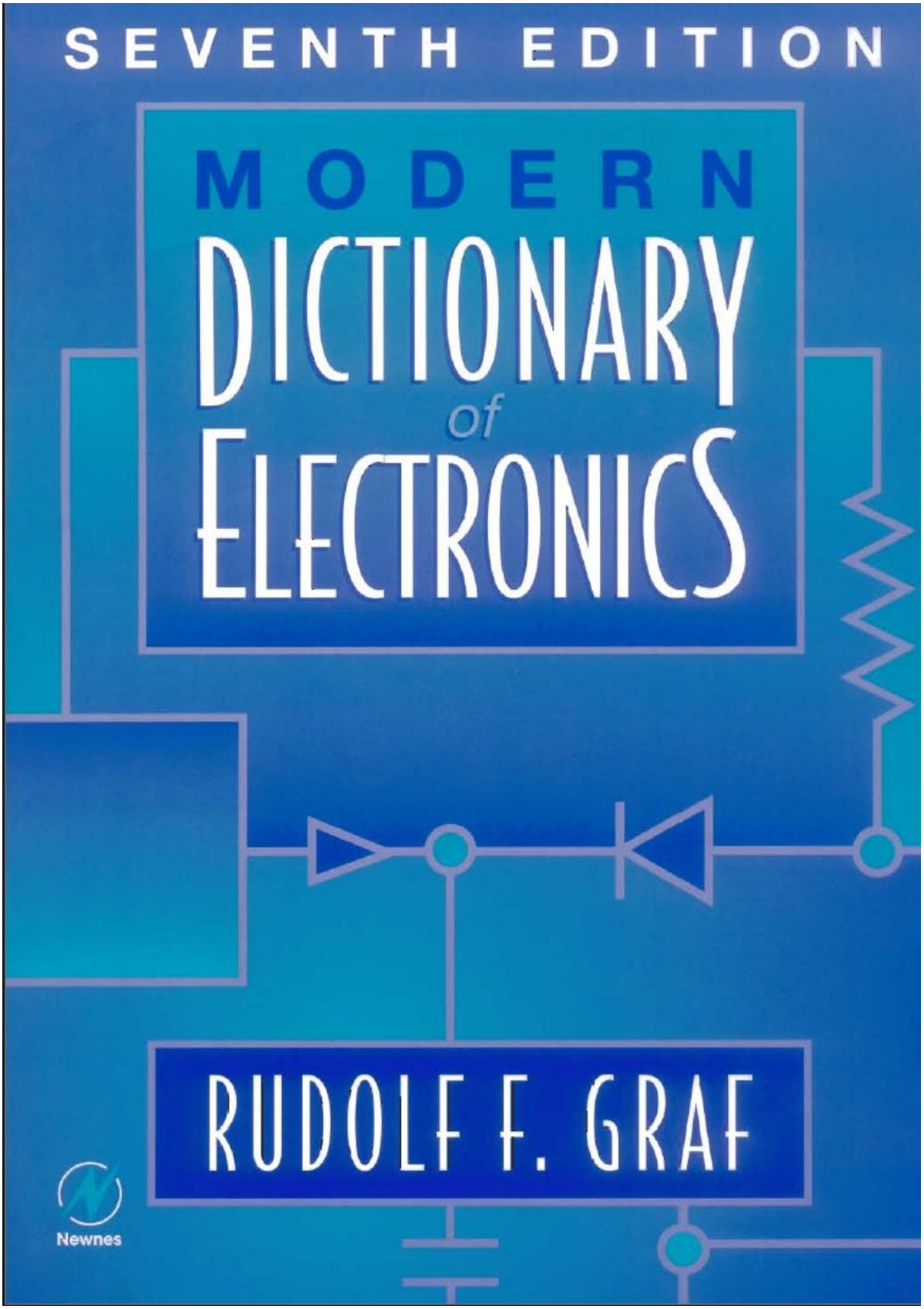

SEVENTH EDITION
MODERN
DICTIONARY
of
ELECTRONICS
RUDOLF F. GRAF
Newnes

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of

ELECTRONICS

SEVENTH EDITION

REVISED AND UPDATED

Rudolf F. Graf



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strip to some specific circuit point to which an external connection is to be made. 2. A metallized area at the end of a thin metallic strip to which a connection is to be made. *See also* beam lead.

bonding wire — Fine gold or aluminum wire for making electrical connections to a semiconductor die or a hybrid circuit between various bonding pads on the semiconductor device substrate and device terminals or substrate lands.

bond liftoff — The failure mode whereby the bonded lead separates from the surface to which it was bonded.

bond schedule — The values of the bonding machine parameters used when adjusting for bonding. For example, in ultrasonic bonding, the values of the bonding force, time, and ultrasonic power.

bond site — *See* bonding area.

bond strength — A measure of the amount of stress required to separate a layer of material from the base to which it is bonded. Peel strength, measured in pounds per inch of width, is obtained by peeling the layer; pull strength, measured in pounds per square inch, is obtained by a perpendicular pull applied to a surface of the layer.

bond-to-bond distance — The distance, measured from the bonding site on the die to the bond impression on the post, substrate land, or fingers, that must be bridged by a bonding wire or ribbon.

bond-to-chip distance — In beam-lead bonding, the distance from the heel of the bond to the component.

bone conduction — The process by which sound is conducted to the inner ear through the cranial bones.

book capacitor — A two-plate trimmer capacitor that has its plates hinged together like the pages of a book. The capacitance is varied by changing the angle between the plates.

Boolean algebra — 1. A system of mathematical logic dealing with classes, propositions, on-off circuit elements, etc., associated by operators such as AND, OR, NOT, EXCEPT, IF ... THEN, etc., thereby permitting computations and demonstration as in any mathematical system. Named after George Boole, famous English mathematician and logician, who introduced it in 1847. 2. Algebraic rules for manipulating logic equations. 3. Shorthand notation for expressing logic functions.

Boolean calculus — Boolean algebra modified to include time.

Boolean equation — Expression of relations between logic functions.

Boolean function — A mathematical function in Boolean algebra.

Boolean operator — The symbol or word used to specify the inclusion or exclusion of criteria such as AND, OR, NOT, etc. Same as logical operator.

boom — A mechanical support for a microphone, used in a television studio to suspend the microphone within range of the actors' voices but out of camera range.

boost capacitor — A capacitor used in the damper circuit of a television receiver to supply a boosted B voltage.

boost charge — The partial charge of a storage battery, usually at a high current rate for a short period.

boosted B voltage — In television receivers, the voltage resulting from the combination of the B-plus voltage from the power supply and the average value of voltage pulses coming through the damper tube from the horizontal deflection-coil circuit. The pulses are partially or wholly smoothed by filtering. This boosted voltage may be several hundred volts higher than the B-plus voltage.

booster — 1. A carrier-frequency amplifier, usually a self-contained unit, connected between the antenna or transmission line and a television or radio receiver. 2. An intermediate radio or TV station that retransmits signals from one fixed station to another. 3. A small, self-contained transformer designed to be connected to a cathode-ray tube socket to increase the filament voltage and thereby extend the life of the tube. 4. A device inserted into a line (or cable) to increase the voltage. Boosting generators are also used to raise the level of a dc line. Transformers are usually employed to boost ac voltages. The term booster also is applied to antenna preamplifiers.

booster amplifier — A circuit used to increase the output current of the voltage capabilities of an operational amplifier circuit without loss of accuracy (ideally) or inversion of polarity. Usually employed inside the loop for accuracy.

booster voltage — The additional voltage supplied by the damper tube of a television receiver to the horizontal-output, horizontal-oscillator, and vertical-output tubes, resulting in a greater sawtooth sweep output.

boot — 1. A form placed around the wire termination of a multiple-contact connector for the purpose of containing the liquid potting compound until it hardens. 2. A housing, usually made from a resilient material, used to protect connector or other terminals from moisture. 3. An accessory, usually of a flexible material, designed to be placed around the terminals of a component as a protective housing. 4. To make a computer operate by loading in a program. 5. The initial starting-up of a PC. The operating system is brought into main memory and takes over control. 6. The automatic routine that clears the memory, loads the operating system, and prepares a computer for use. A *cold boot* occurs when the power is first switched on. A *warm boot* refers to restarting a computer that is already turned on (clearing the memory and reloading the operating system) without first switching it off. Also called boot up.

booting — Loading a computer's memory with the necessary information so it can function. A cold boot occurs when a computer's power is turned on and there is nothing in memory.

boot loader — Also called bootstrap. A program in a minicomputer that usually works on a simple data format called core image. The data format, in this context, is the organization of the data as it appears on the input device from which the program is being loaded. Core image data is binary, bit-for-bit identical to what will appear in memory after loadings. The boot leader is used to bring simple programs into memory and run them immediately.

bootstrap — 1. A technique or device that brings itself into a desired state through its own action; for example, a routine whose first few instructions are sufficient to cause the rest of the routine to be brought into the computer from an input device. 2. A feedback technique that tends to improve linearity and input impedance of circuits operating over a wide range of input signals. *See* boot loader.

bootstrap circuit — A single-stage amplifier in which the output load is connected between the negative end of the plate supply and the cathode, the signal voltage being applied between the grid and cathode. The name *bootstrap* arises from the fact that the change in grid voltage also changes the potential of the input source (with respect to ground) by an amount equal to the output signal.

bootstrap driver — An electronic circuit used to generate a square pulse to drive a modulator tube.

bootstrap loader — Device for loading first instructions (usually only a few words) of a routine into memory, then using these instructions to bring in the rest of the routine.

capacitance level detector — A device with single or multiple probes that operates based on the fact that a change in capacitance level causes a change in probe capacitance.

capacitance meter — An instrument for measuring capacitance. If the scale is graduated in microfarads, the instrument is usually designated a microfaradmeter.

capacitance-operated intrusion detector — A boundary alarm system in which the approach of an intruder to an antenna wire encircling the protected area (a few feet above ground) changes the antenna-to-ground capacitance and thereby sets off the alarm.

capacitance ratio — The ratio of maximum to minimum capacitance, as determined from a capacitance characteristic, over a specified voltage range.

capacitance relay — An electronic circuit incorporating a relay that responds to a small change in capacitance, such as that created by bringing the hand or body near a pickup wire or plate.

capacitance sensor — A sensor that responds to a change in capacitance in a field containing a protected object or in a field within a protected area. Also called capacitance detector.

capacitance switch — A keyboard switch in which two pads on the circuit board under each keyswitch serve as capacitor plates connected to the drive and sense circuits. Depression of the key causes an increase in the series capacitance, coupling the two elements and creating an analog signal in the sense circuit.

capacitance tolerance — The maximum percentage deviation from the specified nominal value (at standard or stated environmental conditions) specified by the manufacturer.

capacitive coupling — Also called electrostatic coupling. The association of two or more circuits with one another by means of mutual capacitance between them. For example, between stages of an amplifier, that type of interconnection that employs a capacitor in the circuit, between the plate of one tube and the grid of the following tube or the collector of one transistor and the base of the following transistor.

capacitive diaphragm — A resonant window placed in a waveguide to provide the effect of capacitive reactance at the frequency being transmitted.

capacitive-discharge ignition — Also called capacitor-discharge ignition. An electronic ignition system used on internal combustion engines to provide nearly constant high voltage regardless of engine speed. A dc-to-dc step-up converter charges a capacitor when the distributor breaker points are closed; when they are open, the capacitor discharges through the ignition coil, thereby generating the ignition voltage

capacitive divider — Two or more capacitors placed in series across a source, making available a portion of the source voltage across each capacitor. The voltage across each capacitor will be inversely proportional to its capacitance.

capacitive feedback — The process of returning part of the energy in the plate or output circuit of a vacuum tube to the grid, or input, circuit by means of a capacitance common to both circuits.

capacitive load — A predominantly capacitive load, that is, one in which the current leads the voltage.

capacitive post — A metal post or screw extending at right angles to the E field in a waveguide. It provides capacitive susceptance in parallel with the waveguide for purposes of tuning or matching.

capacitive reactance — Symbolized by X_C. The impedance a capacitor offers to ac or pulsating dc. Measured in ohms and equal to $1/2\pi fC$, where f is in hertz and C is in farads.

capacitive speaker — *See* electrostatic speaker.

capacitive storage welding — A particular type of resistance welding whereby the energy is stored in banks of capacitors, which are then discharged through the primary of the welding transformer. The secondary current generates enough heat to produce the weld.

capacitive transduction — Conversion of the measurand into a change in capacitance.

capacitive tuning — Tuning by means of a variable capacitor.

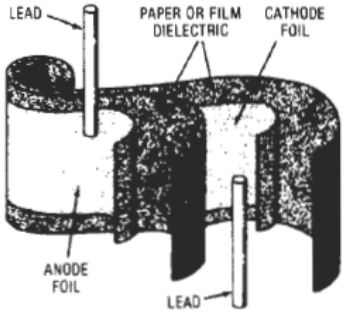
capacitive voltage divider — A combination of capacitors connected in series to form a capacitive voltage dividing device for application with ac voltages.

capacitive welding — An electronic welding system in which energy stored in a capacitor is discharged through the joint to be welded. The resulting current develops the heat necessary for the operation.

capacitive window — A conductive diaphragm extended into a waveguide from one or both sidewalls to introduce the effect of capacitive susceptance in parallel with the waveguide.

capacitivity — *See* dielectric constant.

capacitor — 1. A device consisting essentially of two conducting surfaces separated by an insulating material or dielectric such as air, paper, mica, glass, plastic film, or oil. A capacitor stores electrical energy, blocks the flow of direct current, and permits the flow of alternating current to a degree dependent essentially on the capacitance and the frequency. 2. An electrical energy storage device used in the electronics industry for varied applications, notably as elements of resonant circuits, in coupling and bypass application, blockage of dc current, as frequency determining and timing elements, as filters and delay-line components, and in voltage transient suppression.



Capacitor (internal construction).

capacitor antenna — Also called condenser antenna. An antenna that consists of two conductors or systems of conductors and the essential characteristic of which is its capacitance.

capacitor bank — A number of capacitors connected together in series, parallel, or in series-parallel.

capacitor braking — A means of stopping an induction motor. The capacitor or capacitors can be applied to the winding after shut-off.

capacitor color code — Color dots or bands placed on capacitors to indicate one or more of the following: capacitance, capacitance tolerance, voltage rating, temperature coefficient, and the outside foil (on paper or film capacitors).

capacitor-discharge ignition — *See* capacitive-discharge ignition.

utilizes low-power transmitters that allow uninterrupted communications through sophisticated switching equipment linking the cells. This system, by reusing frequencies and standardizing service and equipment, has substantially improved mobile telephone service.

cellulose acetate — An inexpensive transparent plastic film used as the backing material for many recording tapes.

cellulose-nitrate disc — *See* lacquer disc.

Celsius temperature scale — Also called centrigrade temperature scale. A temperature scale based on the freezing point of water defined as 0°C and the boiling point defined as 100°C, both under conditions of normal atmospheric pressure (760 mm of mercury).

cent — A measure of frequency, defined as equal to 100th of a semitone.

center-fed antenna — An antenna in which the feeder wires are connected to the center of the radiator.

center feed — 1. Attaching feeder wires or a transmission line to the center of the radiator of an antenna. 2. Connection of signal input terminals to the center of a coil.

center frequency — Also called resting frequency. 1. The average frequency of the emitted wave when modulated by a symmetrical signal. 2. The frequency at the center of a spectrum display (for linear frequency scanning). It is usually tunable. 3. Also called free-running frequency. The frequency at which a phase-locked loop operates when not locked onto an incoming (input) signal.

centering control — One of two controls used to shift the position of the entire image on the screen of a cathode-ray tube. The horizontal-centering control moves the image to the right or left, and the vertical-centering control moves it up or down. *See also* framing control.

centering diode — A clamping circuit used in some types of plan-position indicators.

centering magnet — A magnet that centers the televised picture on the face of the tube. Also called framing magnet.

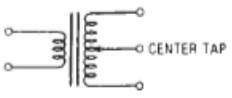
center of gravity — A point inside or outside a body and around which all parts of the body balance each other.

center of mass — On a line between two bodies, the point around which the two bodies would revolve freely as a system.

center poise — Scale of viscosity for insulating varnishes.

center ring — The part that supports the stator in an induction-motor housing. The motor end shields are attached to the ends of the center ring.

center tap — A connection at the electrical center of a winding, or midway between the electrical ends of a resistor or other portion at a circuit.



Center tap.

center-tapped inductor — An inductor that has a tap at half the total inductance.

center wire — A fine loop of wire used in proportional counters as an anode. A high voltage is applied to it to set the conditions for radiation measurement.

center-zero meter — A dc meter that has its zero point at the center of the scale, e.g., a dc galvanometer.

centi- — One hundredth (10^{-2}) of a specific quantity or dimension.

centigrade temperature scale — The older name for a Celsius temperature scale in the English-speaking countries. Officially abandoned by international agreement in 1948, but still in common usage.

centimeter waves — Microwave frequencies between 3 and 30 GHz, corresponding to wavelengths of 10 to 1 centimeters.

central battery exchange — Manual telephone exchange in which a battery situated at the exchange is the source of current for operating supervisory signals, for subscribers' calling signals, and for the current required to enable a subscriber to speak over his or her line.

central office — The facility at which a communications common carrier terminates customer lines and locates the equipment for interconnecting those lines.

central-office equipment — Apparatus used in a telephone central office to furnish communication services.

central-office line — *See* subscriber line.

central processing unit — Also called central processor; abbreviated CPU. 1. The part of a computer system that contains the main storage, arithmetic unit, and special register groups. Performs arithmetic operations, controls instruction processing, and provides timing signals and other housekeeping operations. 2. A group of registers and logic that form the arithmetic/logic unit plus another group of registers with associated decoding logic that form the control unit. Most MOS devices are single-chip CPUs, in that the registers hold as many bits as the word length of the unit. With bit-slice devices, however, central processing units of any bit width can be assembled essentially by connecting the bit-slice parts in parallel. Externally, a bit-slice device will appear to be a coherent single CPU capable of handling words of the desired bit length. 3. That part of a computer system that controls the interpretation and execution of instructions. In general, the CPU contains the following elements: arithmetic and logic unit (ALU), timing and control, accumulator, scratch-pad memory, program counter and address stack, instruction register, and I/O control logic. 4. That unit of a computing system that fetches, decodes, and executes programmed instructions and maintains the status of results as the program is executed.

central processor — *See* central processing unit; CPU.

central station — A control center to which alarm systems in a subscriber's premises are connected, where circuits are supervised and where personnel are maintained continuously to record and investigate alarm or trouble signals. Facilities are provided for the reporting of alarms to police and fire departments or to other outside agencies.

central station alarm system — An alarm system, or group of systems, the activities of which are transmitted to, recorded in, maintained by, and supervised from a central station. This differs from proprietary alarm systems in that the central station is owned and operated independently of the subscriber.

centrex — 1. A service offered by telephone companies. It uses central-office equipment to provide features comparable with those provided by a PBX. 2. An improved PBX system that also provides direct inward dialing (DID) and automatic number identification (ANI) of the calling PBX station.

centrifugal force — The force that acts on a rotating body and that tends to throw the body farther from the axis of its rotation.

centripetal force — The force that compels a rotating body to move inward toward the center of rotation.

electrocoagulation — The process of solidifying tissue by means of a high-frequency electrical current.

electrocution — Killing by means of an electric current.

electrode — 1. In an electronic tube, the conducting element that does one or more of the following: emits or collects electrons or ions, or controls their movement by means of an electric field on it. 2. In semiconductors, the element that does one or more of the following: emits or collects electrons or holes, or controls their movements by means of an electric field on it. 3. In electroplating, the metal being plated. 4. A conductor by means of which a current passes into or out of a fluid or an organic material, such as human skin; often one terminal of a lead. 5. A metallic conductor such as in an electrolytic cell, in which conduction by electrons is changed to conduction by ions or other charged particles. 6. A conductor, not necessarily metal, through which a current enters or leaves an electrolytic cell, arc, furnace, vacuum tube, gaseous discharge tube, or any conductor of the nonmetallic class. 7. That part of a semiconductor device providing the electrical contact between the specified region of the device and the lead to its terminal. 8. In a spark plug, the center rod passing through the insulator forms one electrode. The rod welded to the shell forms another. They are referred to as the center and side electrodes. 9. A conducting element at whose surface electricity passes into another conducting medium.

electrode admittance — The alternating component of the electrode current divided by that of the electrode voltage (all other electrode voltages maintained constant).

electrode capacitance — The capacitance between one electrode and all the other electrodes connected together.

electrode characteristic — The relationship, usually shown by a graph, between the electrode voltage and current, all other electrode voltages being maintained constant.

electrode conductance — The quotient of the in-phase component of the electrode alternating current divided by the electrode alternating voltage, all other electrode voltages being maintained constant. This is a variational and not a total conductance.

electrode current — Current passing into or out of an electrode.

electrode dark current — Also called dark current. 1. In phototubes, the component of electrode current that flows in the absence of ionizing radiation and optical photons. 2. The current that flows in a photodetector when there is no incident radiation on the detector.

electrode dissipation — The power that an electrode dissipates as heat when bombarded by electrons and/or ions and radiation from nearby electrodes.

electrode drop — The voltage drop produced in an electrode by its resistance.

electrode impedance — The reciprocal of electrode admittance.

electrode inverse current — Current through a tube electrode in the direction opposite to that for which the tube was designed.

electrodeless discharge — A luminous discharge produced by means of a high-frequency electric field in a gas-filled glass tube that has no internal electrodes.

electrodeless discharge tube — Abbreviated EDT. A device consisting of an airtight quartz tube that holds the material to be analyzed. When a high-frequency electrostatic field, generated by microwaves, is applied to the tube, it emits energy of a wavelength identical with that of the contained material.

electrodeposition — Also called electrolytic deposition. *See also* electroplating.

electrode potential — 1. The instantaneous voltage on an electrode. Its value is usually given with respect to the cathode of a vacuum tube. 2. The difference in potential between an electrode and the immediately adjacent electrolyte referred to some standard electrode potential as zero. 3. The potential in volts that an electrode has when immersed in an electrolyte, compared to the zero potential of a hydrogen electrode. The potential depends on the material of which the electrode is made.

electrode reactance — The imaginary component of electrode impedance.

electrode resistance — The reciprocal of electrode conductance. It is the effective parallel resistance, not the real component of electrode impedance.

electrodermography — The recording of the electrical resistance of the skin, which is a sensitive indicator of the activity of the autonomic nervous system.

electrode voltage — The voltage between an electrode and the cathode or a specified point of a filamentary cathode. The terms *grid voltage, anode voltage, plate voltage*, etc., designate the voltage between these electrodes and the cathode. Unless otherwise stated, electrode voltages are measured at the available terminals.

electrodialytic process — A process for producing fresh water by using a combination of electric current and two types of chemically treated membranes.

electrodynamic — Pertaining to electric current, electricity in motion, and the actions and effects of magnetism and induction.

electrodynamic braking — A method of stopping a tape-deck motor gently by the application of a predetermined voltage to the motors.

electrodynamic instrument — An instrument that depends for its operation on the reaction between the current in one or more moving coils and the current in one or more fixed coils.

electrodynamic machine — Electric generator or motor in which the output load current is produced by magnetomotive currents generated in a rotating armature.

electrodynamics — 1. The science dealing with the various phenomena of electricity in motion, including interactions of currents with each other, with their associated magnetic fields, and with other magnetic fields. 2. The study of the generation of electromagnetic power by radiation from high-energy beams.

electrodynamic speaker — A speaker consisting of an electromagnet called the field coil, through which a direct current flows.

electrodynamometer — 1. An instrument for detecting or measuring an electric current by determining the mechanical reactions between two parts of the same circuit. 2. A meter movement consisting of a rotatable (moving) wire coil suspended between two fixed (field) wire coils. The three coils can be connected in various configurations, so that rotation of the moving coil is proportional to applied ac or dc voltage or current, to power, power factor, etc.

electroencephalogram — 1. A waveform obtained by plotting brain voltages (available between two points on the scalp) against time. An electroencephalogram is not necessarily a periodic function, although it can beparticularly if the patient is unconscious. These voltages are of extremely low level and require recording apparatus that displays excellent noise rejection. 2. The tracing of brain waves made by an electroencephalograph.

electroencephalograph — Abbreviated EEG. An instrument for measuring and recording the rhythmically varying potentials produced by the brain by the use of electrodes applied to the scalp.

Petitioner Shenzhen Qianfenyi Intelligent Technology Co., Ltd.
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the heart reduces the impedance of the finger, and the resulting change in the current between the electrodes is recorded or displayed on a cathode-ray tube.

fingers — Nonpreferred term for edge-board contact.

finished blank — A crystal product after completion of all processes. It may also include the electrodes adherent to the crystal blank.

finishing — The process of repeated hand lapping and electrical testing by which a finished crystal blank is brought up to specifications.

finishing rate — Expressed in amperes, the rate of charge to which the charging current of a battery is reduced near the end of the charge to prevent excessive gassing and temperature rise.

finish lead — The lead connected to the finish, or outer end, of a coil.

finite — Having fixed and definite limits.

finite-element method — A procedure for solving electromagnetic field problems by dividing the domain of interest into small, basic elements and by solving differential equations in each of those elements.

finite-state machine — A computer in which a set of inputs determines both the set of outputs and also the internal state of the computer.

fins — Radial sheets or discs of metal attached to metal parts of a power tube, power transistor, or other component for the purpose of dissipating heat.

fin waveguide — A waveguide in which a thin longitudinal metal fin is placed to increase the range of wavelengths over which the waveguide can transmit signals efficiently. The method usually is used with circular waveguides.

FIPS — Abbreviation for Federal Information Processing Standard. A standard approved for use by U.S. government agencies.

fire — 1. To change from a blocked condition, in which negligible current flows, to a saturated condition, in which heavy current flows. 2. The term used to describe the act of heating a thick-film circuit so that the resistors, conductors, capacitors, etc., will be transformed into their final form.

fire-control equipment — Equipment that takes in target indications from optical or radar devices and, after calculating the motion of the target and firing vehicle, properties of air, etc., puts out directions of bearing, elevation, and timing for aiming and firing the guns.

fire-control radar — Radar employed for directing gunfire against the targets it observes.

fired tube (tr, atr, and pre-tr tubes) — The condition of a tube while a radio-frequency glow discharge exists at the resonant gap, resonant window, or both.

firewall — 1. A combination of hardware and software that separates a local area network (LAN) into two or more parts for security purposes. 2. A method of partially or totally blocking access (from machines not on a LAN) or of filtering/monitoring incoming packets.

firing — 1. In any gas- or vapor-filled tube, the ionization of the gas and the start of current flow. 2. The excitation of a device during a brief pulse. 3. In a magnetic amplifier, the transition from the unsaturated to the saturated state of the saturable reactor during the conducting or gating alternation. 4. An adjective modifying phase or time, to designate when firing occurs.

firing angle — 1. The electrical angle of the plate-supply voltage at which ionization of a gaseous tube occurs. 2. In a magnetic amplifier, the point on a sine-wave control voltage at which the control ampere-turns are sufficient to saturate the core. This is the point at which the secondary winding (load) impedance drops to zero, and almost all of the supply voltage appears across the load.

firing furnace — Furnace used for the curing of multilayer ceramics for integrated electronics and for the firing of thick-film materials on substrates.

firing point — The point at which the gas or vapor in the tube ionizes and current begins to flow.

firing potential — The controlled potential at which conduction through a gas-filled tube begins.

firing profile — A graph of time versus temperature or, in a continuous thick-film furnace, of position versus temperature.

firmware — 1. A computer program or software stored permanently in PROM or ROM or semipermanently in EPROM. 2. Programs or instructions that are stored in read-only memories; firmware is analogous to software in a hardware form. These instructions are for internal processor functions only, and are transparent to the user. 3. The internal interconnections that permanently determine what functions a device or system can perform. Also called microprogram. 4. Sets of instructions cast into user-modifiable hardware. 5. A series of instructions in ROM (read-only memory). 6. Data stored in a nondestructive form such as hard-wired or in a ROM. 7. An extension to a computer's basic command repertoire to create microprograms for a user-oriented instruction set. This extension to the basic instruction set is done in ROM and not in software. The ROM converts the extended instructions to the basic instructions of the computer.

first article — A sample part or assembly manufactured prior to the start of production for the purpose of ensuring that the manufacturer is capable of manufacturing a product that will meet the requirements.

first audio stage — The first stage in an audio amplifier.

first detector — Now called the mixer. In a superheterodyne receiver, the stage in which the local-oscillator signal is combined with the modulated incoming radio-frequency signal to produce the modulated intermediate-frequency signal.

first fit — In a computer, an algorithm for memory allocation that searches the free list only long enough to find an unused memory block that is large enough to satisfy the requesting task.

first Fresnel zone — In optics and radio communications, the circular portion of a wave front intersecting the line between an emitter and a more distant point where the resultant disturbance is being observed. The center intersects the front with the direct ray, and the radius is such that the shortest path from the emitter through the periphery to the receiving point is one half-wave longer than the ray.

first-generation computer — A computer in which vacuum-tube components are used.

first-in, first-out (FIFO) memory — 1. A type of memory with separate input and output ports. The first data to enter the input port are the first to exit the output port. One use of FIFO memory is as a buffer between a terminal and a LAN in a network interface controller. 2. A data access mechanism that implements a queue. Data elements are always extracted from the data structure in the same order that they are entered (the first element in is the first element out).

first selector — The selector that immediately follows a line-finder in a switch train. It responds to the dial pulses that represent the first digit of the called telephone number.

first-shot effect — A term used relative to solid-state (electronic) timers using a resistor-capacitor (*RC*) single time-constant circuit. Due to the forming effect leakage found in electrolytic capacitors when stored, the first and sometimes second and third operations have longer time delays. The repeat accuracy specification does not include

microcircuit module — An assembly of microcircuits or of microcircuits and discrete parts, designed to perform an electronic-circuit function or functions and constructed in such a manner that it is considered to be a single entity for the purposes of specification, testing, commerce, and maintenance.

microcircuit wafer — A microwafer carrying one or more circuit functions such as a flip-flop or gate. Integrated-circuit chips may be bonded to deposited conductors.

microcode — 1. A computer-coding system that includes suboperations, such as multiplication and division, that ordinarily are inaccessible in programming. A list of very small program steps. 2. A set of control functions performed by the instruction decoding and execution logic of a computer that defines the instruction repertoire of that computer. Microcode is not generally accessible by the programmer. 3. Sequences of low-level steps, making up machine instructions, that are built into a microprocessor that directly control the interaction of the processor's computing elements — that is, machine instructions wired into the hardware that is being controlled. 4. Permanent basic subcommands, built into a computer, that are executed directly by the computer. Generally, these commands define the instruction set of a microprogrammable computer.

microcoding — In a computer, a system of coding that uses suboperations not ordinarily accessible in programming.

microcomponents — 1. Those components smaller than existing components by several orders of magnitude. 2. An assembly of very small, interconnected discrete components — active or passive — that forms an electronic circuit. Interconnection of the various leads is by soldering or welding. Microcomponents use no substrates.

microcomputer — 1. A general-purpose computer composed of standard LSI components built around a central processing unit (CPU). The CPU (or microprocessor) is program-controlled, featuring arithmetic and logical instructions and a general-purpose parallel I/O bus. The CPU is generally contained on a single chip. Generally intended for dedicated applications, the microcomputer also includes any number of ROMs and RAMs (for instruction and data storage) and, in some cases, one or more I/O devices. The simplest microcomputer consists of one CPU chip and one ROM. 2. A computer whose major sections — CPU, control, timing, and memory — are each contained on a single integrated-circuit chip, or, at most, a few chips. An LSI computer. 3. A computer that has a single or multichip LSI CPU, as distinguished from a minicomputer. 4. A class of computer having all major central processor functions contained on a single printed circuit board constituting a stand-alone module. 5. A computer whose central processing unit is a microprocessor. A microcomputer includes microprocessor, memory, and input/output controllers. 6. A device consisting of a central processor (usually a microprocessor, but sometimes a custom LSI chip set or a bit-slice processor) combined with a memory and input/output.

microcomputer development system — Abbreviated MDS. Also called expandable breadboarding system. 1. A key tool used in the development phase of microprocessor-based computers. It provides an efficient means of program coding, subprogram testing, and final testing for the completed program in a simulated operating condition without the use of the hardware that is contained in the final end product. The elements of the MDS combine to make up a complete microprocessor-based computer, which is composed of the central processing unit or microprocessor unit; a mass-storage memory section; either a floppy disk or tape cassette, complete with associated drive and control circuits; a CRT terminal (video readout), a keyboard; and, as there is in most systems, a printer. In addition, an emulator module is part of the system and is used to test the operation of the developed system under defined conditions without the use of final hardware. 2. A system designed exclusively to aid in the development of microprocessor systems. Microcomputer development systems enable a designer to develop software and hardware as if many standard operating system utilities were present in his or her final design. These utilities, however, actually reside in the development system and therefore do not require costly additions to every shipped system. 3. Microcomputer equipped with the hardware and software facilities required for efficient program development and hardware debugging.

microcontroller — A complete microprocessor system on a chip. Includes on-chip the CPU, local RAM, local ROM or EPROM, clock and control circuits, and serial and parallel I/O ports that can be programmed for various control functions. *See also* chip sets.

microcrack — A thin crack in a substrate or chip device, or in thick-film trim-kerf walls, that can only be seen under magnification and which can contribute to latent failure phenomena.

microdensitometer — An instrument used in spectroscopy to measure lines in a spectrum by light transmission measurement.

microelectrode — An extremely small electrode. Some microelectrodes are small enough to contact a single biological cell.

microelectronic circuit — Discrete electrical components assembled and connected in extremely small and compact form.

microelectronic device — An alternate term for integrated circuit.

microelectronics — Also called microsystems electronics. 1. The entire body of electronic art that is connected with or applied to the realization of electronic systems from extremely small electronic parts. 2. *See* integrated circuit. 3. All techniques for the manufacture of extremely small electronic circuits, generally including all types of silicon integrated circuits, thin-film circuits, and thick-film circuits. 4. The physical realization of electronic circuits or systems from a number of extremely small circuit elements inseparably associated on or within a continuous body. Microelectronics has developed along two basic technologies: monolithic integrated circuits and hybrid integrated circuits. 5. The field that deals with techniques for producing miniature circuits, e.g., integrated circuits, thin-film techniques, and solid-state logic modules. 6. The art of electronic equipment design and construction that uses microminiaturization schemes.

microelement — A resistor, capacitor, or transistor, diode, inductor, transformer, or other electronic element or combination of elements mounted on a small ceramic wafer 0.01 inch (or 0.25 mm) thick and about 0.3 inch (0.75 mm) square. Individual microelements are stacked, interconnected, and potted to form micromodules.

microelement wafer — A microwafer carrying one or more components or a simple network. The network can consist, for example, of several thin-film resistors deposited directly on the wafer.

microfarad — One millionth of a farad. Letter symbol: μF.

microfaradmeter — *See* capacitance meter.

microflash — An extremely short electronic flash, having a duration of about 1×10^{-6} second. Used in photographing rapidly moving subjects.

microflash lamp — A lamp that emits radiation pulses having a duration of approximately 1 microsecond.

and demodulates signals transmitted over communications facilities; that is, a device used to convert digital signals into analog (voice-like) signals for transmission over a telephone line. At the other end of the line another modem converts the analog signals back into digital form.

mode number — 1. In a reflex klystron, the number of whole cycles that a mean-speed electron remains in the drift space. 2. The number of radians of phase shift resulting from going once around the anode of a magnetron divided by 2π.

mode of failure — *See* failure mode.

mode of resonance — A form of natural electromagnetic oscillation in a resonator. It is characterized by an unvarying field pattern.

mode of transmission propagation — 1. A form of guided-wave propagation characterized by a particular field pattern that intersects the direction of propagation. The field pattern is independent of its position along the waveguide. For a uniconductor waveguide, it also is independent of frequency. 2. In a vibrating system, the state that corresponds to one of the resonant frequencies.

mode of vibration — The pattern formed by the movement of the individual particles in a vibrating body (e.g., piezoelectric crystal). This pattern is determined by the stresses applied to the body, the properties of the body, and the boundary conditions. The three common modes of vibration are flexural, extensional, and shear.

mode purity — The freedom of an atr tubc from undesirable mode conversion while the tube is in its mount.

mode separation — In an oscillator, the difference in frequency between resonator modes of oscillation.

mode shift — In a magnetron, the change in mode during a pulse.

mode skip — Failure of a magnetron to fire during each successive pulse.

mode transducer — Also called mode transformer. A device that transforms an electromagnetic wave from one mode of propagation to another.

mode transformer — *See* mode transducer.

modification — The physical alteration of a system, subsystem, etc., for the purpose of changing its designed capabilities or characteristics.

modified constant-voltage charge — The charging of a storage battery in which thc voltage of the charging circuit is held substantially constant, but a fixed resistance is inserted in the battery circuit, producing a rising voltage characteristic at the battery terminals as the charge progresses.

modified index of refraction — Also called modified refractive index. In the troposphere, the index of refraction at any height increased by h/a, where h is the height above sea level and a is the mean geometrical radius of the earth. When the index of refraction in the troposphere is horizontally stratified, propagation over a hypothetical flat earth through an atmosphere with the modified index of refraction is substantially equivalent to propagation over a curved earth through the real atmosphere.

modified refractive index — *See* modified index of refraction.

modifier — A device that alters an instruction but does not change the form of energy (for example, the changing of electrical input signals into electrical output signals).

moding — A defect of magnetron oscillation in which the magnetron oscillates in one or more undesired modes.

modular — 1. Made up of modules. 2. Dimensioned according to a prescribed set of size increments. 3. A partitioning scheme for a family of single-board microcomputer family circuit cards wherein system and I/O functions of various types are grouped and organized into modules (a memory module, for example). Each of the modular circuit board elements also includes a bus interface to allow intercommunication. The benefit to the system designer is that various functions can be included only to the degree needed for a specific application. 4. Having dimensions which are integral multiples of a unit of length called a module. 5. Composed of subunits. Computer systems and programs are made this way to make them easier to change or expand. 6. A design technique that permits a device or system to be assembled from interchangeable components; such a system or device can be expanded or modified simply by adding another module.

modular connector — A connector in which similar or identical sections can be assembled together to provide the best connector type or size for the application.

modulate — To vary the amplitude, frequency, or phase of a wave by impressing one wave on another wave of constant properties.

modulated amplifier — In a transmitter, the amplifier stage where the modulating signal is introduced and modulates the carrier.

modulated-beam photoelectric system — An intrusion-detector system that provides reliable beam ranges of several thousand feet. This is done by interrupting the light beam at the source with a rotating punched or slotted disc. In this way, the phototube output is converted to an ac signal, which can then be easily amplified.

modulated carrier — A radio-frequency carrier in which the amplitude or frequency has been varied by, and in accordance with, the intelligence to be conveyed.

modulated continuous wave — Abbreviated MCW. A wave in which the carrier is modulated by a constant audio-frequency tone. In telegraphy service, the carrier is keyed to produce the modulation.

modulated light — Light whose intensity has been made to vary in accordance with variations in an audio-frequency or code signal.

modulated oscillator — An oscillator whose output frequency is varied by an input signal.

modulated photoelectric alarm system — A photoelectric alarm system in which the transmitted light beam is modulated in a predetermined manner and in which the receiving equipment will signal an alarm unless it receives the properly modulated light.

modulated signal generator — A device that produces an output signal that may be changed in amplitude and/or frequency according to a desired pattern. It is calibrated in units of both power (or voltage) and frequency.

modulated stage — The radio-frequency stage to which the modulator is coupled and in which the continuous wave (carrier wave) is modulated in accordance with the system of modulation and the characteristics of the modulating wave.

modulated wave — A carrier wave in which the amplitude, frequency, or phase varies in accordance with intelligence signal being transmitted.

modulating amplifier using variable reactance — A very-high-frequency electron-beam parametric amplifier with bandpass characteristics that are independent of gain, and which is unconditionally stable.

modulating electrode — In a cathode-ray tube, an electrode to which a potential is applied to control the magnitude of the beam current.

modulating signal — *See* modulating wave.

modulating wave — Also called modulating signal, or simply signal. A wave that varies some characteristic (i.e., frequency, amplitude, phase) of the carrier.

modulation — 1. The process of modifying some characteristic of a wave (called a carrier) so that it varies

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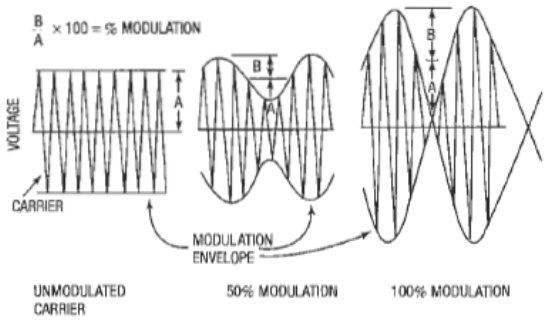
in step with the instantaneous value of another wave (called a modulating wave or signal). The carrier can be a direct current, an alternating current (provided its frequency is above the highest frequency component in the modulating wave), or a series of regularly repeating, uniform pulses called a pulse chain (provided their repetition rate is at least twice that of the highest frequency to be transmitted). 2. The controlled variation of frequency, phase, and/or amplitude of a carrier wave of any frequency in order to transmit a message. 3. In fiber optics, the manner in which information is coded into light for transmission through a fiber. The modulation method may be either pulse modulation (digital) or intensity modulation (analog). 4. The process of varying one signal with another. 5. The imposing of a signal on some type of transmission or storage medium, such as a radio carrier or magnetic tape. 6. The process, or results of the process, whereby some characteristic of one signal is varied in accordance with another signal. The modulated signal is called the carrier and may be modulated in three fundamental ways: by varying the amplitude (amplitude modulation) by varying the frequency (frequency modulation) or by varying the phase (phase modulation). 7. The process by which some characteristic of a higher frequency wave is varied in accordance with the amplitude of a lower frequency wave.

modulation capability — The maximum percentage of modulation possible without objectionable distortion.

modulation code — A code used to cause variations in a signal in accordance with a predetermined scheme; normally used to alter or modulate a carrier wave to transmit data.

modulation distortion — Distortion occurring in the radio-frequency amplifier tube of a receiver when the operating point is at the bend of the grid-voltage/plate-current characteristic curve. As a result, the plate-current changes are greater on positive than on negative half-cycles. The effect is equivalent to an increase in the percentage of modulation.

modulation envelope — A curve, drawn through the peaks of a graph, showing how the waveform of a modulated carrier represents the waveform of the intelligence carried by the signal. The modulation envelope is the intelligence waveform.



Modulation envelope.

modulation factor — In an amplitude-modulated wave, the ratio of half the difference between the maximum and minimum amplitudes to the average amplitude. This ratio is multiplied by 100 to obtain the percentage of modulation.

modulation frequency — That signal which causes the output frequency of an oscillator to be modulated.

modulation index — 1. In frequency modulation with a sinusoidal modulating wave, the ratio of the frequency deviation to the frequency of the modulating wave. 2. A measure of the degree of modulation.

modulation indicator — A relative indicator that glows brighter and brighter as the modulation level approaches 100 percent. It gives the operator some idea of how fully he or she is modulating the carrier.

modulation meter — An instrument that measures the modulation percentage of an amplitude modulated signal and displays the results on a scale or dial.

modulation monitor — *See* modulation meter.

modulation noise — Also called noise behind the signal. 1. The noise caused by the signal, but not including the signal. 2. The noise produced on playback of a tape that is a function of the instantaneous amplitude of the signal. It is caused by poor particle dispersion and surface irregularities.

modulation percentage — The modulation factor multiplied by 100.

modulation plan — The arrangement by which the individual channels or groups of channels are modulated to a final frequency allocation.

modulation ratio — For an electrically modulated source, the number obtained by dividing the percentage of radiation modulation by the percentage of current modulation.

modulation rise — An increase in the modulation percentage. It is caused by a nonlinear tuned amplifier, usually the last intermediate-frequency stage of a receiver.

modulation transfer function — Abbreviated MTF. Also called sine-wave response, and contrast transfer function. 1. The ratio of input modulation to output modulation. 2. A plot of the video output amplitude as a function of TV line number for a sine-wave- modulated input, i.e., a bar pattern with sine-wave density variation serving as the object for the TV camera. The output video amplitude, measured by an oscilloscope, is calibrated at 100 percent for small line numbers (wide lines). 3. The function, usually a graph, describing the modulation of the image of a sinusoidal object as the frequency increases. The ratio of the modulation in the image to that in the object.

modulator — 1. A device that effects the process of modulation. 2. In radar, a device for generating a succession of short energy pulses that cause a transmitter tube to oscillate during each pulse. 3. An electrode in a spacistor.

modulator crystal — A crystal that is used to modulate a polarized light beam by the use of Pockel's effect. Useful as a modulator in laser systems.

modulator driver — A transmitter circuit that produces a pulse to be delivered to the control grid of the modulator stage.

modulator glow tube — A cold-cathode recorder tube used for facsimile and sound-on-film recording. It provides a modulated, high-intensity, point-of-light source.

modulator stage — The last stage through which the signal that modulates the radio-frequency wave is passed.

module — 1. A unit in a packaging scheme displaying regularity and separable repetition. It may or may not be separate from other modules after initial assembly. Usually all major dimensions are in accordance with a prescribed series of dimensions. 2. A packaging concept in which identical forms are used. 3. A complete subassembly of a larger system combined in a single package. 4. An interchangeable plug-in item containing electronic components, which may be combined with other interchangeable items to form a complete unit. 5. A collection of modules or a collection of software items in any

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