPED LOOP.

B-H meter Any instrument for displaying or evaluating the hysteresis loop of a magnetic material.

bhp Abbreviation of *brake horsepower.*

Bi Symbol for BISMUTH.

bias **1.** Any parameter of which the value is set to a predetermined level to establish a threshold or operating point. Although it is common to think of bias currents and bias voltages, other parameters (e.g., capacitance, resistance, illumination, magnetic intensity, etc.) can serve as biases. **2.** In a high-fidelity audio system, a circuit in a tape recorder/player that optimizes performance for a particular type of recording tape.

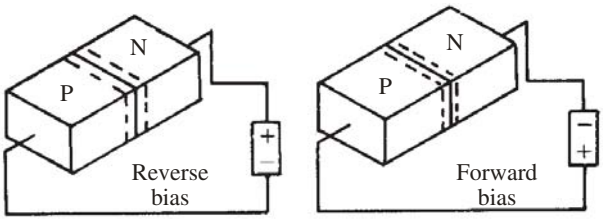
bias current A steady, constant current that presets the operating threshold or operating point of a circuit or device, such as a transistor, diode, or magnetic amplifier. Compare BIAS VOLTAGE.

bias current drift The ratio of a change in input bias current to a change in ambient temperature, generally expressed in nanoamperes per degree Celsius.

bias distortion Distortion caused by operation of a tube or transistor with incorrect bias so that the response of the device is nonlinear.

biased diode A diode having a dc voltage applied in either forward or reverse polarity. Current flows readily through the forward-biased diode; the reverse-biased diode appears as an open circuit. The biased diode is the basis of clippers, limiters, slicers, and similar circuits.

biased off In a circuit or device, the state of cutoff caused by application of a control-electrode bias. Examples include collector-current cutoff (when the dc base bias of a bipolar transistor reaches a critical value), and drain-current cutoff (when the dc gate bias reaches a critical value in a field-effect transistor).



biased diodes

biased search A scheme that a mobile robot can use to find its way to a destination or target, by deliberately searching off to the side and then homing in as the approach progresses. It is so called because the general nature of the initial error (bias) is known, although its exact extent need not be known.

bias oscillator In a magnetic recorder, an oscillator operated at a frequency in the 40-kHz to 100-kHz range to erase prerecorded material and bias the system magnetically for linear recording.

bias resistor A usually fixed resistor, such as the source resistor in a field-effect-transistor (FET) circuit or the emitter resistor in a bipolar-transistor circuit, across which a desired bias voltage is developed by current flowing through the resistor.

bias set A control, such as a potentiometer or variable autotransformer, that facilitates manual adjustment of the dc bias of a circuit.

bias stabilization **1.** The maintenance of a constant bias voltage, despite variations in load impedance or line voltage. It is usually accomplished by means of automatic voltage regulation. **2.** The stabilization of transistor dc bias voltage by means of resistance networks or through the use of barretters, diodes, or thermistors.

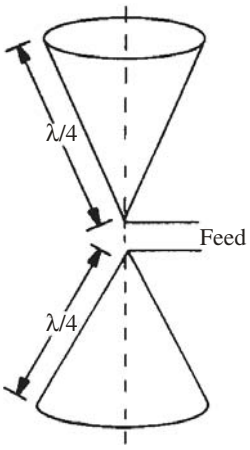
bias supply **1.** Batteries that provide bias voltage or current for bipolar or field-effect transistors. **2.** A line-operated unit for supplying dc bias and consisting of a transformer, rectifier, and high-grade filter.

bias voltage A steady voltage that presets the operating threshold or operating point of a circuit or device, such as a transistor. Compare BIAS CURRENT.

bias windings The dc control windings of a saturable reactor or magnetic amplifier.

biconical antenna A form of broadband antenna, consisting of two conical sections joined at the apexes. The cones are at least ¼ wavelength in diagonal height. The vertex angles of the cones can vary, although the apex angle is usually the same in each cone. The vertex angle affects the feedpoint impedance. Such an antenna radiates, and responds optimally to, signals with polarization parallel to the axis of the cones.

biconical horn antenna A double-horn microwave antenna that radiates along relatively sharp front and back beams.



biconical antenna

bidecal base The 20-pin base of a cathode-ray tube. Also see DIHEPTAL, DUODECAL, and MAGNAL.

bidirectional Radiating or receiving (usually equally) from opposite directions (e.g., front-and-back radiation from an antenna or loudspeaker, or front-and-back pickup with an antenna or microphone).

bidirectional antenna An antenna with a directional pattern that consists of maximum lobes 180 degrees apart.

bidirectional bus In computers, a data path over which both input and output signals are routed.

bidirectional bus driver In a microcomputer, a signal-driving device that permits direct connection of a buffer-to-buffer arrangement on one end (the interface to I/O, memories, etc.) and data inputs and outputs on the other. This device permits bidirectional signals to pass and provides drive capability in both directions.

bidirectional counter A counter that can count consecutively up from a given number or down from that number. Also called UP-DOWN COUNTER.

bidirectional current A current that flows in both directions. Utility alternating current (ac) is a common example.

bidirectional loudspeaker A loudspeaker that delivers sound waves to the front and rear.

bidirectional microphone A microphone that picks up sound waves equally well from the front and rear.

bidirectional transistor A symmetrical transistor (i.e., one in which the two main current-carrying electrodes can be interchanged without influencing device performance). Some field-effect transistors (FETs) are of this type; the drain and the source can be interchanged.

bifilar electrometer An electrometer in which the sensitive element consists of two long platinized-quartz fibers. When an electric potential is ap-

plied, the fibers separate by a distance proportional to the voltage.

bifilar resistor A wirewound resistor with two oppositely wound filaments. The nature of the winding tends to cancel the inductance, making the device useful at a much higher frequency than an ordinary wirewound resistor.

bifilar transformer A transformer in which unity coupling is approached by interwinding the primary and secondary coils (i.e., the primary and secondary turns are wound side by side and in the same direction).

bifilar winding **1.** A method of winding a coil (such as a resistor coil) in the shape of a coiled hairpin so that the magnetic field is self-canceling and the inductance is minimized. **2.** A method of winding transformers to minimize leakage reactance.

bifilar winding

bifurcated contact A forked contact whose parts act as two contacts in parallel for increased reliability.

bilateral amplifier An amplifier that transmits or receives in either direction equally well (i.e., the input and output can be exchanged at will).

bilateral antenna A bidirectional antenna, such as a loop antenna or a half-wave dipole.

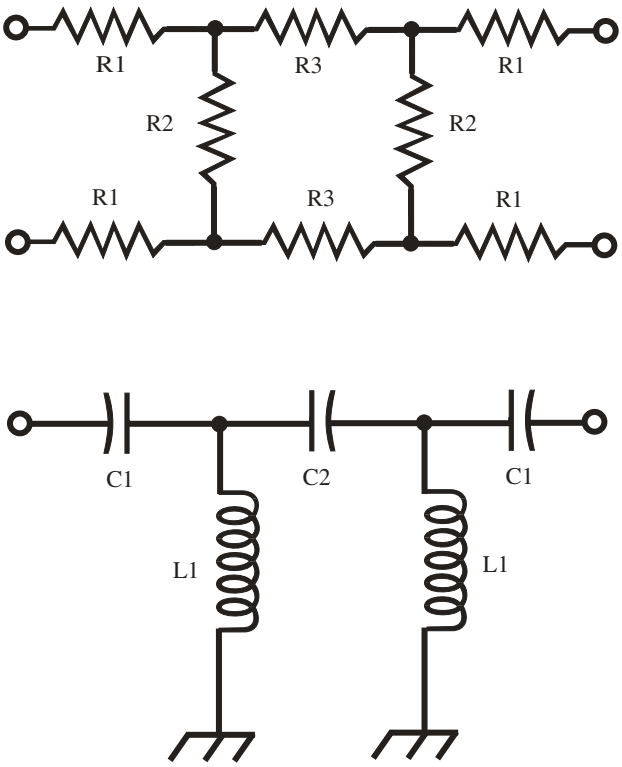
bilateral element A circuit element or component (as a capacitor, resistor, or inductor) that transmits energy equally well in either direction. Compare UNILATERAL ELEMENTS.

bilateral network A network, usually passive and either balanced or unbalanced, that has BILATERAL SYMMETRY. Thus, the input and output terminals can be exchanged without affecting the performance of the network in any way.

bilateral symmetry **1.** Exhibiting symmetry, with respect to a vertical line or plane. **2.** For a network, having the property that if the input and output are reversed, the circuit behavior remains precisely the same. See BILATERAL NETWORK. **3.** For an amplitude-versus-frequency response curve, having the property that the right-hand and left-hand halves are mirror images of each other.

billboard antenna A phased group of dipole antennas that lie in one plane. A reflector might be used behind the entire array.

bilobe pattern An antenna radiation pattern consisting of two major lobes in a given plane, usually the horizontal plane. Often the lobes exist in opposite directions relative to each other, as in a half-wave dipole. But they can be at varying angles, as in a long-wire antenna.



bilateral network

bimetal A union of two dissimilar metals—especially those having a different temperature coefficient of expansion. The two are usually welded together over their entire surface.

bimetallic element A strip or disk of bimetal. When the element is heated, it bends in the direction of the metal that has the lower temperature coefficient of expansion; when cooled, it unbends. Usually, an electrical contact is made at one extreme or the other so that the element can serve as a thermostat.

bimetallic switch A temperature-sensitive switch based on a bimetallic element.

bimetallic thermometer A thermometer based on a bimetallic element that is mechanically coupled (as through a lever and gear system) to a pointer that moves over a temperature scale.

bimetallic thermostat A thermostat in which a bimetallic element closes or opens a pair of switch contacts.

bimorphous cell A piezoelectric transducer that consists of two crystal plates, such as Rochelle salt, bound intimately face to face. In a crystal microphone, vibration of the transducer results in a voltage output; in a crystal headphone, an ac signal voltage impressed on the transducer causes vibratory mechanical motion.

BiMOS A combination of bipolar and MOSFET transistors in an integrated circuit. Thus, a typical BiMOS device can have MOSFET input for high impedance and bipolar output for low impedance.

binant electrometer An electrometer in which a thin platinum vane ("the needle") is suspended within two halves of a metal pillbox-shaped container. The halves or binants are biased with a dc voltage of 1 to 12 V, and the unknown voltage is applied to the vane. It is also called DUANT ELECTROMETER and HOFFMAN ELECTROMETER.

binary **1.** Pertaining to the base-2 number system. Thus, binary arithmetic uses two digits: 0 and 1. **2.** Pertaining to two-element chemical compounds.

binary arithmetic Mathematical operations performed using only the digits 0 and 1.

binary cell In a computer memory, an element that can display either of two stable states.

binary chain A cascade of binary elements, such as flip-flops, each unit of which affects the stable state of the succeeding unit in sequence.

binary channel Any channel whose use is limited to two symbols.

binary code A system of numbers representing quantities by combinations of 1 and 0; a binary-number system.

binary-coded decimal notation In digital computer operations, a system of notation in which each digit of a decimal number is represented by its binary equivalent. Thus, the decimal number 327 in BCD notation becomes 0011 0010 0111. (By contrast, in pure binary notation, 327 is 101000111.)

binary-coded octal notation A method of numbering in which each base-8 digit is represented by a binary number from 000 to 111.

binary-controlled gate circuit A gate circuit controlled by a binary stage. An example is a gating transistor that receives its on/off pulses from a flip-flop.

binary counter A counter circuit consisting of a cascade of bistable stages. Each stage is a scale-of-two counter because its output is on for every second input pulse. At any instant, the total binary count in a multistage counter thus is shown by the on and off states of the various stages in sequence.

binary decoder A device or stage that accepts binary signals on its input lines, and provides a usually exclusive output (representing a decimal digit, for example).

binary digit See BIT.

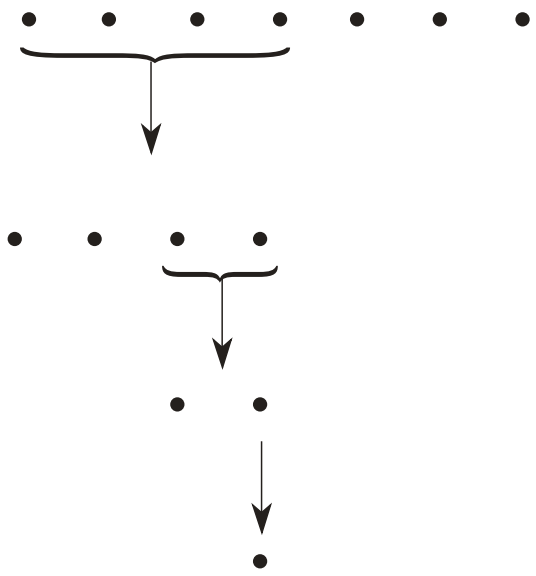
binary number system The base-two system of notation. This system uses only two symbols, 0 and 1, and accordingly is easily applied to two-position switches, relays, and flip-flops.

binary preset switch In a binary counter or binary control circuit, a selector switch that allows the circuit to be preset to deliver an output pulse only after a predetermined number of input pulses.

binary relay See BISTABLE RELAY.

binary scaler In its simplest form, a single two-stage device, such as a flip-flop, which functions as a divide-by-two counter, because one output pulse results from every two input pulses. Higher-order scaling is obtained by cascading stages.

binary search A system of search entailing the successive division of a set of items into two parts and the rejection of one of the two until all items of the sought-for kind are isolated.



binary search

binary signal Any signal that can attain either of two states. Such a signal is always a digital signal.

binary-to-decimal conversion **1.** The automatic conversion of a number represented by a series of binary pulses into the corresponding decimal number, which then is displayed by a readout device. **2.** The arithmetic operation of converting a binary number into a decimal number; this can be done by noting the powers of 2 represented by the various binary digits in a number, and then adding the decimal values of these powers.

binary word A binary numeral that has a particular meaning, agreed upon by convention. For example, the letters A through Z can be represented by binary numbers 00001 through 11010; a word can be represented by several blocks of five digits.

binaural Literally, two-eared. In sound recording and reproduction, the transcription of a broad sound source using two microphones spaced at approximately the distance between the ears on a human head, and played back using headphones

to re-create the stereo effect. The technique evolved into multichannel stereophonic reproduction.

binaural machine hearing Also called *stereo machine hearing.* The ability of a machine, such as a robot, to sense the direction and distance to a source of sound, using two acoustic transducers and a computer to process their output signals. The machine determines the location of the sound source by comparing the relative amplitude and phase of the signals from the two transducers. It functions according to the same principle as human hearing, in which a person can determine the general direction and distance to a sound source by subconsciously comparing the relative amplitude and phase of the sounds arriving at the left and right ears.

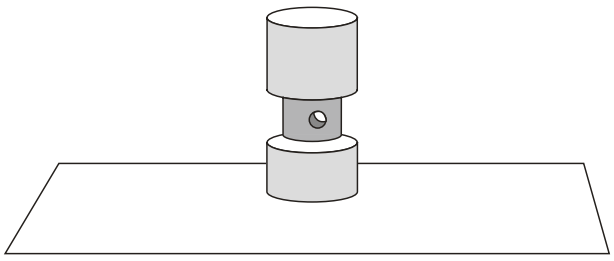
binaural sound The equivalent of a listener hearing a concert through a pair of earholes; it takes earphones to reproduce the signal. If speakers are substituted for the earphones, the listener hears monophonically, as if standing back several feet from the earholes.

binder A material (such as lacquer) that acts as a holder and cohesive medium for the particles of another material. It is used in carbon resistors, ceramic dielectric bodies, powder cores, and resistive and metallic paints.

binding energy A property of the nucleus of an atom. The binding energy of a nucleus is equal to the difference between the nuclear weight and the sum of the weights of the lighter particles making up the nucleus. The nucleus is stable when the binding energy is high.

binding force Any one of the electrostatic forces that bind crystals together.

binding post A screw-type terminal of various styles, often having a hole into which a wire or tip can be inserted and gripped. It is used for temporary indoor connections only.



binding post

binistor A semiconductor switching device that exhibits two stable states and also negative resistance.

binocular machine vision Also called *stereoscopic machine vision.* The ability of a machine vision system to provide depth and perspective data. Uses two optical sensors spaced a fixed distance apart. The left sensor sees a slightly different image than the right sensor. These two images are combined and processed by a computer, allowing the machine (such as a mobile robot) to determine the distances to various objects in its environment. Functions on the same principle as stereoscopic human vision.

bin picking In robotics, the selection of a particular object from a container (bin) in which there are many objects. Can be done using object recognition, bar coding, or passive transponders. It requires a sensor, operating in conjunction with a computer that processes the sensed data and controls the movements of the robot.

binomial An algebraic expression containing two terms joined by a plus or minus sign. Examples: $a^2 + b^2$, $3x^3 - 6x$.

binomial theorem The theorem, proven by Isaac Newton, permits a binomial to be raised to any desired power without performing the multiplications. In electronics, *power series* are convenient for expressing such expressions.

biochemical cell A fuel-cell energy source in which electricity is generated chemically through the oxidation of biological substances. Also called *biochemical fuel cell.*

biochip **1.** A natural, living organism with a physical structure that in some way resembles that of an electronic *integrated circuit (IC).* **2.** A theoretical possibility, according to some scientists, but not yet a practical reality: An IC manufactured by a laboratory process that mimics the way in which nature builds living organisms. A form of *artificial life,* harnessed for electronic and/or computing applications.

bioelectricity **1.** Electric currents in living tissues, generated by the organism and not applied by external means. **2.** The science or study of such currents.

bioelectrogenesis The study and application of electricity generated by living animals, including humans, in the powering and control of electronic devices.

bioelectronics Electronics in relation to the life sciences—especially the electronic instrumentation of biological experiments.

bioengineering **1.** The engineering of equipment, such as electron microscopes, electroencephalographs, centrifuges, irradiators, etc., for study and experimentation in the life sciences. **2.** The engineering of equipment, such as pacemakers, hearing aids, X-ray apparatus, shock-therapy units, etc., for aid or support-of-life processes.

biofeedback A technique in which changes in skin temperature and resistance are detected and displayed by an electronic device.

biofeedback monitor A system that provides an indication of skin temperature and resistance to a user. Because skin temperature and resistance are affected by emotions, such as fear, nervous-

ness, anger, etc., these monitors might be of value to people who wish to gain improved control of their emotions, and thus perhaps minimize the physiological effects of stress.

biological robot Believed by some researchers to be possible, but not yet a practical reality: A living organism created by biological cloning, whose brain has been programmed exactly as a computer is programmed.

biological shield An absorbent shield that blocks or attenuates ionizing radiation to protect personnel working near radioactive materials.

bioluminescence **1.** The emission of light by a living organism. **2.** The light itself so produced by living organisms.

biomechanism An electromechanical device that simulates the workings of some part of a living being's body. Examples are electromechanical hands, arms, and legs. Such a device is often difficult to distinguish from its biological counterpart when obscured by clothing.

biomechatronics A contraction of the words *bio*logy, *mecha*nics and ele*ctronics.* Research, development and manufacturing that encompasses aspects of all three fields. This is especially important in robotics.

biometrics Mathematics, and in particular, statistics and probability, applied to biology.

biometric security system An advanced intrusion-prevention system that measures biological characteristics of the people who are authorized to enter a property. Such a machine can employ vision systems, object recognition, and/or pattern recognition to check a person's face. The machine might use speech recognition to identify people by the waveforms of their voices. It might record a hand print, a fingerprint, or an iris print, or a combination of all these things. A powerful computer analyzes the data obtained by the sensors and determines whether the person is authorized to enter the premises.

bionics The study, design, and application of microelectronic systems that simulate the functions of living organisms.

biotelemetry The use of telemetry to collect data from living organisms or to direct their movement.

biotelescanner An instrument that monitors body functions via radio, from a great distance.

Biot/Savart law A principle of electromagnetism that expresses the intensity of magnetic field H in the vicinity of a long, straight wire carrying a steady current I. The basic formula is $H = 2I/r$, where H is in oersteds, I is in amperes, and r is the distance in centimeters from the wire.

bip Abbreviation of *binary image processor.*

biphase half-wave rectifier An alternative term for FULL-WAVE RECTIFIER; also, each leg of a two-diode full-wave rectifier.

BIPM Abbreviation of *International Bureau of Weights and Measures.*

bipolar The condition of possessing two pole sets. In a conventional (non-FET) transistor, one pole set exists between the base and collector, and another pole set exists between the base and emitter.

bipolar driving unit A magnetic headphone or loudspeaker in which both poles (north and south) of a magnet actuate a diaphragm or lever.

bipolar operation See AUTOMATIC POLARITY.

bipolar transistor A two-junction transistor whose construction takes the form of a pnp or an npn "sandwich." Such devices are current-operated, compared with field-effect transistors, which are voltage-operated. The bipolar transistor (of which the familiar npn and pnp types are examples) uses both electron and hole conduction.

biquinary code A variety of binary-coded-decimal notation in which seven bits are used to represent each decimal digit. A number is written in two groups of bits: a two-bit group followed by a five-bit group. The positional values are 5 and 0 for the two-bit group, and 4, 3, 2, 1, and 0 for the five-bit group.

biquinary decade A decade counter that consists of a binary stage, followed by a quinary stage.

bird **1.** Slang for orbiting SATELLITE. **2.** Slang for *guided missile.*

birdie **1.** A spurious beat note in a superheterodyne receiver. So called because of the characteristic chirping sound it makes as the operator tunes by the frequency on which it occurs. **2.** A parasitic oscillation in a radio transmitter, also called a *spurious emission* or *spur.*

Birmingham wire gauge Abbreviation, BWG. Also called *Stubs gauge.* A method of designating the various sizes of solid wire. BWG diameters are somewhat larger than corresponding AMERICAN WIRE GAUGE diameters for a given wire-size designator.

Birmingham Wire Gauge (BWG) Diameters

BWG	Millimeters	Inches
1	7.62	0.300
2	7.21	0.284
3	6.58	0.259
4	6.05	0.238
5	5.59	0.220
6	5.16	0.203
7	4.57	0.180
8	4.19	0.165
9	3.76	0.148
10	3.40	0.134
11	3.05	0.120
12	2.77	0.109
13	2.41	0.095
14	2.11	0.083
15	1.83	0.072
16	1.65	0.064
17	1.47	0.058
18	1.25	0.049
19	1.07	0.042
20	0.889	0.035

bismuth Symbol, Bi. A metallic element. Atomic number, 83. Atomic weight, 209.

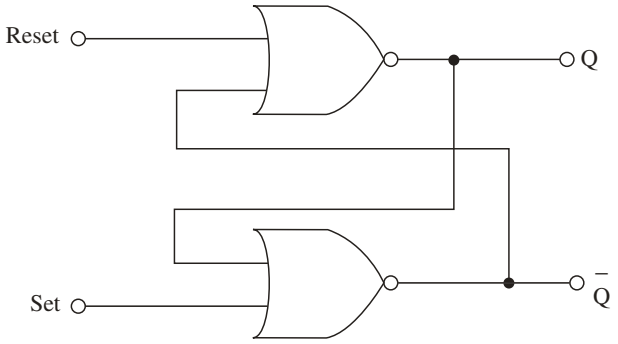
bismuth flux meter A flux meter in which the sensor contains a length of bismuth wire, which acts as a magnetoresistor.

bismuth thermocouple A thermocouple that uses the junction between bismuth and antimony wires. Used in thermocouple-type meters.

bistable Having two stable states.

bistable device Any device, such as a flip-flop, the operation of which exhibits two stable states and which can be switched at will from one state to the other.

bistable multivibrator A multivibrator, the operation of which exhibits two stable states. More commonly known as a FLIP-FLOP. These circuits are abundant in digital electronic equipment. Compare ASTABLE MULTIVIBRATOR and MONOSTABLE MULTIVIBRATOR.



bistable multivibrator

bistable relay A relay that has two stable states: open and closed. Successive actuating pulses open and close the relay, two consecutive pulses being required to return the relay to a given state. Also called *binary relay*, *relay flip-flop*, and *electromechanical flip-flop.*

bistatic radar A radar set in which the transmitting and receiving antennas are separate.

bistate Having two states. Example: the performance of a FLIP-FLOP.

bit An acronym formed from the words *binary digit.* The smallest or elementary unit of data in digital electronics. Represented either by logic 0 (low) or logic 1 (high). These states can be represented by any dichotomy, such as off/on, false/true, minus/plus, dark/bright, red/green, etc.

BIT Abbreviation of *built-in test.*

bit density The number of digital bits per unit area or volume, as the number of bits per square centimeter of magnetic tape.

BITE Abbreviation of built-in test equipment.

bit rate The speed in BITS PER SECOND (bps) at which digital data bits are transmitted or handled.

bit-slice processor A microprocessor whose word or byte capacity is achieved through the use of interrelated smaller capacity processors (e.g., a 16-bit unit derived from eight 2-bit "slices").

bits per second Abbreviation, bps. An expression of digital data speed. Commonly used in computer communications. This unit is often confused with, and improperly called, the *baud.* There is generally a difference between the speed of a signal in baud, and the speed of the same signal in bps. Compare BAUD.

bitter pattern A pattern produced in a suspension of ferromagnetic powder in the presence of an imperfection in a magnet. The pattern appears as an irregularity that is easy to see.

Bjerknes' equation An expression for the total (primary plus secondary) decrement of a tuned circuit, based on measurements of the tank current at the resonant frequency and at a frequency near resonance.

BK **1.** Radiotelegraph signal for BREAK. **2.** Abbreviation of BREAK-IN.

Bk Symbol for BERKELIUM.

black-and-white Also called *monochrome* and *gray-scale.* Any system of image reproduction, transmission, or reception in which the image is composed of opaque elements (black) and white or bright areas, as in noncolor television reception.

black area An area in which there is only an encrypted signal.

blackboard system A method via which computers can recognize, and to some extent determine the meaning of, spoken words and visual images. Incorporates machine vision and/or machine hearing in conjunction with artificial intelligence (AI). Incoming voices and/or images are digitized and entered into a large-capacity random-access memory (RAM). The data is evaluated by sophisticated software to determine the most logical or probable interpretations of the sounds and images.

blackbody An ideal surface or object, that completely absorbs energy of any wavelength that strikes it. Such an object is a theoretically perfect radiator of energy at all wavelengths.

blackbody radiation Electromagnetic radiation from a heated ideal BLACKBODY. This radiation is conceived as covering the entire ELECTROMAGNETIC FREQUENCY SPECTRUM. It can be expressed graphically as a characteristic curve with a peak at a wavelength that depends on the absolute temperature of the object. As the absolute temperature increases, the peak occurs at progressively shorter wavelengths (higher frequencies). This enables radio astronomers to get a reasonably good idea of the temperatures of distant celestial objects, such as planets.

black box **1.** Any "box" or "block" that can be included in an analysis or synthesis based upon the BLACK-BOX CONCEPT. **2.** Any functional unit (such as a module) whose operating characteristics are known, and that can be inserted into

a system in development or maintenance operations. **3.** Any subcircuit or stage that can be specified in total as required in a system, in terms of its known or prescribed performance, but whose internal structure need not be known.

black-box concept A technique for development of equivalent circuits and of considering their operation. The "box" has a pair of input terminals and a pair of output terminals; one input terminal is often common to one output terminal. The contents of the box need not be known, but from the input and output current and voltage relationships, its nature can be determined. Moreover, from the available input signal and desired output signal, the internal circuit of the box can be specified. Integrated circuits (ICs) are often treated as black boxes by engineers designing complex electronic equipment.

black compression Attenuation of the level of dark areas in a television picture.

blacker than black The video-signal amplitude region above the level that just darkens the screen. Signal information (such as control pulses) in this region are therefore not seen.

black light **1.** Ultraviolet radiation—especially when used to cause visible fluorescence in certain materials. **2.** A lamp that produces a principal portion of its radiation in the ultraviolet region, causing visible fluorescence of certain substances. Such lamps are used in some scientific experiments, and also for creating special effects at presentations or parties. It is hazardous to look directly at the output of such a lamp with unprotected eyes.

blackout **1.** A complete interruption of ac utility power to numerous customers at the same time. **2.** A complete cessation of ionospheric radio-wave propagation, such as might be caused by a solar flare. **3.** Complete blanking of the screen of an oscilloscope or picture tube.

black reference In a television signal, the blanking level of pulses, beyond which the sync pulse is in the *blacker-than-black* region.

black reference level In a television signal, the voltage threshold of the BLACK REFERENCE (i.e., its level above zero volts).

black transmission A system of picture or facsimile transmission in which the maximum copy darkness corresponds to the greatest amplitude (in an amplitude-modulated transmitter) or the lowest instantaneous frequency (in a frequency-modulated transmitter). Compare WHITE TRANSMISSION.

blank **1.** A piezoelectric plate cut from a quartz crystal, but not yet finished to operate at a desired frequency. **2.** To obscure or interrupt a signal or electron beam (usually momentarily), as in z-axis blanking in an oscilloscope. **3.** A silicon wafer cut from a large slab, containing dopants only. **4.** A magnetic diskette or tape on which nothing is recorded. **5.** An optical diskette on which nothing is recorded. **6.** A location (such as a symbol or space) that is used to verify proper data character grouping and values.

blanketing A form of radio interference accompanied by severe degradation of reception, virtually unaffected by tuning, over a wide range of frequencies. An example is ac line noise caused by an arcing power transformer or electrical appliance in the vicinity of a receiving antenna. It tends to occur most often at low, medium, and high frequencies.

blanking Obscuring or momentary elimination of a signal (see BLANK, **2**).

blanking interval The short period during which the electron beam of a cathode-ray tube is cut off so that the beam can return to its start position without creating a trace on the screen.

blanking level The discrete, predetermined level (usually a threshold voltage) at which BLANKING occurs.

blanking pedestal In the horizontal pulse of a television signal, the lower portion between zero volts and the blanking level.

blanking pulse A pulse that produces momentary blanking (see BLANK, **2**).

blanking time The time interval during which the electron beam of a cathode-ray tube is interrupted by a blanking signal.

blank tape **1.** Magnetic tape that has never been subjected to the recording process and that is substantially free from noise. **2.** Magnetic tape from which all preexisting information has been erased.

blasting **1.** Severe overloading of a sound system, usually caused by setting the volume control at or near maximum and then applying a significant input signal to the amplifier. Accompanied by distortion, in its worst form, it can cause damage to speakers and/or headsets. **2.** In a communications receiver, the result of a strong signal coming in unexpectedly when the automatic gain control (AGC) has been switched off, and the audio-frequency (AF) and radio-frequency (RF) gain controls are set high for reception of weak signals.

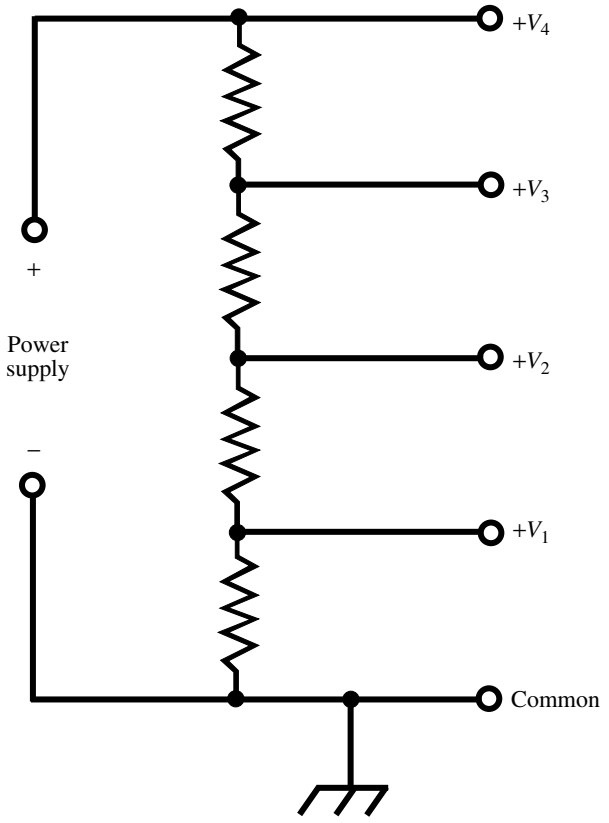
bleeder A resistor or group of resistors, used permanently to drain current from charged capacitors. It establishes the predetermined initial load level for a power supply or signal source, and it serves as a safety device in high-voltage power supplies.

bleeder current The current normally flowing through a bleeder.

bleeder divider A network of resistors, series-strung across the output of a power supply or its regulator. As a load resistor, the bleeder improves regulation and protects against no-load voltage surges. The resistor junctions allow various voltages to be drawn from the supply.

bleeder power Power dissipated as heat in a bleeder.

bleeder resistor See BLEEDER.



bleeder divider

bleeder temperature The operating temperature in a bleeder. It is generally high because of power dissipation in the form of heat.

bleeding whites A flowing of the white areas of a television picture into the black areas; an overload condition.

blemish See BURN.

blind flight The flying of aircraft entirely by means of instruments and electronic communications.

blind landing Landing of an aircraft entirely by means of instruments and electronic commnications.

blind zone **1.** In radar operations, an area that gives no echoes. **2.** Skip zone (see ZONE OF SILENCE).

blip **1.** The pulse-like figure on a radar scan, indicating the transmission or reflection (see A-SCAN and J-SCAN). Also called PIP. **2.** In visual alignment of a tuned circuit using a sweep generator and marker generator, the pulse or dot produced on the response curve by the marker signal. **3.** A short, momentary signal pulse, such as a single Morse dot.

BLIP Abbreviation for *background-limited infrared photoconductor.*

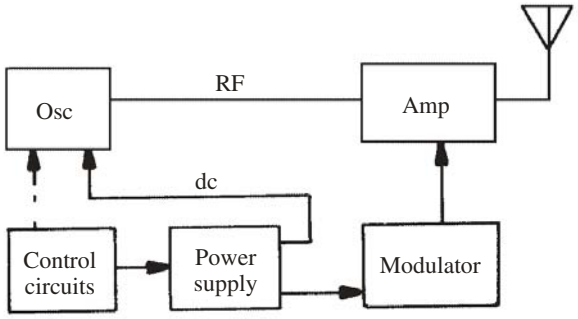
blip-scan ratio The number of radar scans necessary to show a visible blip, or echo, on a radar screen.

Bloch functions Solutions of the *Schrodinger wave equation* for a single electron surrounded by an electric field. The field varies periodically with distance from the source.

Bloch wall The transition layer between adjacent ferromagnetic domains (see DOMAIN).

block **1.** A group of data words or digits. **2.** A group of memory storage spaces. **3.** A circuit that operates as an identifiable unit. **4.** The symbol for a circuit, stage, unit, or device in a BLOCK DIAGRAM.

block diagram A simplified diagram of an electronic system, in which circuits, stages, units, or devices are shown as two-dimensional boxes with the internal wiring and detail circuitry omitted. This makes it possible to clearly show the interconnection among circuits, stages, units or devices. It also provides a concise rendition of the overall functional concept of the system.



block diagram
(of a radio transmitter)

blocked impedance The input impedance of a transducer, whose output load is a theoretically infinite impedance.

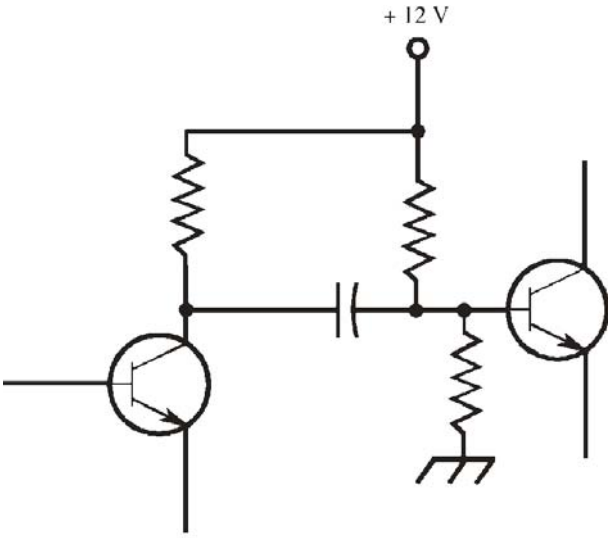
blockette In a computer, the subdivision of a character block that is handled as a unit during data transfer.

blocking action Obstruction of circuit action, usually abrupt, through internal action or by the application of an external signal. Thus, the operation of an amplifier can be blocked (output reduced to zero) by an input signal or by excessive feedback, either of which overloads the input.

blocking capacitor A capacitor inserted into a circuit to prevent the passage of direct current while easily passing alternating current.

blocking choke Any inductor, such as a choke coil, that is used to prevent the flow of an alternating current while allowing direct current to pass with little resistance.

blocking interference Radio interference from signals strong enough to reduce the receiver output through blocking action.



blocking capacitor

blocking oscillator An oscillator that turns itself off after one or more cycles. It does this as a result of an accumulation of negative charge on its input electrode (base of a bipolar transistor or gate of a field-effect transistor). The action is repetitive. In the self-pulsing type of blocking oscillator, a series of pulses consisting of trains of sine waves with intervening spaces is generated. In the single-swing type of blocking oscillator, the output consists of a series of single cycles with long intervals between them.

blocking oscillator synchronization **1.** In the BLOCKING OSCILLATOR used in the vertical deflection circuit of a television receiver, the oscillator is synchronized with vertical sync pulses arriving in the video signal. **2.** Synchronization of the repetition rate of any blocking oscillator with a suitable external control signal.

blocking system In a telephone system, a method of dealing with the condition of having more subscribers than connection paths. Allocation is made on a demand basis. If all channels are in use, it is impossible to make new calls. This prevents excessive degradation of the quality of existing connections.

block length The number of characters, bits, or words that compose a defined unit word or character group.

block transfer The conveyance of a word or character grouping in a computer register to another register or a peripheral device.

blooming On a cathode-ray-tube (CRT) screen, an enlargement of the electron-beam spot, caused by poor focusing. This results in poor image resolution.

blooper **1.** A radio receiver that is in oscillation, and is transmitting a signal that causes interference. **2.** A parasitic oscillation in a radio transmitter. **3.** In broadcasting, a statement in which a radio or television announcer makes an embarrassing error or breach of etiquette.

blow The opening of a fuse or circuit breaker as a result of excessive current.

blower A fan used to remove heat from electronic circuits. These are often used in tube-type radio-frequency (RF) power amplifiers, where much heat is generated, and in computers to cool the microprocessor and surrounding components.

blowout **1.** An alternate term for BURNOUT. **2.** The forceful opening of a circuit breaker. **3.** The extinguishing of an arc.

blowout coil An electromagnet that provides a field to extinguish an arc.

blowout magnet A permanent magnet that provides a field to extinguish an arc.

blst Abbreviation of *ballast.*

blue-beam magnet In a color television picture-tube assembly using three electron guns, a small permanent magnet to adjust the static convergence of the beam for blue phosphor dots.

blue box An accessory device (sometimes unlawfully used) that generates tones that switch a telephone circuit in the placing of calls.

blue glow **1.** In a neon lamp, a bluish light that results from high-voltage arcing. **2.** The normal color of the gas discharge in an argon glow lamp. **3.** The bluish glow between anode and cathode of a gassy vacuum tube. **4.** The normal color of the discharge that fills a mercury-vapor tube.

blue gun The electron in a three-gun color picture tube, the beam from which strikes the blue phosphor dots.

blueprint **1.** A type of contact-print reproduction in which a sheet of sensitized paper is exposed to an image on a translucent or transparent film, under strong light, and is then developed and fixed. Although this process is still used to reproduce electronic illustrations and typescripts, it has been superseded largely by other (dry) processes. **2.** Loosely, any plan or design for the development of a system.

blue restorer In a three-gun color television circuit, the dc restorer in the blue channel.

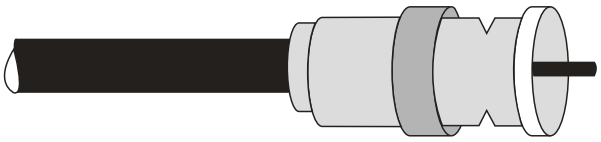
blue ribbon program A computer program that has been hand-prepared and debugged completely before its first computer run.

blue video voltage The signal voltage presented to the grid of the blue gun of a three-gun color picture tube.

blurring **1.** BLOOMING. **2.** A defocusing of a television picture or oscilloscope trace. **3.** An obscuring of a signal by echoes or trailing (e.g., the slow decrement of a Morse code signal element).

B-minus Also called *B-negative.* The negative terminal of a B-power supply.

BNC Abbreviation of *bayonet Neill-Concelman.* A type of coaxial connector that can be quickly con-



BNC

nected and disconnected. It is commonly used with test equipment.

B-negative Alternative expression for B-MINUS.

BNL Abbreviation of *Brookhaven National Laboratory.*

BO Abbreviation of *beat oscillator.* Also abbreviated BFO.

board **1.** A panel containing patch jacks. **2.** A printed circuit.

boat A type of crucible in which a semiconductor material is melted and sometimes processed. The material of which the boat is made (e.g., graphite) does not react with or contaminate the semiconductor material.

bobbin **1.** A usually nonmetallic spool on which a coil is wound. **2.** The form onto which the voice coil of a loudspeaker is wound.

Bode plot A pair of curves plotted to the same frequency axis, one showing the gain of a network or amplifier and the other showing its phase shift. Phase and amplitude of active and passive networks can be exhibited. Also called *Bode curve* and *Bode diagram.*

body-antenna effect The tendency of the human body to act as a receiving antenna when a finger is touched to the antenna input terminal of a receiver or when a hand (or the whole body) is brought close enough to the circuit to provide capacitive coupling.

body capacitance Capacitance between the body of the operator (as one plate of an equivalent capacitor) and a piece of electronic equipment (as the other plate). This phantom capacitance is often the cause of detuning and of the injection of interfering signals and noise because the body acts as a pickup antenna.

body electrode **1.** An electrode attached to the human body (or to the body of a laboratory animal) to conduct body-generated currents to an instrument, as in cardiography, electroencephalography, and myography. **2.** An electrode attached to the human body (or to the body of a laboratory animal) to conduct currents into the body, as in shock therapy and skin-resistance measurement.

body leakage Leakage of current through the bulk or body of a dielectric material, as opposed to SURFACE LEAKAGE.

body temperature In a thermistor, a rating that represents the temperature measured on the surface of the device. It is any combination of ambient temperature, power dissipation, and operation of the internal heater element (if the thermistor has one).

bof Abbreviation of *barium oxide ferrite.*

boffle A loudspeaker enclosure consisting of stretched screens that are sound absorbing and elastic.

bogie Also called *bogey.* **1.** The exact value of a specified characteristic. Thus, if resistance is given as 1 kΩ ±0.5%, the bogie value is 1 kΩ. **2.** The average value (i.e., the ARITHMETIC MEAN). **3.** A false or unidentified echo on a radar screen.

Bohr atom The concept of the nature of the atom, proposed by Niels Bohr in 1913 partly to explain why the electrons in the Rutherford atom do not fly off into space or fall into the nucleus. The Bohr theory places the electrons in permissible orbits where they cannot radiate energy (see BOHR RADIUS). They can radiate or absorb energy, however, if they go to a lower orbit or to a higher orbit, respectively. Compare RUTHERFORD ATOM.

bohrium Symbol, Bh. Also called *unnilseptium* (Uns). Atomic number, 107. The most common isotope has atomic weight 262. Classified as a transition metal. It is human-made and is not known to occur in nature.

Bohr radius Symbol, a_0. A physical constant whose value is approximately 5.291772×10^{-11} meter.

boiling point Abbreviation, bp. The temperature at which a liquid vaporizes. The boiling point of water in air at a pressure of one atmosphere is 100°C or 212°F.

bolometer Any device that is essentially a small, nonrectifying, temperature-sensitive resistor that can be used for heat sensing, radio-frequency power measurement, curve changing, demodulation, circuit protection, etc. Included in this category are the BARRETTER, the THERMISTOR, and the wire-type FUSE.

bolometer bridge A dc bridge in which a bolometer is one of the four arms. The bridge is balanced first with the bolometer cold. The bolometer then is excited with a radio-frequency (RF) current, whereupon the resultant heating changes the bolometer resistance. The bridge is rebalanced for the new resistance. The RF power driving the bolometer is determined according to a predetermined function of bridge settings versus RF input power.

Boltzmann constant Symbol, k. A figure that enters into the calculation of thermionic emission and of thermal noise factor. It represents the temperature equivalent of work function, in electron volts per Kelvin (eV/K) or joules per Kelvin (J/K). The values are approximately:

$$k = 8.617 \times 10^{-5} \text{ eV/K} = 1.38 \times 10^{-23} \text{ J/K}$$

Boltzmann's principle A description of the statistical distribution of large numbers of tiny particles under the influence of a force, such as an electric or magnetic field. When the system is in

statistical equilibrium, the number of particles in any portion of the field is given by:

$$N_E = N_{0e}^{-E/kT}$$

where E is the potential energy of a particle in the observed area, N_0 is the number of particles per unit volume in a part of the field where E is zero, k is the BOLTZMANN CONSTANT, T is the absolute temperature of the system of particles, and e is approximately equal to 2.718.

bombardment The usually forceful striking of a target with rays or a stream of particles.

bond **1.** An area in which two or more items are securely and intimately joined. **2.** The attractive force that holds an atomic or subatomic particle or particle group together.

bonded-barrier transistor A bipolar transistor in which the connection at the base region is alloyed.

bonded negative-resistance diode A diode that displays a negative-resistance characteristic over part of its current curve. This results from avalanche breakdown.

bond energy In a molecule, the energy necessary to break an atomic bond.

bonding **1.** The formation of bonds between adjacent atoms in a crystalline material, such as a semiconductor. See specifically COVALENT BINDING FORCES, IONIC BINDING FORCES, and METALLIC BINDING FORCES. **2.** The secure fastening together of conducting surfaces, as by soldering or brazing, to produce a high-conductance, leak-free continuum.

bond strength The minimum stress required to separate a material from another to which it is bonded.

bone-conduction transducer A device used in place of the earphone in a hearing aid to convey sound energy to the bone structure of the head.

Bongard problem A method of evaluating how well a machine vision system can differentiate among patterns. Similarities and differences are noted between objects in two sets of boxes. It was developed for object-recognition systems, mainly for use in intelligent robots.

book capacitor A variable capacitor in which the metal plates are bonded along one edge and separated from each other by means of mica sheets. The capacitance is varied by opening and closing the assembly book fashion. It is used as a padder or trimmer.

Boolean algebra A system of symbolic logic. Statements are represented as symbols, usually variables such as x, y, and z. The logical AND operation is represented by multiplication; the logical inclusive OR operation is represented by addition; the logical NOT operation is represented by a minus sign or a line over the element symbol. The system has rules, definitions and axioms via which *theorems* can be derived. Used by engineers in the design of digital electronic circuits.

Boolean truth table

x	y	*AND* xy	*NOT* x	*OR* $x + y$
0	0	0	1	0
0	1	0	1	1
1	0	0	0	1
1	1	1	0	1

Boolean function In mathematical logic, a function that makes use of BOOLEAN ALGEBRA.

Boolean theoreams

1. $x + 0 = x$ (additive identity)
2. $x1 = x$ (multiplicative idenity)
3. $x + 1 = 1$
4. $x0 = 0$
5. $x + x = x$
6. $xx = x$
7. $(x')' = x$ (double negation)
8. $x + x' = 1$
9. $x'x = 0$
10. $x + y = y + x$ (commutativity of addition)
11. $xy = yx$ (commutativity of multiplication)
12. $x + xy = x$
13. $xy' + y = x + y$
14. $x + y + z = (x + y) + z = x + (y + z)$ (associativity of addition)
15. $xyz = (xy)z = x(yz)$ (associativity of multiplication)
16. $x(y + z) = xy + xz$ (distributivity)
17. $(x + w)(y + z) = xy + xz + wy + wz$ (distributivity)

boom **1.** A horizontal support for a microphone, enabling the microphone to be suspended over a sound source, but out of the sight of a camera. **2.** A horizontal support for a small antenna that is undergoing tests or sampling the field of another antenna. **3.** The supporting element in a Yagi, quad, or log-periodic antenna. It establishes the center of gravity and directional axis of the radiation pattern. The driven element(s) and parasitic element(s) are attached, usually at right angles.

boost capacitor In the damper circuit of a television receiver, the capacitor that is used to boost the B-plus voltage. Also called *booster capacitor.*

boost charge A high-current, short-interval charge used to revitalize a storage battery quickly. Also called *booster charge.*

booster **1.** Any device used to increase the amplitude of a signal (e.g., as an amplifier or preamplifier) or of an energy source (e.g., to boost the output of a power supply). **2.** A radio-frequency preamplifier used ahead of a television receiver.

booster battery **1.** A battery used to forward bias a diode detector into a favorable region of its conduction curve, or to bias a bolometer into the square-law region of its response. **2.** A battery supplying power to a booster.

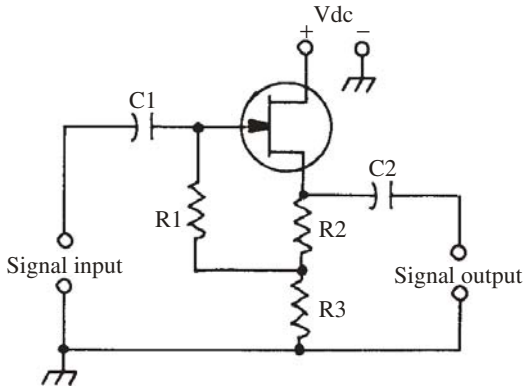
booster gain The amplification (usually in terms of voltage gain) provided by a booster (see especially BOOSTER, **2**).

boot **1.** The powering-up routine in a digital computer, in which the machine executes a series of programs to get itself ready for use. **2.** The resetting of a computer, by pressing certain keyboard keys (e.g., CTRL-ALT-DEL), pressing a reset button, or by powering-down, waiting about two minutes, and then powering-up again. **3.** To install a computer diskette and instruct the computer to execute one or more programs on the diskette. **4.** A usually flexible protective nipple or jacket pulled over a cable or connector, so called from its resemblance to a foot boot.

boot loader A form of computer program that operates on the BOOTSTRAP ROUTINE.

bootstrap A technique for making a device or process achieve a condition through its own actions; see BOOTSTRAP CIRCUIT, for example.

bootstrap circuit A specialized form of follower circuit that presents very high input impedance. Its chief feature is the return of the control-element resistor to a tap on the source or emitter resistor. The technique takes its name from the figurative notion that such a circuit "lifts its input impedance by its own bootstraps."



bootstrap circuit
(with junction-type field-effect transistor)

bootstrap routine **1.** Also called *bootstrap program.* In a digital computer, and especially in a personal computer, the routine that the machine follows when first powered-up. See BOOT, **1.** **2.** In a digital computer, a routine in which the first few instructions put in storage are later used to complete the routine, as supplemented by some operator instruction. **3.** A portion of a computer program that is used to establish an alternate version of the program.

borax-aluminum cell An electrolytic cell that consists essentially of an aluminum electrode and a lead electrode in a saturated solution of sodium tetraborate (borax). After electroforming, such a cell can be used either as a rectifier or as an electrolytic capacitor.

boric acid Formula, H_3BO_3. A compound used variously in electronics—especially as the electrolyte in electrolytic capacitors.

bornite Formula, Cu_5FeS_4. A natural mineral that is a sulfide of copper and iron. Its crystalline structure made it important in early semiconductor diodes (crystal detectors).

boron Symbol, B. A metalloidal element. Atomic number, 5. Atomic weight, 10.82. It is used as a dopant in semiconductor processing.

bot **1.** Abbreviation for *beginning of tape.* **2.** Abbreviation of *bottom.*

bottoming Excessive movement of the cone of a loudspeaker or the diaphragm of a headphone so that the magnet or supporting structure is struck by the moving-coil piston assembly. It produces a clapping sound, particularly on bass (low-frequency) audio peaks.

bounce **1.** The springback or vibration of the armature of a relay on closure. **2.** An abnormal, abrupt change in the brightness of the image in a television receiver or cathode-ray-tube (CRT) computer monitor.

boundary **1.** In a polycrystalline substance, the area of contact between adjacent crystals. **2.** The area of meeting of two regions (such as n and p) in a semiconductor.

boundary defect A condition in which a piezoelectric crystal has two regions, intersecting in a plane, with different polarizations.

boundary effect In audio systems, a pheno-menon in which the proximity of an acoustic transducer to a flat surface enhances the pickup and/or transmission of sound. Occurs because of reflection of acoustic waves from the surface.

bound charge The portion of the electric charge on a conductor that does not escape to ground when the conductor is grounded. This occurs because of induction from neighboring charge carriers. Compare FREE CHARGE.

bound electron An electron held tightly in its orbit within an atom so that it is not ordinarily free to drift between atoms and contribute to electric current flow.

bow-tie antenna A center-fed antenna in which the two horizontal halves of the radiator are triangular plates that resemble a bow tie. A flat reflector consisting of closely spaced horizontal wires is mounted behind the triangles.

bow-tie test An oscilloscope-display checkout of a single-sideband (SSB) signal, in which the appearance of the display indicates the signal quality. The transmitter output signal is fed to the

vertical deflection plates of the oscilloscope. The exciter audio output is fed to the horizontal sweep input of the scope.

boxcars Long pulses with short separating spaces between them.

box-shaped loop The characteristic square-loop hysteresis curve (B-H loop) that result when a sine wave of current is used to magnetize a sample of magnetic material. In this plot, which covers all four quadrants, the horizontal axis (H) displays magnetizing force, and the vertical axis (B) displays magnetization. Also see HYSTERESIS.

Boys radiomicrometer A detector for radiant energy. The device consists of a thermocouple and a galvanometer. When energy falls on the thermocouple, a voltage is produced, and this is measured by the galvanometer.

bp **1.** Abbreviation of BOILING POINT. **2.** Abbreviation of BANDPASS.

bpi Abbreviation of *bits per inch.*

B-plus Also called *b-positive.* **1.** Symbol, B+. The positive dc voltage required for certain electrodes of vacuum tubes, transistors, etc. **2.** The positive terminal of a B power supply.

B positive See B-PLUS.

B power supply A name used sometimes for the unit that supplies high-voltage dc energy to a vacuum tube plate or screen circuit.

bps Abbreviation of BITS PER SECOND.

Br Symbol for BROMINE.

bracketing A troubleshooting routine characterized by isolating progressively smaller areas in a circuit or chain of stages until the defective subcircuit or stage is located.

Bradley detector A locked-oscillator circuit that was once used as an FM detector.

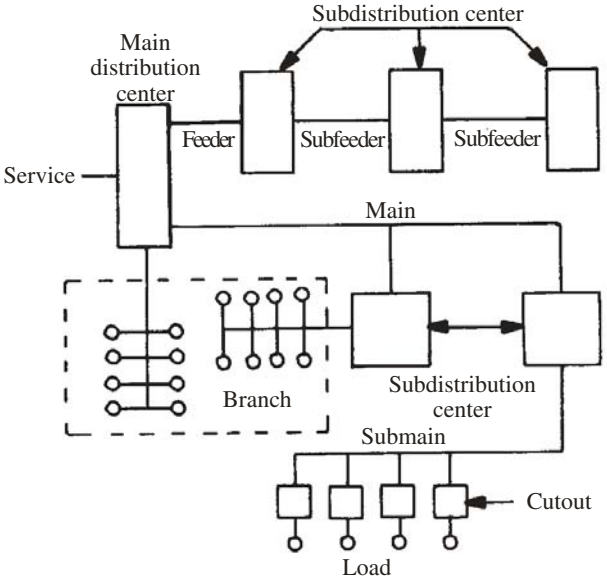
braid **1.** A woven network of fine metal wires used for grounding purposes. It is usually made of fine copper conductors. The increased surface-area-to-volume ratio improves the conductivity, at radio frequencies, over a single conductor that has the same cross-sectional area. Braid can be tinned (saturated with solder) to retard corrosion. **2.** It is also called a *shield.* The outer conductor in prefabricated coaxial cable.

braided wire A length of braid. Used for grounding or shielding purposes.

brain waves Alternating or pulsating voltages that are caused by electrical activity in the brain of an animal or human being. The voltages can be picked up by electrodes attached to the scalp, and amplified to be viewed on a cathode-ray-tube (CRT) screen, heard by headphones or speakers, or traced by an electroencephalograph.

branch **1.** Any one of the separate paths of a circuit. With respect to the layout of its components, a branch can be series, parallel, series-parallel, parallel-series, or any combination of these. It is also called a LEG. **2.** See BRANCH CIRCUIT.

branch circuit In electrical wiring, a group of outlets served through a single cutout from a source of power-line ac voltage. The source can be a distribution center, subdistribution center, main, or submain. Interior lighting circuits are usually branch circuits because many lights are connected to one circuit controlled by a single fuse or circuit breaker.



branch circuit (enclosed in broken lines)

branch current Current flowing through a branch of a circuit, whose magnitude, with respect to the total current of the circuit depends on the nature of the branch.

branched In molecular polymers, the condition of side chains being attached to the main chain.

branched windings Forked windings of a polyphase transformer.

branching In robotics and artificial intelligence (AI), a set of routines or programs containing points at which a computer must select from among two or more alternatives. Such routines are used in critical processes, such as the manufacture of precision equipment.

branch point See JUNCTION POINT.

branch voltage The voltage, or voltage drop, across a branch of a circuit.

brass **1.** An alloy of copper and zinc that is widely used in electronics. Compared to annealed copper, this metal has four times the resistivity (or ¼ the conductivity), half the temperature coefficient, more than twice the tensile strength, and a lower melting point (900°C). **2.** A colloquialism for an old-fashioned, straight telegraph key.

brass pounder **1.** Colloquialism for telegraph operator or radiotelegraph operator. **2.** A radio ama-

teur who handles large amounts of message traffic, particularly via Morse code. **3.** A radio amateur proficient in Morse code operation.

Braun electroscope An electroscope consisting essentially of a fixed metal vane to which a movable needle is fastened at a pivot. The repulsion between the two, when an electric charge is applied, causes the needle to move over a calibrated scale.

bravo Phonetic representation of the letter B.

brazing The joining of two metal (usually iron or steel) parts together with a suitable melted copper-alloy metal. Compare SOLDERING.

breadboard **1.** A perforated board, a chassis, or any basic framework on which electronic components can be mounted and quickly wired for the preliminary test of a circuit. It is so called because the first such foundation units of this sort actually were wooden breadboards. **2.** Any preproduction electronic prototype circuit. **3.** To set up a circuit on a breadboard.

breadboard model **1.** The preliminary model of an electronic device, often built on a breadboard (see BREADBOARD, **1**). **2.** Loosely, any prototype.

break **1.** An open circuit. **2.** To open a circuit. **3.** In communications, a word indicating a desire to transmit on a wavelength already occupied by radio traffic. **4.** See BREAK-IN, **1**.

break-before-make contacts Contacts, especially in a rotary selector switch, that open one circuit before closing the next one.

breakdown **1.** Failure of a circuit or device, caused mainly by excessive voltage, current, or power. A sudden high current, however, does not always indicate failure. **2.** AVALANCHE BREAKDOWN. **3.** The separation of an electronics problem or project into its constituent parts for an easier solution.

breakdown diode See ZENER DIODE.

breakdown region The region, in a pn junction, in which avalanche breakdown occurs.

breakdown strength See DIELECTRIC STRENGTH.

breakdown voltage **1.** The voltage at which current suddenly passes in destructive amounts through a dielectric. **2.** The voltage at which a gas suddenly ionizes, as in a gas tube. **3.** The voltage at which the reverse current of a semiconductor junction suddenly rises to a high value (nondestructive if the current is limited). See AVALANCHE BREAKDOWN.

break-in **1.** A technique of radio communication in which one station interrupts a transmission from another station, rather than waiting until the end of the latter's transmission. **2.** Also called *full break-in.* In a radio communications transceiver or transmitter/receiver combination, extremely rapid transmit/receive switching, approaching *full duplex* communications. Every pause in transmission, even of only a few milliseconds, creates a "receive window" allowing reception between spoken words or Morse code elements. **3.** BURN-IN.

breaking current The momentary current that flows when the contacts of a switch or relay are broken.

break-in keying A system of radiotelegraph keying in which the receiver is in operation whenever the key is open. See BREAK-IN, **2.**

break-in operation In radiotelegraph or single-sideband (SSB) communications, the practice of interrupting at any time to "talk back" to the other transmitting station. This operation is made possible by high-speed transmit/receive switching. See BREAK-IN, **2.**

break-in relay An electromechanical or solid-state relay that enables break-in operation. Largely supplanted by solid-state switching devices.

breakover point In a silicon-controlled rectifier, the source-voltage value at which the load current is suddenly triggered to its steep climb. Also called TRIGGERING POINT.

breakover voltage In a silicon-controlled rectifier with open gate circuit, the anode voltage at which anode current is initiated.

breakpoint A point in a computer program when, for the purpose of obtaining information for the program's analysis, the sequence of operations is interrupted by an operator or a monitor program.

breakpoint frequencies The upper- and lower-frequency points at which the gain-versus-frequency response of an amplifier or network departs from flatness.

breakpoint instruction An instruction that stops a computer.

breakthrough **1.** A new discovery, insight, or solution to a problem that results in an advancement in the state of the art. **2.** See PUNCHTHROUGH. **3.** See BREAKDOWN, **1. 4.** See AVALANCHE BREAKDOWN.

break time The time taken for a relay to drop out completely or a switch to open. Compare MAKE TIME.

breathing Slow, rhythmic pulsations of a quantity, such as current, voltage, brightness, beat note, etc.

breezeway In a sync pulse in NTSC color television, the part of the back porch between the trailing edge of the pulse and the color burst.

B-register An index register in a computer for storing words that are used to change an instruction before it is executed by the program.

Bremsstrahlung radiation The radiation emitted by a charged particle whose speed is altered when it passes through the electric field in the vicinity of an atomic nucleus.

brevity code A code not intended to conceal information, but to shorten the number of characters in a message or data file. The Q SIGNALS are an example of a brevity code used in communications. In computer data transfer and communications, brevity codes allow compression, speeding up the transfer rate and reducing the storage space for a given amount of data.

Brewster angle From BREWSTER'S LAW, the polarizing angle at which the reflected and refracted rays of incident light are perpendicular to each other.

Brewster's law (Sir David Brewster, 1781–1868). For any dielectric reflector, the relationship in which the refractive index is equal to the tangent of the polarizing angle.

bridge **1.** A network, usually consisting of four branches, connected so that an input signal can be applied between two opposite points and the output taken between the other two opposite points. When the component values are in a certain ratio, the voltage between the output points is zero, and the bridge is said to be balanced or set to null. **2.** A circuit such as that described in (**1**) used for electrical measurements. **3.** An audio or servo amplification system in which the load is driven from two outputs having opposite polarity, neither of which are at ground potential. **4.** A communications path between or among two or more networks. This allows the subscribers in any network to obtain data from, or send data to, any other network, in effect creating a network of networks.

bridge balance control A potentiometer, variable capacitor, or variable inductor that is used to adjust a bridge circuit to balance.

bridge-connected amplifier **1.** A dc amplifier stage in which the transistors and resistors are connected in a four-arm bridge circuit, with respect to dc. When the bridge is initially balanced, all dc is eliminated in the output load. The input signal unbalances the bridge, which results in an amplified output signal in the load. **2.** An amplifier pair having opposing outputs across which a load can be bridged to obtain twice the power output of either amplifier alone.

bridged differentiator See HALL NETWORK.

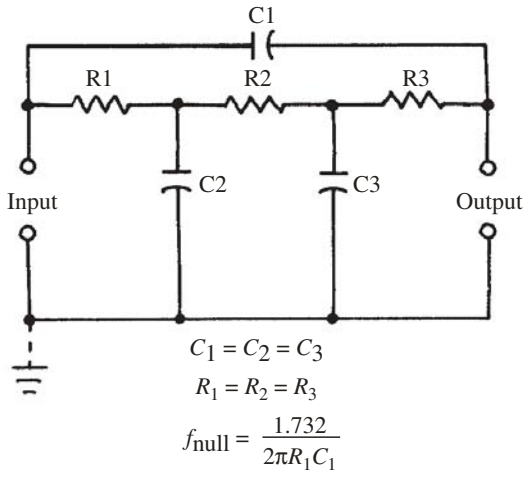
bridge detector The output-indicating device (e.g., meter, oscilloscope, or headphones) that indicates whether a bridge is balanced or unbalanced. Also called *null detector* or *null indicator.*

bridged integrator A null network that consists of a two-stage resistance-capacitance (RC) integrator circuit bridged by a capacitor. This network produces a shallow null at a single frequency determined by the *R* and *C* values in the integrator. Compare HALL NETWORK.

bridged-tee attenuator An attenuator consisting of a tee section, between the input and output of which is bridged a single-series arm.

bridged-tee circuit Any circuit (of resistors, capacitors, inductors, or a combination of these) that consists of a tee section, bridged by a single-series section, from input to output.

bridged-tee null network A bridged-tee circuit of resistance (*R*) and capacitance (*C*), proportioned so that at some setting of the *R* and *C* values, the output of the circuit is zero.



bridged integrator

bridged-tee oscillator A low-distortion oscillator circuit whose frequency is determined by a bridged-tee null network inserted into the negative-feedback path of the circuit.

bridge feedback A combination of current feedback and voltage feedback around an amplifier circuit. It is so called because, in the feedback circuit, the resistors and the output resistance of the amplifier form a four-arm bridge.

bridge generator The power source (e.g., a battery or oscillator) that supplies the signal to a BRIDGE used for electrical measurements.

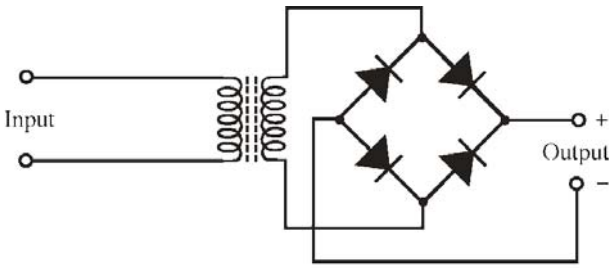
bridge indicator See BRIDGE DETECTOR.

bridge oscillator See BRIDGE GENERATOR.

bridge rectifier A full-wave rectifier circuit in which four rectifying diodes are connected in a bridge configuration. Each half-cycle of ac input is rectified by a pair of diodes in opposite quarters of the bridge and in series with each other. The bridge does not require a transformer with a center-tapped secondary, as does the FULL-WAVE, CENTER-TAP RECTIFIER circuit.

bridge source See BRIDGE GENERATOR.

bridge-type meter A frequency-sensitive bridge (such as the Wien bridge) that can be used to measure audio frequency. Because the bridge can be balanced at only one frequency at a time,



bridge rectifier

its adjustable arm can be calibrated to read the frequency directly.

bridge-type impedance meter An impedance-measuring circuit in which unknown impedance *Z* is connected in series with a calibrated variable resistor R. An ac voltage is applied to the series circuit. The separate voltage drops across the resistor and impedance are measured successively as the value of *R* is varied. When the two voltage drops are identical, *Z* equals *R*, and the impedance can be read from a calibrated dial on the variable-resistor control.

bridge-type oscillator A resistance-capacitance (RC) tuned oscillator in which a Wien bridge is used as the frequency-determining circuit in the feedback loop.

bridge-type power meter **1.** See BOLOMETER BRIDGE. **2.** A four-arm bridge specially designed to operate at radio frequencies. At null, the impedance of the unknown is read directly from the balancing dial or calculated from bridge constants. This instrument is used to measure the impedance of circuit components, antennas, and transmission lines.

bridge-type SWR meter A four-arm bridge that is specially designed to operate at radio frequencies. At null, the standing-wave ratio (SWR) is calculated from the bridge resistance values or read from a direct-reading scale on the null-indicating meter.

bridging amplifier An amplifier whose input impedance is so high that it can be considered infinite for practical purposes. Thus, the amplifier can be connected across a load or line without significantly affecting the operation of the system.

bridging coupler A voltage-dependent resistor that permits an occasionally used device (such as a bell) to be connected permanently across a regularly used device (such as a telephone) without continuously short-circuiting the latter. Thus, the bridging coupler ordinarily has very high resistance; but when the line voltage is momentarily raised, the resistance lowers and the occasionally used device is actuated (e.g., the bell rings).

bridging gain The gain of a bridging amplifier expressed as the ratio (in decibels) of the power developed in the amplifier load to the power in the load to which the input terminals of the amplifier are connected.

bridging loss The loss that results from the shunting of a speaker, microphone, earphone, or other transducer by a resistor, capacitor, or inductor. Generally, the loss is expressed as a power ratio in decibels.

Briggsian logarithm (Henry Briggs, 1556-1631). A base-10 logarithm, generally known as a COMMON LOGARITHM. Compare NAPIERIAN LOGARITHM.

brightness SI unit, candela per square meter (cd/m^2); cgs unit, lambert (L). The quantity of light, per unit area, emitted or reflected perpendicular to a light-emitting surface.

brightness control **1.** In a computer monitor, television receiver, or oscilloscope, a potentiometer that varies the negative bias voltage on the control grid of the cathode-ray tube (CRT). The brightness of the image is inversely proportional to this negative bias voltage. **2.** The control of the brightness of an illuminated area.

brilliance See BRIGHTNESS.

brilliance control **1.** The BRIGHTNESS CONTROL in a television receiver or computer monitor. **2.** The brightness control in a cathode-ray oscilloscope. **3.** A control for adjusting the level of the tweeter output in a speaker system.

British Standard wire gauge Abbreviation, NBS SWG. A classification of wire sizes sometimes used in England, Australia, and New Zealand. The higher the number, the thinner the wire. The designator does not take into account any coatings on the wire, such as enamel, rubber, or plastic insulation. In the United States, the *American wire gauge* is more often used. See AMERICAN WIRE GAUGE.

British Standard Wire Gauge (NBS SWG) Diameters

NBS SWG	Millimeters	Inches
1	7.62	0.300
2	7.01	0.276
3	6.40	0.252
4	5.89	0.232
5	5.38	0.212
6	4.88	0.192
7	4.47	0.176
8	4.06	0.160
9	3.66	0.144
10	3.25	0.128
11	2.95	0.116
12	2.64	0.104
13	2.34	0.092
14	2.03	0.080
15	1.83	0.072
16	1.63	0.064
17	1.42	0.056
18	1.22	0.048
19	1.02	0.040
20	0.91	0.036
21	0.81	0.032
22	0.71	0.028
23	0.61	0.024
24	0.56	0.022
25	0.51	0.020
26	0.46	0.018
27	0.42	0.0164
28	0.38	0.0148
29	0.345	0.0136
30	0.315	0.0124
31	0.295	0.0116
32	0.274	0.0108

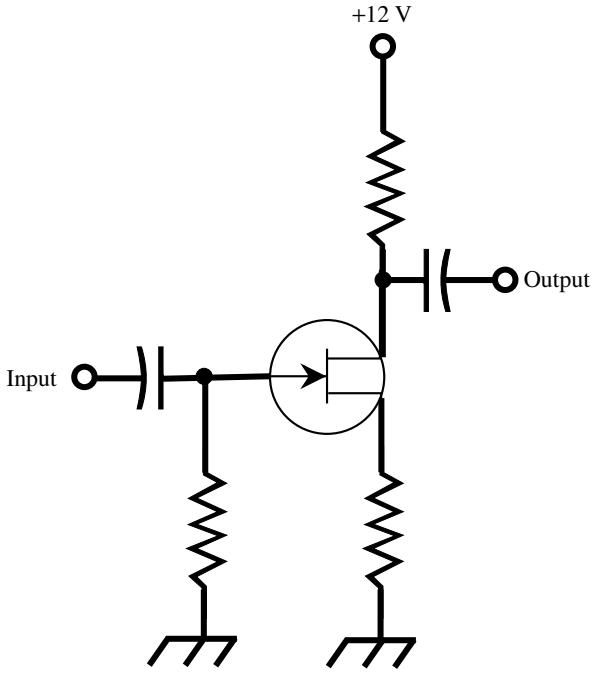
NBS SWG	Millimeters	Inches
33	0.254	0.0100
34	0.234	0.0092
35	0.213	0.0084
36	0.193	0.0076
37	0.173	0.0068
38	0.152	0.0060
39	0.132	0.0052
40	0.122	0.0048

British thermal unit Abbreviation, Btu. The amount of heat required to raise the temperature of a pound of water by one degree Fahrenheit, in an ambient environment of slightly greater than 39°F.

broadband Also called *wideband.* Possessing a characteristic wide bandwidth or range of operating frequencies. This term can be applied at audio frequencies (AF) or radio frequencies (RF), and is frequently used to describe the performance of oscillators, amplifiers, antennas, and various types of networks. The term can also be applied to describe the nature of electromagnetic emissions or noise. Examples are given in the following several definitions. Compare NARROWBAND.

broadband amplifier An amplifier that has very wide frequency response, such as 10 Hz to 10 MHz. Examples are an instrument amplifier and a video amplifier.

broadband antenna An antenna that operates satisfactorily over a comparatively wide band of frequencies without requiring retuning at individual frequencies. Examples are the log-periodic and discone antennas.



broadband amplifier

broadband electrical noise Electrical noise that is present over a wide frequency spectrum (e.g., 3 kHz to 30 MHz).

broadband I-F An intermediate-frequency (IF) amplifier or amplifier chain. The wide frequency response is important when an increased bandpass is preferred to high selectivity, as in high-fidelity radio tuners.

broadband interference Interference, other than noise, that is present over a wide band of frequencies. An example is over-the-horizon shortwave radar, recognizable by its characteristic "woodpecker" sound in communications receivers at high frequencies.

broadband Klystron A Klystron oscillator with a broadbanded tuned circuit.

broadband tuning Receiver tuning characterized by a selectivity curve having a pronounced flat top or broad nose that passes a wide band of frequencies. Also called *broadband response.*

broadcast **1.** A radio-frequency transmission of an intelligence-bearing signal that is directed to numerous unspecified receiving stations. **2.** The transmission or dissemination of signals to a large, unspecified number of receiving stations.

broadcast band Any band of frequencies allocated for broadcasting (see BROADCAST SERVICE, **1**), but particularly the U.S. standard amplitude-modulation (AM) and frequency-modulation (FM) radio broadcast bands at 535 to 1605 kHz (AM) and 88 to 108 MHz (FM).

broadcasting The dissemination of signals for reception by the general public, not for communications purposes.

broadcast interference Abbreviation, BCI. Interference to normal reception by broadcast receivers, usually arising from signals emitted by other stations.

broadcast receiver A receiver intended primarily to pick up standard broadcast stations. Also see BROADCAST BAND.

broadcast service **1.** Any radio transmitting service (including television) that exists for the purpose of sending out electromagnetic signals for general reception, rather than addressing them to specific receiving stations. **2.** The service provided by a station operating in the broadcast band.

broadcast station Any station in the broadcast service, but especially one assigned to operate in the standard U.S. broadcast bands. Also called *broadcasting station.*

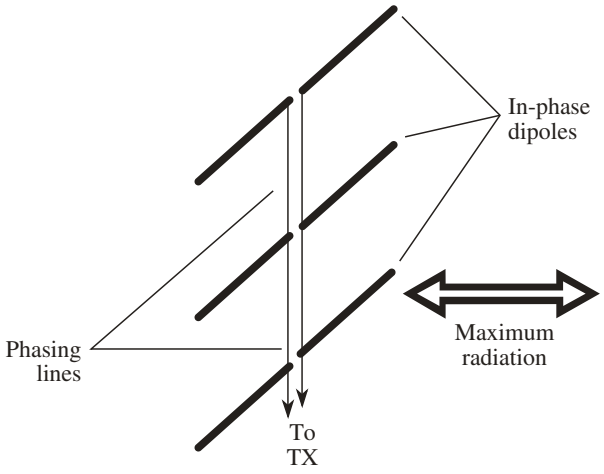
broadcast transmitter A radio transmitter designed specifically for, and operated in, the broadcast service.

broad response Slow deflection of an indicator, such as a meter, over a relatively wide range of values of the input quantity.

broadside In a perpendicular direction; for example, broadside radiation from an antenna.

broadside antenna See BROADSIDE ARRAY.

broadside array Also called *broadside antenna.* A phased group of antennas arranged so maximum radiation occurs in directions perpendicular to the plane containing the driven elements. This requires that all of the antennas be fed in phase. The elements can be half-wave dipoles or full-wave, center-fed conductors. Full-wave elements have a slight gain over half-wave elements. At high frequencies, this type of array is usually constructed from two driven antennas. At very-high and ultra-high frequencies there can be several driven antennas. The antennas can each consist of a single element, or they can be Yagis, loops, or other systems with individual directive properties. In general, the larger the number of elements in the entire array, the greater the gain and directivity.



broadside array

broad tuning Tuning that is characterized by pronounced signal width, often resulting in adjacent-channel interference. A common cause of such impaired selectivity is low *Q* in the tuned circuit(s).

Broca galvanometer A device consisting of an astatic magnetic arrangement, with a coil enclosing central consequent poles. The device is characterized by fast response and high sensitivity.

bromine Symbol, Br. A nonmetallic element of the halogen family. Atomic number, 35. Atomic weight, 79.90.

bronze An alloy of copper and tin that has various uses in electronics. Also see PHOSPHOR BRONZE.

Brown and Sharpe gauge See AMERICAN WIRE GAUGE.

Brownian movement (Robert Brown, 1773–1858). Random movement of microscopic particles—especially in solutions. It occurs because of collisions of molecules with the particles. Einstein showed, in his early work, a connection between this movement and the *Boltzmann constant.*

brownout A deliberate lowering of line voltage by a power company to reduce load demands. Minor events of this type often pass unnoticed by the average consumer. More pronounced events produce observable effects, such as shrinkage of television and cathode-ray-tube (CRT) computer-display images.

Bruce antenna A vertical collinear array that consists of several resonant sections connected by short, rigid, parallel-conductor stubs. The currents in the radiating sections are in phase. Maximum radiation and response occur broadside to the antenna (omnidirectional in the horizontal plane). Polarization is vertical. The antenna produces gain at low radiation and response angles, and is commonly used in repeater installations and fixed communications stations at very-high frequencies (VHF) and ultra-high frequencies (UHF).

brush A usually metal or carbon strip, blade, or block, that slides in contact with another part, as in a motor commutator.

brush discharge Also called *Saint Elmo's fire.* A cloud of repelled ions around the tip of a pointed conductor charged to a high voltage. It often produces a visible glow in the air.

brush holder The housing for a brush in a motor, generator, rheostat, slip-ring junction in a rotating data-transmission system, etc.

brute force **1.** The transmission of a signal of excessive or unnecessary power. **2.** An inefficient approach to a problem, which might solve the problem, but requires far more energy, effort, or computer memory/storage space than the minimum needed to accomplish the same result.

brute-force filter A pi-type lowpass dc power supply filter, so called because of the extremely large inductances and capacitances that are generally used.

brute supply An unregulated power supply.

B-scope A cathode-ray tube (CRT), used in radar, that presents a B DISPLAY.

B service A teletype communication system operated by the Federal Aviation Administration (FAA).

B-supply The dc power supply that provides anode operating voltages, such as plate and screen voltages in a vacuum-tube radio-frequency (RF) power amplifier.

BT-cut crystal A piezoelectric plate cut from a quartz crystal at an angle of rotation (relative to the x-axis) of -49°. It has a zero temperature coefficient of frequency at approximately 25°C. Also see CRYSTAL AXES and CRYSTAL CUTS.

Btu Abbreviation of BRITISH THERMAL UNIT.

BuAer Abbreviation of *Bureau of Aeronautics.*

bubble memory In digital-computer practice, a special type of static magnetic memory. The mag-

netic material is divided into regions that are magnetized in different directions. So called because the flux lines of the tiny magnetized regions are shaped somewhat like, and move around after the fashion of, bubbles on the surface of a glass of soda.

bubble shift register A shift register that uses a magnetic bubble (see BUBBLE MEMORY) that can be moved sequentially from electrode to electrode on a wafer.

bubbling See MOTORBOATING.

bucket A computer memory or a designated location in such a memory.

bucking The process of counteracting one quantity, such as a current or voltage, via series or parallel application of a similar quantity that has opposite polarity (180 degrees out of phase).

bucking circuit **1.** A circuit used to obtain bucking action. The simplest form is a battery and potentiometer that supply a variable voltage of polarity opposite to that of the voltage to be bucked. A more sophisticated form is an ac transformer, the secondary of which is connected in series and out of phase with the ac utility line. **2.** The zero-set circuit in an electronic voltmeter.

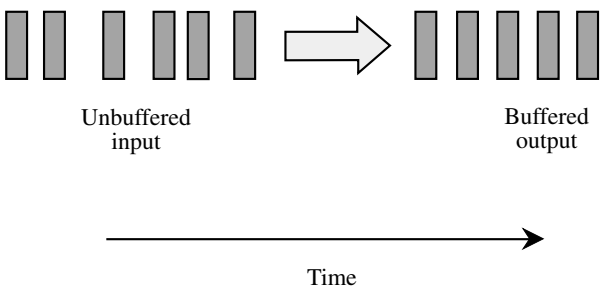
bucking coil A coil placed and positioned so that its magnetic field partially or completely cancels the field of another coil. Troublesome hum fields sometimes are neutralized with such a coil.

bucking voltage See BACK VOLTAGE, **2.**

buckling The warping of storage-battery plates, usually resulting from excessive charge or discharge.

buckshot In an amplitude-modulated (AM) or single-sideband (SSB) radio transmission, broadband signal splatter caused by excessive modulation, or detuned multiplier circuits.

buffer **1.** An amplifier used principally to match two dissimilar impedance points and isolate one stage from a succeeding one in a cascaded system, and thus to prevent undesirable interaction between the two. **2.** In a digital computer, a storage site used temporarily during data transfers to compensate for differences in data flow rates. **3.** In digital-computer operations, a follower stage that is used to drive a number of gates without overloading the preceding stage.



buffer, 2.

buffer amplifier See BUFFER, **1.**

buffer capacitor A high-voltage fixed capacitor that is placed across a transformer secondary to suppress voltage spikes and sharp waveforms—especially when the input is a square wave.

buffer circuit **1.** In a data system that uses a keyboard, an electronic circuit that allows the operator to type ahead of the data output. **2.** See BUFFER, **1**, **2** and **3.**

buffered output An output (power, signal, etc.) that is delivered from the generating device through an isolating stage, such as a buffer amplifier. This arrangement protects the device from variations in the external load. Compare UNBUFFERED OUTPUT.

buffer storage **1.** A buffer that is used to interface between data systems with different rates of transmission. **2.** See BUFFER, **2.**

bug **1.** Slang for WIRETAP, **1. 2.** Slang for circuit fault, **1**. **3.** A semiautomatic key that some radiotelegraph operators use to send Morse code.

bug key See BUG, **3.**

building-block technique The process of assembling electronic equipment by quickly connecting together already completed stages (in the form of boxes or blocks) and supplying power and signals to the setup. Also called *modular technique* and *modular construction.*

building-out circuit A short section of transmission line shunting another line; it is used for impedance matching. Also called *building-out section.*

buildup **1.** The process whereby the voltage of a rotating generator starts at a point that is determined by the residual magnetism of the machine, and gradually increases to a voltage representing the point at which the resistance line crosses the magnetization curve. **2.** The (usually gradual) accumulation of a quantity (e.g., the buildup of charge in a capacitor).

bulb A globe-like container having any of a number of characteristic shapes from spherical to tubular and usually evacuated, for enclosing the elements of an electron device, such as a vacuum tube, gas tube, photocell, or lamp.

bulge **1.** A nonlinear attenuation-versus-frequency curve in a transmission line. **2.** A localized nonlinearity in a function.

bulk The body or mass of a semiconductor specimen, as opposed to junctions within the specimen. Current flows through a junction, but it can also flow, more or less, through the mass of semiconductor wafer into which the junction has been formed.

bulk effect An effect, such as current, resistance, or resistivity, observed in the overall body of a sample of material, as opposed to a region within the material or on its surface. Thus, a silicon diode can display junction resistance (i.e., resistance offered by a junction processed in a wafer of silicon), as well as bulk resistance (i.e., the effec-

tive resistance of all paths around the junction, through the mass of the wafer). Compare SURFACE EFFECT.

bulk-erased tape Recording tape whose signal content has been removed via a bulk eraser.

bulk-erase noise **1.** The residual magnetic impulses that remain on a magnetic tape after it has been bulk-erased. **2.** Noise generated by bulk-erased tape when the latter passes through deenergized record or erase heads in a tape machine.

bulk eraser A type of power-line-frequency degausser that erases an entire reel of magnetic tape without requiring that the tape be unreeled and passed continuously under an erase head. This saves considerable time, but often leaves some BULK-ERASE NOISE on the tape. Also called BULK DEGAUSSER.

bulletin board In personal computing or amateur packet communications, a system that allows subscribers to leave messages for each other for access via a *modem* or *terminal node controller.*

bulletin station A station intended for the transmission of bulletins of interest to certain parties, such as military personnel or amateur radio operators. An example is W1AW in Newington, Connecticut, an amateur radio station that transmits bulletins and code practice.

buncher In a Klystron, a cavity resonator that contains two grids mounted parallel to the electron stream. The electrostatic field of the grids alternately accelerates and retards the electrons, velocity-modulating the stream into bunches.

buncher grids In a Klystron, the closely spaced grids that velocity-modulate the electron beam into successive bunches.

buncher resonator In a velocity-modulated tube, such as a Klystron, the input cavity resonator.

buncher voltage The radio-frequency (RF) grid-to-grid voltage in the buncher resonator of a Klystron.

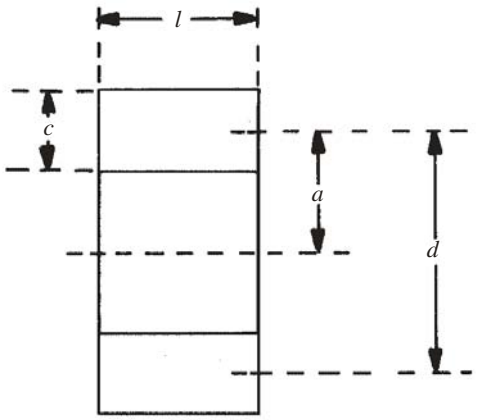
bunching The production of electron bunches in a velocity-modulated tube, such as a Klystron. Also see BUNCHER.

bunch stranding A technique for combining several thin wires into a single thick wire. Often used in guy wires and electrical conductors to improve tensile strength and flexibility. At radio frequencies, bunch stranding also improves electrical conductivity by increasing the ratio of surface area to cross-sectional area. This minimizes losses caused by *skin effect.*

Bunet's formula A formula for calculating the inductance of a multilayer air-core coil that has a diameter less than three times the length:

$$L = a^2N^2/(9a + 10l + 8.4c + 3.2cl/a)$$

where N is the number of turns, a is the average coil radius, c is the winding thickness, and l is the length of the coil.



Bunet's formula

Bunsen cell A cell consisting of a zinc rod in a sulfuric acid solution contained in a porous pot, which is in a nitric acid solution. The zinc rod serves as the negative pole; the positive pole is a piece of hard carbon. The cell produces about 1.9 volts and delivers relatively high current.

burden See VOLTAGE BURDEN.

burn **1.** A blemish on the screen of a cathode-ray tube (CRT), caused by destruction of the phosphor there. This results from prolonged focusing of an intense electron beam in one spot. **2.** A blemish on the screen of a television picture tube, usually resulting from ions that reach the screen when the ion trap is not working correctly.

burn-in A long, thorough, carefully controlled preliminary test of a component, device, or system, to stabilize its electrical characteristics after manufacture and to ensure that it will function according to rated specifications. An important test for equipment whose reliability must be guaranteed, such as an emergency communications transceiver.

burnout **1.** Failure of a conductor or component caused by overheating from excess current or voltage. **2.** The open-circuiting of a fuse. **3.** Electrical failure of any type.

burst **1.** The abrupt ionization of the gas in an ionization chamber by cosmic rays. **2.** An abrupt increase in the amplitude of a signal. Also, the type of signal that results from burst action. **3.** See COLOR BURST.

burst amplifier In a color-television receiver, the amplifier that separates the burst pulse from the video signals and amplifies the former. See COLOR BURST.

burst gate timing In a color-television receiver, the timing of the gating pulse with the input signal of the burst amplifier.

burst generator A signal generator delivering a burst output (see BURST, **2**) for testing various types of equipment. Its output is intermediate between sine waves and square waves, and is convenient for rapidly appraising the perfor-

mance of such devices as amplifiers, filters, electronic switches, transducers, and loudspeakers.

burst transmission A short transmission at high speed. This method of transmission saves time, but increases the necessary bandwidth of a signal by the same factor as the ratio of the high speed to the original speed.

bus **1.** A main conductor in a circuit. A bus can be high in the sense that its potential is above or below ground, or it can be low or at ground reference. **2.** In computer operations, a common group of paths over which input and output signals are routed.

bus driver A buffering device designed to increase the driving capability of a microprocessor, which itself might be capable of driving no more than a single load.

business machine Any piece of electronic or electromechanical equipment used mainly, or entirely, for business purposes. Examples are photocopiers, facsimile (fax) machines, printers, and computers.

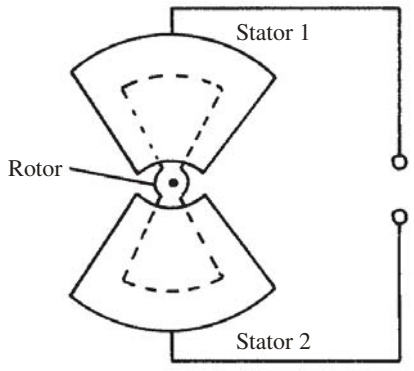
busing The parallel interconnection of circuits.

busy test A check conducted to find out whether or not a certain telephone subscriber line is in use.

busy tone Also called *busy signal.* An intermittent tone that indicates that the subscriber line being called is in use.

Butler oscillator An oscillator that consists of a two-stage amplifier with a quartz crystal in the positive-feedback path from output to input.

butterfly capacitor A plate-type variable capacitor that has two stator sections and a single rotor section common to the two stators. External connections are made to the stators only. Thus, no wiping contact is required to the rotor, and the troubles associated with such a contact are avoided. The butterfly capacitor is actually two variable capacitors in series. The unit is so called from the shape of its rotor.



butterfly capacitor

butterfly circuit A combination of a butterfly capacitor and a ring, of which the stator plates of the capacitor are an integral part. The resulting structure is a compact variable-frequency tuned circuit. The ring supplies the inductance, and the butterfly supplies the capacitance. It is also called *butterfly tank* and *butterfly resonator.*

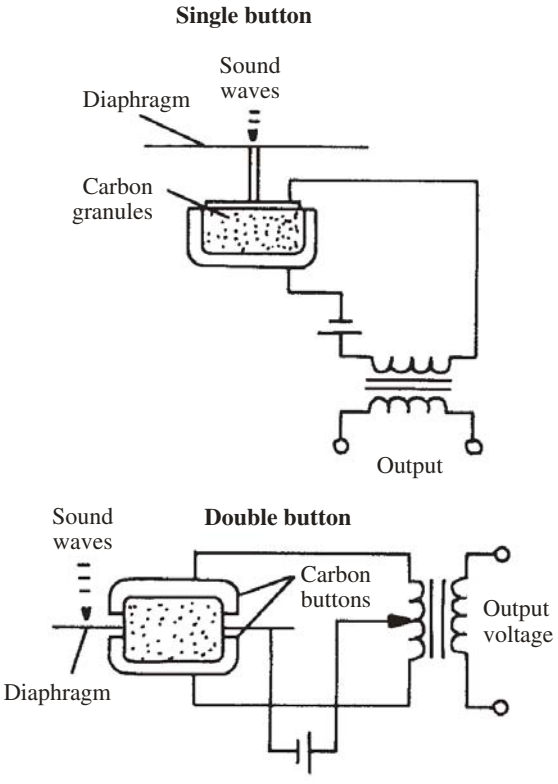
Butterworth filter A high-pass, low-pass, band-pass or band-rejection filter, characterized by a flat passband (absence of passband ripple) and high attenuation at frequencies far removed from the passband.

Butterworth function A mathematical function that is used in the design of a BUTTERWORTH FILTER.

button **1.** Usually, a small switch that is actuated by finger pressure. It is also called pushbutton and pushbutton switch. Sometimes, the term is applied only to the insulated knob or pin which is pushed to operate the switch. **2.** A tiny lump of impurity material, placed on the surface of a semiconductor wafer for alloying with the wafer to form a junction. See ALLOY JUNCTION. **3.** The carbon element(s) in a BUTTON MICROPHONE.

button capacitor A button-shaped ceramic or silvered-mica fixed capacitor. Because of its disk shape and mode of terminal connection, it offers very low internal inductance.

button microphone A microphone in which a button-shaped carbon element is attached to a diaphragm, which is set into vibration by sound waves. This motion causes the button resistance to vary, modulating a direct current that passes

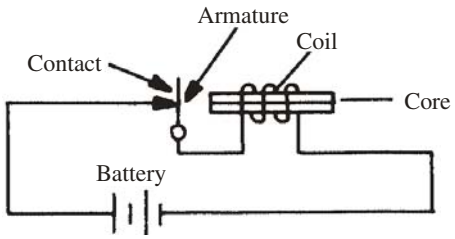


button microphone

through the button. A single-button microphone has only one button, whereas a double-button microphone has two—one mounted on each side of the center of the diaphragm.

buzz **1.** A low-pitched rough sound with high-frequency components, usually the result of electrical interference from nonsinusoidal voltages generated by neighboring equipment or devices. **2.** The waveform associated with such a sound. **3.** Fastening two conducting surfaces by a KELLIE BOND.

buzzer A nonringing device used principally to generate sound other than that achievable with sine waves. In an electromechanical vibrating-reed buzzer, the reed acts as an armature, which is mounted close to the core of an electromagnet. At quiescence, the reed rests against a stationary contact. When voltage is applied to the electromagnet, the reed is attracted to the core, moving away from the contact; but this breaks the circuit, the magnetism ceases, and the reed springs back to the contact. The action is repeated continuously at a frequency that depends on the reed dimensions and its distance from the core.



buzzer

BV Abbreviation of BREAKDOWN VOLTAGE.

B voltage The dc voltage required by certain electrodes of vacuum tubes and transistors. It especially pertains to voltages required by the plate and screen of a vacuum tube, as opposed to the filament voltage and control-grid voltage.

bw **1.** Abbreviation of *bandwidth.* 2. Abbreviation of *black-and-white.*

BWA Abbreviation of *backward-wave amplifier.*

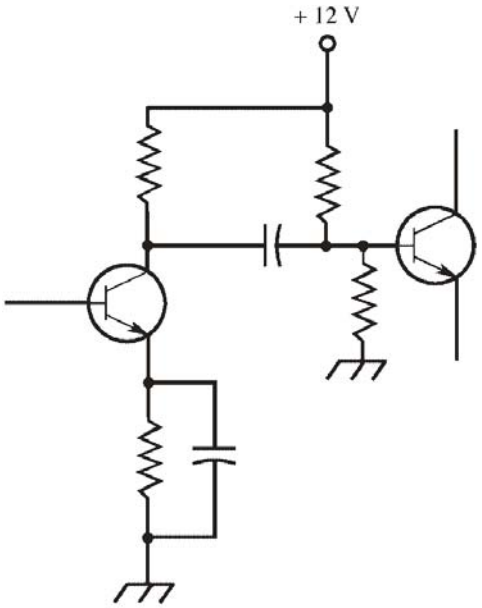
BWG Abbreviation of BIRMINGHAM WIRE GAUGE.

BWO Abbreviation of BACKWARD-WAVE OSCILLATOR.

BX Symbol and abbreviation for armored and insulated flexible electrical cable.

bypass A route (either intended or accidental) through which current easily flows around a component or circuit instead of through it.

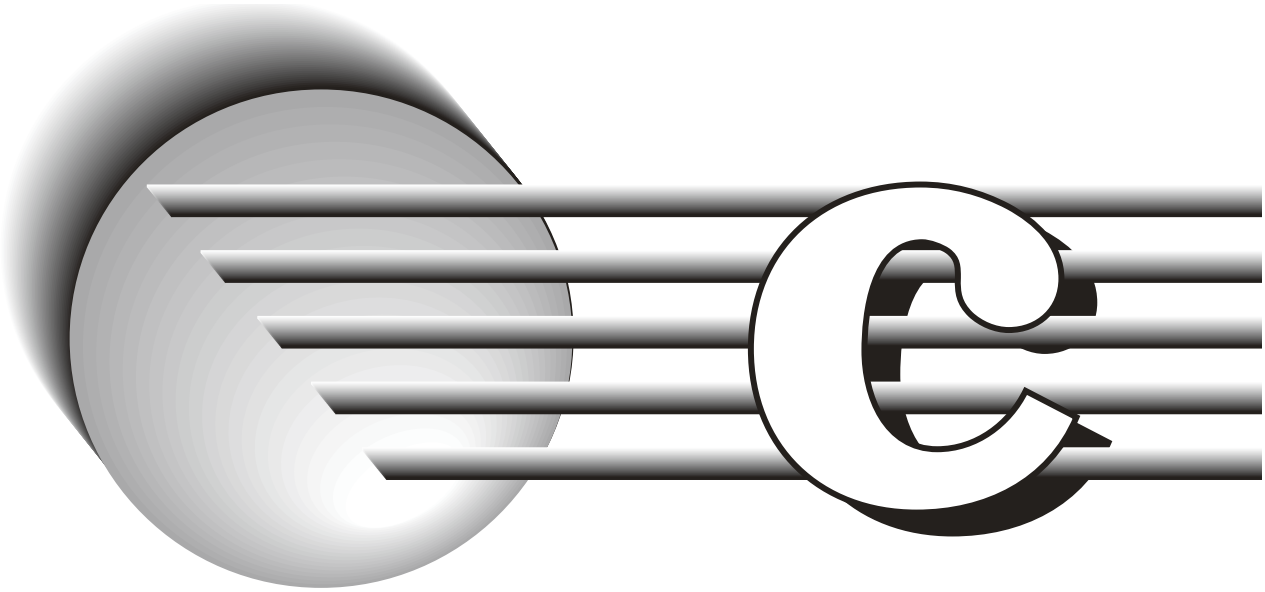
bypass capacitor A capacitor that is used to conduct an alternating current around a component or group of components. Often the ac is removed from an ac/dc signal, the dc being free to pass through the bypassed component.



bypass capacitor

B-Y signal In a color television receiver, the color-difference signal which, when combined with a luminance (Y) signal, forms a blue primary signal for the three-gun picture tube.

byte In digital-computer and data-communications operations, a unit of data consisting of eight contiguous bits. In packet communications, the term *octet* is often used.



C **1.** Abbreviation of CAPACITANCE. **2.** Symbol for COLLECTOR of a transistor. **3.** Symbol for CARBON. **4.** Abbreviation of CELSIUS. **5.** Symbol for COULOMB. **6.** Abbreviation of CALORIE.

c **1.** Abbreviation of CENTI. **2.** Abbreviation of CENTS. **3.** Symbol for CAPACITANCE. **4.** Symbol for SPEED OF LIGHT in a vacuum.

Ca Symbol for CALCIUM.

cabinet An enclosure for a piece of apparatus. It might or might not incorporate electromagnetic shielding.

cable **1.** A usually flexible (but sometimes rigid) medium, via which electrical power or signals are transferred. Although the term is occasionally applied to a single conductor, especially when it is a braid or weave of a number of wires, cable usually means a bundle of separate, insulated wires or strands of fiberoptic material. **2.** CABLEGRAM.

cable address A code word that specifies the recipient of a CABLEGRAM.

cable assembly A special-purpose cable with connectors.

cable attenuation Reduction of signal intensity along a cable, usually expressed in decibels per foot, hundred feet, mile, etc.

cable capacitance Capacitance between conductors in a cable or between conductors and the outer sheath of a cable. **2.** Sometimes, capacitance between a cable and earth.

cable clamp A support device for cable runs in equipment and systems.

cable communications Telegraphy or telegraphy via a (usually undersea) cable.

cable connector A connector, such as a coaxial fitting, that joins cable circuits or connects a cable to a device.

cabled wiring Insulated leads connecting circuit points; they are tied together with lacing cord or with spaced fasteners.

cablegram A (usually printed) message transmitted or received via undersea cable. Compare RADIOGRAM and TELEGRAM.

cable loss See CABLE ATTENUATION.

cable run The path taken by a cable.

cable splice **1.** An electrical attachment between two sections of cable that has identical or similar construction, with or without the use of connectors. **2.** To electrically attach two sections of cable that have identical or similar construction, with or without the use of connectors.

cable tie A short piece of wire or plastic that holds wires or cables in a bundle.

cable TV See COMMUNITY-ANTENNA TELEVISION.

cache memory A short-term, high-speed, high-capacity computer memory. Similar to a scratchpad or read-write memory.

CAD Acronym for *computer-aided design.*

CAD/CAM Acronym for *computer-aided design and manufacturing.*

cadmium Symbol, Cd. A metallic element. Atomic number, 48. Atomic weight, 112.41. Many electronic structures are cadmium plated for protection.

cadmium borate phosphor Formula, (CdO + B_2O_3): Mn. A substance used as a phosphor coating on the screen of cathode-ray tubes. The characteristic fluorescence is green-orange.

cadmium cell Also called *Weston standard cell.* An electrochemical standard cell used as a reference voltage source. Produces 1.0186 volt at 20°C.

cadmium plating The process of coating a conductor or component with cadmium to increase its resistance to corrosion.

cadmium selenide photocell A photoconductive cell in which cadmium selenide is the light-sensitive material.

cadmium silicate phosphor Formula, (CdO + SiO_2). A substance used as a phosphor coating on the screen of cathode-ray tubes; the characteristic fluorescence is orange-yellow.

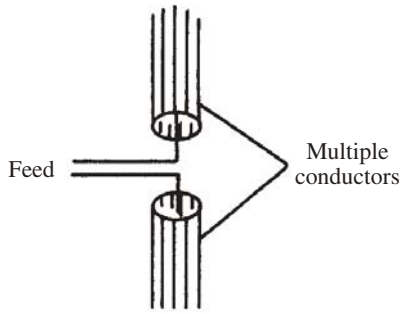
cadmium standard cell See STANDARD CELL.

cadmium sulfide photocell A photoconductive cell in which cadmium sulfide is the light-sensitive material.

cadmium tungstate phosphor Formula, CdO + WO_3. A substance used as a phosphor coating on the screen of cathode-ray tubes; the characteristic fluorescence is light blue.

cage A completely shielded enclosure, such as a screen room, which is covered with a grounded fine-mesh conductive screen on all sides.

cage antenna An antenna, usually center-fed and balanced, that consists of multiple parallel conductors arranged in a cylindrical cage configuration. The cage results in a much broader bandwidth than is the case with an antenna made up of a single conductor. Cage antennas are typically used at frequencies between about 10 and 200 MHz.



cage antenna

CAI Abbreviation for *computer-assisted instruction.*

CAL An acronym for *conversional algebraic language*, a general-purpose problem-oriented computer programming language used in time-sharing systems.

calcium Symbol, Ca. A metallic element of the alkaline-earth group. Atomic number, 20. Atomic weight, 40.08.

calcium phosphate phosphor Formula, $Ca_3(PO_4)_2$. A substance used as a phosphor coating on the screen of long-persistence cathode-ray tubes; the characteristic fluorescence is white, as is the phosphorescence.

calcium silicate phosphor Formula, (CaO + SiO_2): Mn. A substance used as a phosphor coating on the screen of cathode-ray tubes; the characteristic fluorescence ranges from green to orange.

calcium tungstate phosphor Formula, $CaWO_4$. A substance used as a phosphor coating on the screen of short-persistence cathode-ray tubes; the characteristic fluorescence is blue, as is the phosphorescence.

calculate To perform the steps of an intricate mathematical operation. Compare COMPUTE.

calculating punch A data-processing peripheral that reads punched cards, makes calculations, and punches new data into those cards or new cards.

calculator A machine that performs mathematical operations, especially arithmetic. Typically, the device is a small box with buttons and a miniature numeric display. Used only in mathematical applications. In contrast, a COMPUTER can be used for a much wider variety of jobs, such as word processing, graphics, and data-base. Many personal computers have calculator programs; the "buttons" are actuated by pointing and clicking with a mouse.

calculus **1.** The symbology and rules comprising a system of logic, such as BOOLEAN ALGEBRA. **2.** A branch of mathematical analysis concerned with rates of change and accumulation. See DIFFERENTIAL CALCULUS and INTEGRAL CALCULUS.

calendar age The age of a piece of equipment, measured since the date of manufacture. Specified in years, months, and days. The actual manufacture date might alternatively be given.

calendar time The time available in a working period [i.e., a 40-hour work week represents a calendar time of 120 hours (five days times 24 hours per day)].

calibrate To compare and bring into agreement with a standard.

calibrated measurement **1.** A measurement made with an instrument that has been calibrated with a standard reference source. **2.** A measurement that is corrected for instrument error.

calibrated meter An analog or digital meter that has been adjusted to agree as closely as possible with a reference source.

calibrated scale **1.** A scale whose graduations have been carefully checked for accuracy (i.e., they correspond to the true values of the quantity that they represent). The scale is graduated to read directly in units of the quantity, such as milliamperes, kilohertz, volts, etc. **2.** A scale with fixed, plain numeric graduations (e.g., 0 to 100) that do not directly indicate the magnitude of a quantity, but that can be converted to various quantities via graphs, nomographs, tables, or charts. See CALIBRATION CURVE.

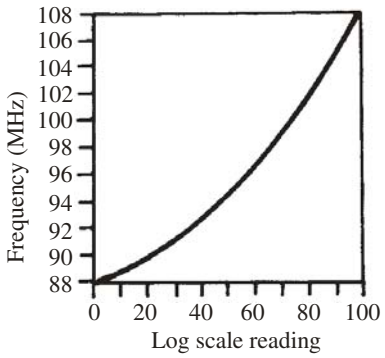
calibrated sweep In an oscilloscope, a sweep circuit calibrated to indicate sweep frequency or time at all control settings.

calibrated triggered sweep In an oscilloscope, a triggered sweep circuit calibrated in terms of sweep time or frequency.

calibration **1.** Determining the accuracy with which an instrument indicates a quantity. **2.** Determining the degree to which the response of a circuit or device corresponds to desired performance. **3.** Marking a scale to show actual values of a quantity in the form of a direct readout. For example, the scale of an analog meter might be calibrated in milliamperes (mA) from 0 to 50 in increments of 1 mA.

calibration accuracy **1.** A quantitative expression of the agreement between the value of a quantity, as indicated by an instrument, and the true value. Usually expressed as the maximum percentage of the true value by which the indicated value can be expected to deviate in either direction (e.g., ±0.5 percent). **2.** The precision of a direct-reading meter in terms of its full-scale deflection (e.g., ±2.0 percent of full scale).

calibration curve A graph showing the relation between the actual values of a quantity and the setting or indication of an instrument or component. Usually plotted in rectangular coordinates.



calibration curve

calibration marker A pip or blip, superimposed on a pattern displayed on a cathode-ray-tube (CRT) screen, to identify a point closely as to frequency, voltage, distance, or some similar term.

calibrator A device used to perform a calibration (e.g., a signal generator).

calibrator crystal A highly accurate and stable quartz crystal, used in an oscillator as a frequency standard. An example is the 100-kHz crystal oscillator and harmonic generator used in some communications receivers.

californium Symbol, Cf. A radioactive element produced artificially. Atomic number, 98. Atomic weight, 251.

call **1.** In communications, a transmission by a station for the purpose of either alerting a particular receiving station for which there is a message, or alerting all receiving stations to prepare them for a general broadcast message. **2.** In a computer program, a branch to a closed subroutine; also, to branch to such a subroutine.

call direction code Abbreviation, CDC. In telegraph networks, a special code that, when transmitted to a terminal, causes the teleprinter to be automatically switched on.

calling sequence **1.** Computer program instructions needed to establish the conditions for a call (see CALL, **2**). **2.** Subroutine instructions providing a link to the main program.

call instruction A computer program instruction that makes a program controller branch to a subroutine; it also locates and identifies the parameters needed for the subroutine's execution. Also known as *subroutine call.*

call letters Letters and/or numbers assigned to, and used to identify, licensed radio stations.

calorie Abbreviation, cal or C. The amount of heat energy, at a pressure of 1 atmosphere, that will raise the temperature of 1 gram of water by 1 degree Celsius.

calorimeter An instrument for measuring heat energy. By adaptation, a calorimeter can be used to measure radio-frequency (RF) power—especially at microwave frequencies (see CALORIMETRIC POWER METER).

calorimeter system See CALORIMETRIC POWER METER.

calorimetric power meter A specialized form of wattmeter, in which the power to be measured is dissipated in an oil or water bath that has a known and fixed mass. The wattage is determined indirectly, by measuring the extent to which the temperature of the liquid increases in a certain amount of time.

CAM **1.** Abbreviation of *computer-aided manufacturing.* **2.** Abbreviation of *content-addressed memory.*

cambric Finely woven cotton or linen used for insulation. One type of spaghetti (conductor insulation), for example, is varnished cambric tubing.

camera cable A multiwire cable that conducts the video signal from a television camera to control equipment.

camera chain In television, the camera and the equipment immediately associated with it, excluding the transmitter and its peripherals.

camera signal The output signal delivered by a television camera.

camera tube Any video pickup tube, such as an iconoscope or orthicon, that converts light reflected by a scene into a corresponding television signal.

Campbell bridge A circuit that is used for comparing mutual inductance with capacitance.

camp-on In a telephone system, a method of engaging a line that is busy until it becomes available for use.

CAN Abbreviation of CANCEL CHARACTER.

can **1.** A metal enclosure or container roughly resembling a tin can (though not necessarily cylindrical), used for shielding or potting components. **2.** Colloquial expression for HEADPHONE.

Canada balsam A transparent cement derived from the turpentine distilled from balsam fir resin. It is useful in optical technology and in certain areas of electro-optics.

Canadian Standards Association The Canadian equivalent of the *National Bureau of Standards* in the United States. An agency that publishes agreed-on standards for industries.

cancel character **1.** IGNORE CHARACTER. **2.** A control character indicating that the associated data is erroneous.

cancellation The elimination of one quantity by another, as when a voltage is reduced to zero by another voltage of equal magnitude and opposite sign.

candela Symbol, cd. The SI unit of luminous intensity; 1 cd represents 1⁄60 of the radiating power of one square centimeter of a perfect radiator at the temperature of freezing platinum.

candle Abbreviation, c. Also called *international candle*. A unit of light intensity that is the value of emission by the flame of a sperm-whale-oil candle burning at the rate of 7.776 grams per hour.

candle power Abbreviation, cp. Luminous intensity in international candles: the luminous intensity resulting from the burning of a sperm-whale-oil candle at 7.776 grams per hour.

candoluminescence White light produced without extreme heat.

cannibalization The deliberate use of parts from operational equipment to temporarily repair or maintain other equipment. It is a last-resort, emergency measure.

cap **1.** Abbreviation of CAPACITANCE. **2.** Abbreviation of CAPACITOR.

capacimeter See CAPACITANCE METER.

capacitance Symbol, C. Unit, farad. The property exhibited by two conductors separated by a dielectric, whereby an electric charge becomes stored between the conductors. Capacitance is thought of as analogous to mechanical elasticity. Also see FARAD.

capacitance bridge A four-arm ac bridge for gauging capacitance against a standard capacitor. In its simplest form, it has a standard capacitor in one arm and resistors in the other three.

capacitance coupling The transfer of ac energy between two circuits or devices by a capacitor or capacitance effect. Also see COUPLING.

capacitance diode See VARACTOR.

capacitance divider An alternating-current voltage divider that uses capacitors, rather than resistors. It is used in certain oscillators, such as the Colpitts type.

capacitance filter A filter consisting of only a high-capacitance capacitor. Because the capacitor cannot discharge instantaneously, it tends to maintain its voltage and smooth out the ripples in the voltage applied to it.

capacitance-inductance bridge A combination ac bridge that can be used for either capacitance or inductance measurement. Both capacitance and inductance can be measured in terms of a standard capacitance; however, some of these bridges use standard inductors in the inductance-measuring mode.

capacitance meter A direct-reading meter for measuring capacitance. In most available types, a stable ac voltage is applied to the meter circuit, to which an unknown capacitor is connected in series; meter deflection is roughly proportional to the reactance of the capacitor. Also called MICROFARAD METER.

capacitance ratio In a variable capacitor, the ratio of maximum to minimum capacitance.

capacitance relay A relay circuit that operates from a small change in its own capacitance. It consists of an RF oscillator whose tank capacitance is very low. When a finger is brought near the circuit's short pickup antenna, the attendant increase in capacitance detunes the oscillator, activating the relay. Also called PROXIMITY RELAY and PROXIMITY SWITCH.

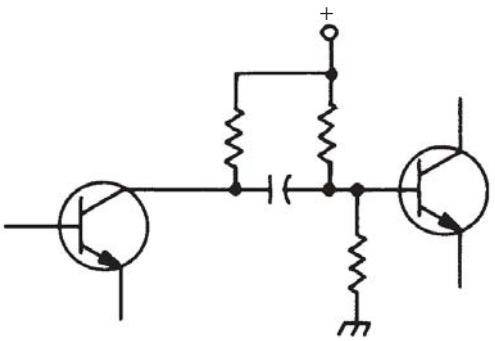
capacitance-resistance bridge A combination ac bridge that can be used for either capacitance or resistance measurement. The unknown resistance is measured against a standard resistor; the unknown capacitance against a standard capacitor.

capacitance sensor See CAPACITANCE TRANSDUCER.

capacitive amplifier See DIELECTRIC AMPLIFIER.

capacitive attenuator An ac attenuator whose elements are capacitors in any desired combination of fixed and/or variable units. The desired attenuation is afforded by the capacitance ratio.

capacitive coupling A means of coupling between circuits that uses a series capacitor for direct-current blocking. The signal passes through the capacitor, but the blocking effect allows different bias voltages to be applied to the two stages.



capacitive coupling

capacitive diaphragm A metal plate deliberately placed in a waveguide to introduce capacitive reactance and, thereby, cancel an inductive reactance.

capacitive-discharge ignition An electronic ignition system for automotive engines. Provides nearly constant high voltage, regardless of engine speed. A dc-to-dc step-up converter charges a large capacitor (typically to 300 volts) when the distributor breaker points are closed; when they are open, the capacitor discharges through the ignition coil, thereby generating an ignition pulse of several thousand volts.

capacitive division Reduction of an ac voltage by a capacitive voltage divider.

capacitive feedback Feeding energy back from the output to the input of an amplifier or oscillator through a capacitor.

capacitive-input filter A smoothing filter for ac power supplies, in which the element closest to the rectifier is a capacitor, regardless of the components or circuits placed subsequently.

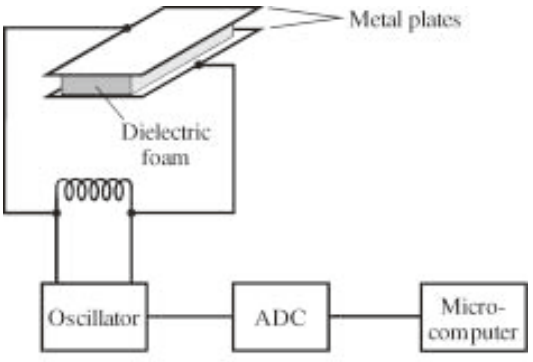
capacitive load A load consisting of a capacitor or a predominantly capacitive circuit.

capacitive loading In an antenna, the addition of capacitance in series with the element(s). This raises the resonant frequency for a radiator having a given physical length. It can also serve to increase the physical length required for a radiator having a specified resonant frequency. Compare INDUCTIVE LOADING.

capacitive post A protrusion inside a waveguide for the purpose of introducing capacitive reactance to cancel an inductive reactance.

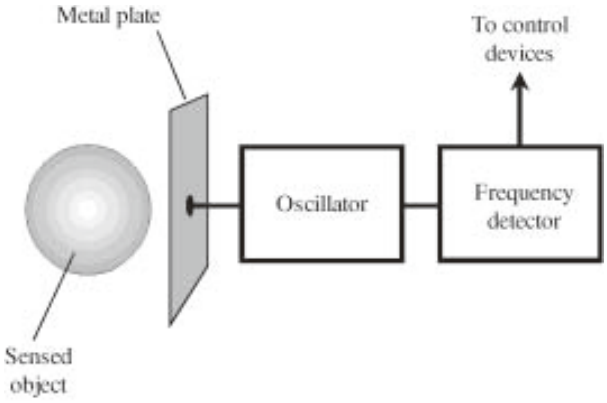
capacitive potentiometer See CAPACITIVE VOLTAGE DIVIDER.

capacitive pressure sensor A pressure sensor that uses a radio-frequency oscillator and a pair of metal plates separated by dielectric foam. The circuit is designed so a change in the capacitance between the plates causes the oscillator frequency to change. This change is sensed. A signal is sent to an analog-to-digital converter (ADC) and then to a microcomputer that calculates the extent of the pressure.



capacitive pressure sensor

capacitive proximity sensor A transducer used in mobile robots that detects the presence of certain kinds of objects. It consists of an oscillator whose frequency is determined by an inductance-capacitance (LC) circuit to which a metal plate is connected. When a conducting or partially conducting object comes near the plate, the mutual capacitance changes the oscillator frequency. This change is detected and sent to the robot controller.



capacitive proximity sensor

capacitive reactance Symbol, X_C. Unit, ohm. The reactance exhibited by an ideal capacitor, considered as a negative pure-imaginary quantity; $X_C = -j/(6.28fC)$, where f is the frequency in hertz, C is the capacitance in farads, and j is the unit imaginary number (the square root of –1). Alternatively, f can be specified in megahertz and C in microfarads. In a pure capacitive reactance, current leads voltage by 90 degrees. Also see CAPACITANCE, CAPACITOR, and REACTANCE.

capacitive speaker See ELECTROSTATIC SPEAKER.

capacitive transducer A transducer consisting essentially of a refined variable capacitor whose value is varied by a quantity under test, such as pressure, temperature, liquid level, etc.

capacitive tuning Variable-capacitor tuning of a circuit.

capacitive voltage divider A capacitive attenuator usually consisting of two series-connected capacitors whose values are such that an applied ac voltage is divided across them in the desired ratio.

capacitive welding An electronic welding system in which energy stored in a capacitor is discharged through the joint to be welded. This develops the heat necessary for the operation.

capacitive window A pair of capacitive diaphragms used in a waveguide to introduce capacitive reactance.

capacitor A passive electronic-circuit component consisting of, in basic form, two metal electrodes or plates separated by a dielectric (insulator).

capacitor amplifier See DIELECTRIC AMPLIFIER.

capacitor antenna See CONDENSER ANTENNA.

capacitor bank A network of capacitors connected in combination, yielding a desired characteristic.

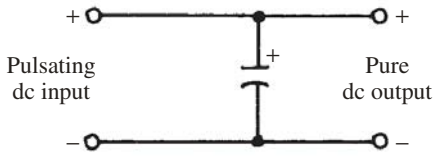
capacitor braking The connection of a capacitor to the winding of a motor after the removal of power, to speed up the process of braking.

capacitor color code See COLOR CODE.

capacitor decade See DECADE CAPACITOR.

capacitor-discharge ignition CAPACITIVE-DISCHARGE IGNITION.

capacitor filter In a direct-current power supply, a filter consisting simply of a capacitor connected in parallel with the rectifier output.



capacitor filter

capacitor-input filter A filter whose input component is a capacitor. The capacitor-input power-supply filter is distinguished by its relatively high dc output voltage, but somewhat poorer voltage regulation, compared with the CHOKE-INPUT FILTER.

capacitor leakage Direct current flowing through the dielectric of a capacitor. In a good nonelectrolytic capacitor, this current is normally less than 1 microampere. In an electrolytic capacitor, it can be up to several milliamperes, depending on the capacitance and the applied voltage.

capacitor loudspeaker See ELECTROSTATIC SPEAKER.

capacitor microphone See CONDENSER MICROPHONE.

capacitor motor An ac motor that uses a capacitor in series with an auxiliary field winding for starting purposes. Initially out-of-phase current in the auxiliary field (starting winding) causes a rotating field that turns the rotor. When the rotor reaches a safe speed, a centrifugal switch disconnects the capacitor and auxiliary field, and the motor continues running as an induction motor.

capacitor series resistance The ohmic loss in a capacitor. It results partly from conductor losses, and partly from losses in the dielectric material.

capacitor substitution box An enclosed assortment of selected-value capacitors arranged to be switched one at a time to a pair of terminals. In troubleshooting and circuit development, any of several useful fixed capacitance values can be thus obtained.

capacitor voltage **1.** The voltage at the terminals of a capacitor. **2.** The maximum voltage rating of a capacitor.

capacitor voltmeter See ELECTROSTATIC VOLTMETER.

capacity **1.** A measure of a cell's or battery's ability to supply current during a given period. **2.** CAPACITANCE. **3.** The number of bits or bytes a computer storage device can hold. **4.** The limits of numbers that a register can process.

capacity lag In an automatic control system, a delay caused by the storing of energy by the components. For example, in a heating system, capacity lag results from the time taken to heat the air or fluid after the thermostat turns on the heat.

capillary electrometer A sensitive voltage indicator, consisting of a column of mercury in a transparent capillary tube, in which is suspended a small drop of acid. When a voltage is applied to both ends of the mercury column, the acid drop moves toward the low-potential end of the column over a distance proportional to the voltage.

capstan The driven spindle or shaft of a magnetic tape recorder or transport.

capture area The effective ability of a radio antenna to pick up electromagnetic signals. The larger the capture area, the greater the antenna gain.

capture effect **1.** In frequency-modulation (FM) radio receivers, the effect of domination by the stronger of two signals, or by the strongest of several signals, on the same frequency. **2.** In an automatic-frequency-control system, the tendency of the receiver to move toward the strongest of several signals near a given frequency. **3.** In general, the tendency of one effect to totally predominate over other effects of lesser amplitude.

capture ratio A measure of frequency-modulation (FM) tuner selectivity: The amplitude difference, in decibels, between unwanted signals and the one being tuned in.

carbon Symbol, C. A nonmetallic element. Atomic number, 6. Atomic weight, 12.011. Carbon, besides being an invaluable material in electronics, is an important constituent of organic compounds.

carbon arc The arc between two electrified pencils of carbon or, as in an arc converter, between a carbon pencil and a metal electrode.

carbon brush A contact made of carbon or some mixture of carbon and another material, used in motors, generators, variable auto-transformers, rheostats, and potentiometers.

carbon-button amplifier An audio-frequency amplifier having as the active component an earphone whose diaphragm is attached to a carbon microphone button. The input signal applied to the earphone makes its diaphragm vibrate. The vibrating button modulates a local

direct current. Amplification results from the large ratio of modulated local current to input-signal current.

carbon-composition resistor A non-inductive resistor made from a mixture of finely powdered carbon with a non-conductive substance, usually phenolic. The resulting clay-like material is pressed into a cylindrical shape, and wire leads are inserted in the ends. The resistance depends on the ratio of carbon to the non-conducting material, and on the physical distance between the wire leads. This type of resistor is useful from direct current to ultra-high radio frequencies. Compare FILM RESISTOR, WIREWOUND RESISTOR.

carbon/disk rheostat A rheostat consisting of a stack of carbon disks or washers, arranged so that a controllable pressure can be exerted on the stack. As a knob is turned, a screw increases or decreases the pressure, varying the total resistance of the stack.

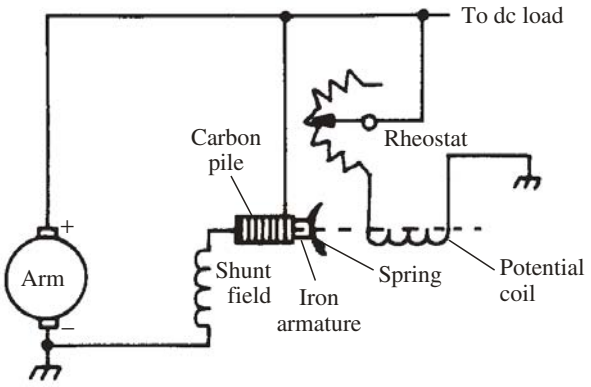
carbon-film resistor A stable resistor whose resistance element is a film of carbon, vacuum-deposited on a substrate, such as a ceramic.

carbonization The application of a coat of carbon onto an electrode, either by electroplating or by any other means.

carbon microphone A microphone that includes one or two carbon buttons. See BUTTON MICROPHONE.

carbon-paper recorder A recorder in which a signal-actuated stylus writes, by impression only, through a sheet of carbon paper onto a plain sheet underneath. This eliminates the need for an ink-carrying stylus.

carbon-pile regulator A voltage regulator in which a stack of carbon disks or washers is in series with the shunt field. The pile resistance and field current depend on pressure applied to the pile by a wafer spring acting through a movable iron armature. Voltage drops increase the pressure and voltage rises decrease the pressure, thus regulating the generator with which it is associated.



carbon-pile regulator

carbon-pile rheostat See CARBON-DISK RHEOSTAT.

carbon recording **1.** A record made with a CARBON-PAPER RECORDER. **2.** The use of a carbon-paper recorder in data acquisition, facsimile, communications, and similar applications.

carbon resistor A resistor made from carbon, graphite, or some composition that contains carbon.

carbon/silicon-carbide thermocouple A thermocouple that is a junction between carbon and silicon carbide.

carbon transfer recording A method of facsimile reception in which the image is reproduced by carbon particles sprayed on the paper, a process controlled by the received signal.

carbon-zinc cell See ZINC-CARBON CELL.

Carborundum Formula, SiC. Trade name for a synthetic silicon carbide used as a semiconductor, refractory, or abrasive. Also see SILICON CARBIDE.

Carborundum crystal Trade name for a characteristically superhard crystal of silicon carbide.

Carborundum varistor A voltage-dependent resistor made from Carborundum.

carcinotron A special kind of oscillator tube used at ultra-high and microwave frequencies.

card **1.** A usually thin, rectangular board containing a PRINTED CIRCUIT, often equipped with an edge connector that makes it easy to install, remove, or replace. Common in electronic and computer equipment having modular construction. **2.** The usually flat, thin insulating strip on which a resistor element is wound.

cardiac monitor An electronic device that displays or records electrical impulses from the heart for medical observation or diagnosis.

cardiac pacemaker An electrical cardiac stimulator that causes the heart to beat at certain intervals. Used when the patient has heart disease that prevents the heart from regulating itself.

cardiac stimulator An electronic device (sometimes implanted in the subject) that supplies electric pulses to stimulate heart action. Also called DEFIBRILLATOR and PACEMAKER.

card image In memory storage, the data contained on a single card.

cardiogram ELECTROCARDIOGRAM.

cardiograph ELECTROCARDIOGRAPH.

cardioid diagram A polar response curve in the shape of a cardioid pattern.

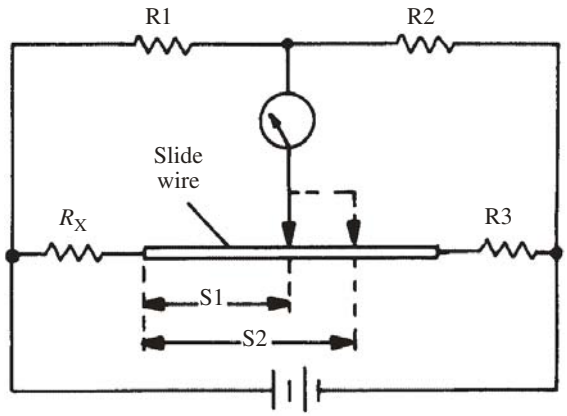
cardioid microphone A microphone with a (roughly) heart-shaped sound-field pickup pattern.

cardioid pattern A radiation/response pattern with one sharp null in the direction opposite the single main lobe. The lobe is extremely broad. In two dimensions, the curve is shaped somewhat like a “Valentine” heart.

cardiotachometer A device that indicates the pulse rate.

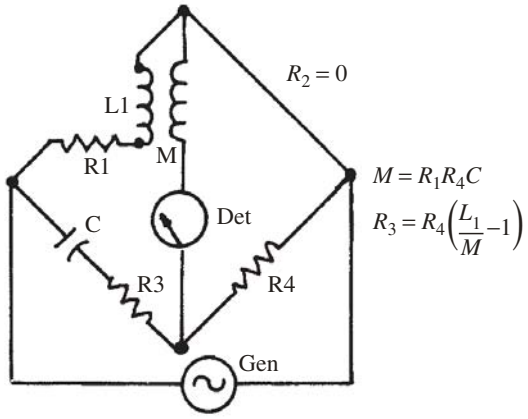
cardistimulator See CARDIAC STIMULATOR.

Carey-Foster bridge A special version of the slide-wire bridge that is useful for measuring an unknown resistance, whose value is close to that of a standard resistance.



Carey-Foster bridge

Carey-Foster mutual inductance bridge An ac bridge that permits the measurement of mutual inductance in terms of a standard capacitor.



Carey-Foster mutual inductance bridge

carnauba wax A wax obtained from the Brazilian wax palm. Used as an electrical insulator, and as the dielectric in some electrets.

Carnot theorem In thermodynamics, the proposition that in a reversible cycle, all available energy is converted into mechanical work. Also called *Carnot's principle.*

carrier **1.** See CARRIER WAVE. **2.** See CHARGE CARRIER.

carrier amplifier See DIELECTRIC AMPLIFIER.

carrier beating **1.** The mixing of two radio-frequency carriers that are separated by a small amount of frequency, resulting in an audible tone in a receiver. **2.** A heterodyne in a facsimile or television signal, resulting in a pattern of cross hatches in the received image.

carrier choke A radio-frequency (RF) choke, inserted in a line to block a carrier component.

carrier chrominance signal For conveying color television information, sidebands of a modulated chrominance subcarrier.

carrier color signal For conveying color information in color television transmission, the sidebands of a modulated chrominance subcarrier (plus the unsuppressed chrominance subcarrier) added to the monochrome signal.

carrier concentration In a semiconductor material, the number of charge carriers per unit volume.

carrier control **1.** The modification, adjustment, or switching of a carrier wave. **2.** Adjustment of a circuit or device by means of a carrier wave.

carrier current The current component of a carrier wave, or the amplitude of that current. Compare CARRIER POWER and CARRIER VOLTAGE.

carrier-current communication See WIRED WIRELESS.

carrier-current control **1.** Control of the current component in a carrier wave. **2.** Remote control by means of wired wireless.

carrier-current receiver See WIRED-RADIO RECEIVER.

carrier-current relay A radio-frequency (RF) relay circuit, operated over a wire line by means of a transmitter.

carrier-current transmitter See WIRED-RADIO TRANSMITTER.

carrier deviation See CARRIER SWING.

carrier dispersion In a semiconductor, the spreading out of electrons and holes that leave the emitter simultaneously, but arrive at the collector at various times after following different paths.

carrier frequency The center frequency of a CARRIER WAVE.

carrier-frequency pulse A pulse that contains radio-frequency oscillation.

carrier-frequency range The band of carrier frequencies over which a transmitter or signal generator can operate.

carrier injection The apparent emission (injection) of electrons or holes into a semiconductor when a voltage is applied to the junction.

carrier leak **1.** A point at which carrier-wave energy escapes a circuit or enclosure. **2.** The residual carrier voltage present in the output of a carrier-suppressing circuit.

carrier level The amplitude of an unmodulated carrier wave.

carrier lifetime In a semiconductor, the interval before an injected current carrier (see CARRIER INJECTION) recombines with an opposite carrier and ceases to be mobile.

carrier line In carrier-current systems (see WIRED WIRELESS), the line or cable conducting the carrier-wave energy.