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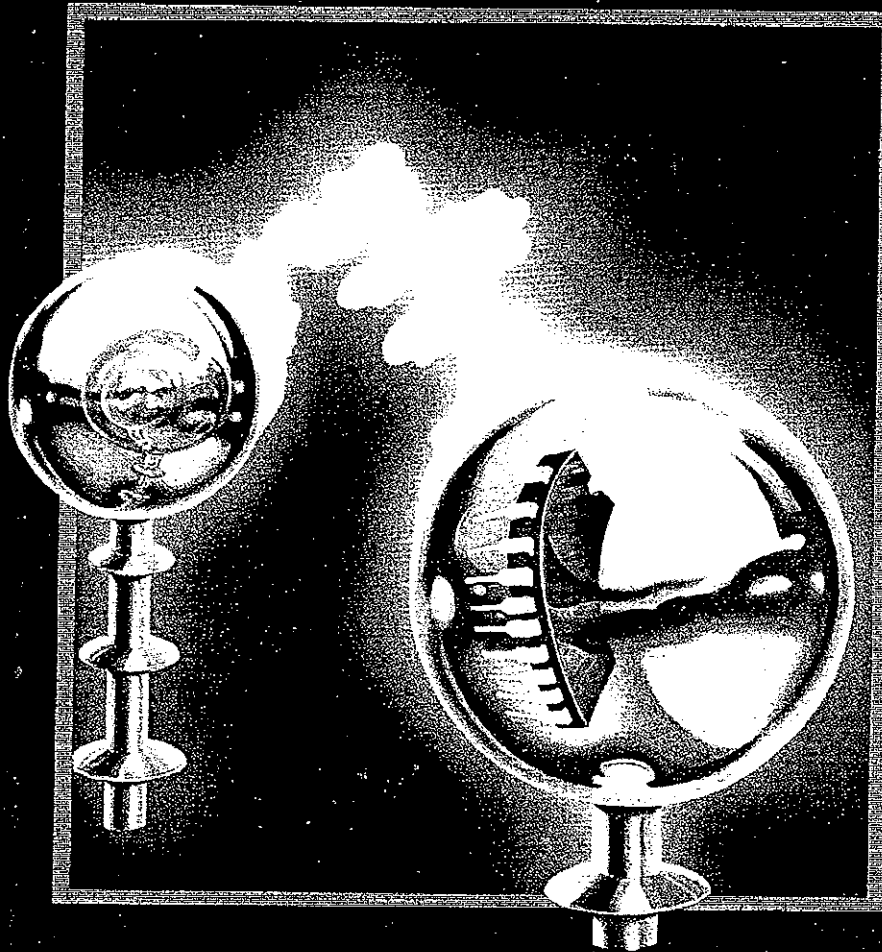
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# Modern Dictionary of Electronics

SIXTH EDITION

Rudolf F. Graf



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by Rudolf F. Graf

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by physical variables, such as voltage, resistance, rotation, etc.

**analog input module** — An i/o rack module which converts an analog signal from a user device to a digital signal which may be processed by the processor.

**analog meter** — An indicating instrument that employs a movable coil and pointer arrangement (or equivalent) to display values along a graduated scale.

**analog multiplexer** — 1. Circuit used for time sharing of analog-to-digital converters between a number of different analog information channels. Consists of a group of analog switches arranged with inputs connected to the individual analog channels and outputs connected in common. 2. Two or more analog switches with separate inputs and a common output, with each gate separately controllable. Multiplexing is performed by sequentially turning on each switch one at a time, switching each individual input to a common output. 3. A device which selects one of several analog signals according to a digital code. Analog multiplexers (amux) are available in many forms and their chief application is as a "front end" in data-acquisition systems, enabling a single analog-to-digital converter to monitor more than one information channel.

**analog network** — A circuit or circuits that represent physical variables in such a manner as to permit the expression and solution of mathematical relationships between the variables, or to permit the solution directly by electric or electronic means.

**analog output** — 1. As distinguished from digital output. Here the amplitude is continuously proportionate to the stimulus, the proportionality being limited by the resolution of the device. 2. An output quantity which varies smoothly over a continuous range of values rather than in discrete steps.

**analog panel meter** — See APM.

**analog recording** — A method of recording in which some characteristic of the record current, such as amplitude or frequency, is continuously varied in a manner analogous to the time variations of the original signal.

**analog representation** — A representation that does not have discrete values, but is continuously variable.

**analog signal** — 1. An electrical signal that varies continuously in both time and amplitude, as obtained from temperature or pressure, or speed transducers. A voltage level that changes in proportion to the change in a physical variable. 2. A signal representing a variable which may be continuously observed and continuously represented.

**analog switch** — 1. A device that either

transmits an analog signal without distortion, or completely blocks it. 2. Any solid-state device, with or without a driver, capable of bilaterally switching voltages or current. It has an input terminal, output terminal, and, ideally, no offset voltage, low on resistance, and extreme isolation between the signal being gated and control signals. 3. A means to interconnect two or more circuits whose information is represented in analog form using a network which may or may not be time divided and may or may not consist of linear elements.

**analog-to-digital conversion** — 1. The process of converting a continuously variable (analog) signal to a digital signal (binary code) that is a close approximation of the original signal. 2. The process of quantizing a continuous function.

**analog-to-digital converter** — Abbreviated a-d converter or adc. 1. A circuit that changes a continuously varying voltage or current (analog) into a digital output. The input may be ac or dc, and the output may be serial or parallel, binary or decimal. 2. Device that translates analog signals (voltages, pressures, etc.) from sensors into numerical digital form (binary, decimal, etc.).

**analog computing** — Computing system where continuous signals represent mechanical (or other) parameters.

**analog transmission** — Transmission of a continuously variable signal as opposed to a discretely variable one.

**analog value** — A continuously variable value, such as a current or voltage.

**analytical engine** — An early form of general-purpose digital computer invented in 1833 by Charles Babbage.

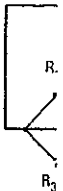
**analyzer** — 1. An instrument or other device designed to examine the functions of components, circuits, or systems; and their relations to each other; as contrasted with an instrument designed to measure some specific parameter of such a system or circuit. 2. Of computers, a routine the purpose of which is to analyze a program written for the same or a different computer. This analysis may consist of summarizing instruction references to storage and tracing sequences of jumps. 3. An instrument that evaluates and/or measures one or more specific parameters (e.g., voltage, current, frequency, logic level, bit time, distortion, etc.). 4. A test assembly that checks the performance of, or locates trouble in, electronic equipment. Also called test set and tester.

**anastigmat** — A lens system designed so as to be free from the aberration called astigmatism.

**anchor** — An object, such as a metal rod, set into the ground to hold the end of a guy wire.

**ancillary equipment** — Equipment not di-

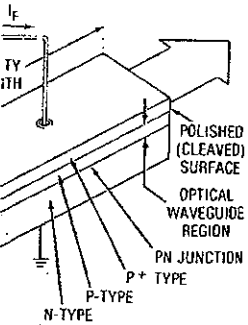
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**AND/OR circui** produces a pre when several 1 input signals a characteristics  
**OR gate**.  
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used semiconductor diode in modulation inversion has been between the conduction and s. Radiation is emitted in the combination across the band frequency modulation of the can be achieved by modulating current. Usually, the optical formed by cleaving or polishing faces of the diode crystal. Dimensions of the device are 0.1 x 0.5 mm. 2. A semiconductor carrying a high current in the direction. Radiation is produced combine with holes in the direction. For coherent emission, intensity must exceed a threshold of about 10,000 A/sq cm for diode diodes. 3. A solid-state device with at least one pn junction capable of emitting coherent or incoherent radiation under specified conditions. It operates as a resonant optical cavity known as a pn junction laser having at least one pn junction. Its energy level transition is between energy bands of valence and conduction bands and it can be tuned in frequency by temperature or pressure alteration or by the Zeeman effect of a magnetic field. 4. **Injection laser diode** — 1. A coherent light-emitting diode (LED) comprised of an injection junction area, end mirrors, and gap semiconductors, forming a Fabry-Pérot optical cavity. 2. In an injection laser diode, recombination takes place within the pn junction and light is emitted from the diode



Injection laser diode.

**Injection laser diode** — Abbreviated as injection laser diode. It is a running microwave oscillator that is typically in the range of 10 to 100 GHz. It is typically used in fiber optic communication systems. It is typically used in fiber optic communication systems. It is typically used in fiber optic communication systems.

of 70 to 30 dB below the output level of the ILO.

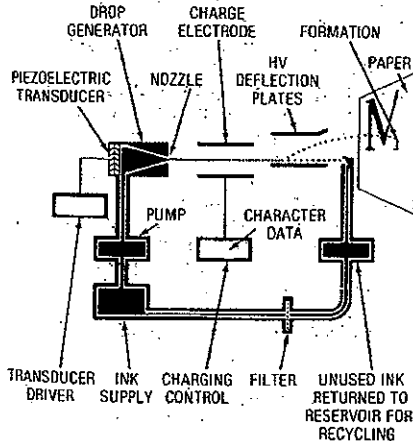
**Injection luminescent diode** — 1. A gallium arsenide diode, operating in either the laser or noncoherent mode, that can be used as a source of visible or near infrared light for use in triggering such devices as light-activated switches. 2. A semiconductor (gallium-arsenide) diode operating in either a coherent or incoherent mode that is used as a near-infrared or visible source in triggering light-activated devices.

**Injector** — An electrode on a capacitor.

**Ink** — 1. One of several conductive materials used for chip bonding, electrostatic shielding, corona shielding, making connections, repairing on printed circuits, attaching leads, adhesive work, ignition cable sheath coating, and making electrodes, contacts, terminations, surfaces, receptive to plating, etc. 2. Synonymous with "composition" and "paste" when relating to screenable thick-film materials, usually consisting of glass frit, metals, metal oxide, and solvents. 3. In hybrid technology, the conductive paste used on thick film materials to form the printed conductor pattern. Usually contains metals, metal oxide, glass frit, and solvent. 4. In thick film, composition of micrometer-size polycrystalline solids suspended in a thixotropic vehicle. The solids are chosen for their electrical characteristics (i.e., metals for conductives, metals and oxides for resistives, and glasses for glazes and dielectrics).

**Ink blending** — See blending.

**Ink-jet printer** — 1. A nonimpact printing technique which utilizes droplets of ink to form copy images. As the print head moves across the surface of the copy paper it shoots a stream of tiny, electro-



Ink-jet printer.

**Injection luminescent diode—input**

statically charged ink drops at the page, placing them precisely to form individual print characters. 2. An imprinting device that forms letters and numbers by electrostatically aiming a jet of ink onto the paper.

**Ink-mist recording** — Also called ink-vapor recording. In facsimile, electromechanical recording in which particles of an ink mist are deposited directly onto the record sheet.

**Ink recorder** — The ink-filled pen or capillary tube that produces a graphic record.

**Ink recording** — A type of mechanical facsimile recording in which an inked helix marks the record sheet.

**Ink-vapor recording** — See Ink-Mist Recording.

**Inleads** — Those portions of the electrodes of a device that pass through an envelope or housing.

**In-line heads** — See Stacked Heads.

**In-line procedures** — In COBOL, the procedural instructions that are part of the main sequential and controlling flow of the program.

**In-line processing** — The processing of data in random sequence not subject to preliminary sorting or editing.

**In-line subroutine** — A subroutine that is inserted directly into the linear operational sequence. Such a subroutine must be recopied at each point in a routine where it is needed.

**In-line tuning** — The method of tuning the intermediate-frequency strip of a superheterodyne receiver in which all the intermediate-frequency amplifier stages are made resonant to the same frequency.

**Inorganic electrolyte** — A solution that conducts electricity due to the presence of ions of substances not of organic origin.

**In phase** — Two waves of the same frequency that pass through their maximum and minimum values of like polarity at the same instant are said to be in phase.

**In-phase portion of the chrominance signal** — That portion of the chrominance signal having the same phase as, or exactly the opposite phase from, that of the subcarrier modulated by the I-signal. This portion of the chrominance signal may lead or lag the quadrature portion by 90 electrical degrees.

**Input** — 1. The current, voltage, power or other driving force applied to a circuit or device. 2. The terminals or other places where current, voltage, power, or driving force may be applied to a circuit or device. 3. Data to be processed. 4. The process of transferring data from an external computer storage to an internal storage. 5. The terminals, jack, or receptacle provided for the introduction of an electrical signal or electric power into a device or system.



**outconnector—output capacity**

“planned” when prescheduled, as for routine maintenance.

**outconnector**—In a flowchart, a connector indicating a point at which a flowline is broken to be continued at another point.

**outdoor antenna**—A receiving antenna located on an elevated site, outside a building.

**outdoor transformer**—A transformer of weatherproof construction.

**outer marker**—In an instrument-landing system, a marker located on a localizer course line at a recommended distance (normally about 4½ miles or 7.2 km) from the approach end of the runway.

**outgas**—The release of gas from a material over a period.

**outgassing**—1. A phenomenon in which a substance in a vacuum spontaneously releases absorbed and occluded constituents as vapors or gases. 2. De-aeration or other gaseous emission from a printed-board assembly (printed board, component or connector) when exposed to a reduced pressure or heat, or both.

**outlet**—1. The point where current is taken from a wiring system. 2. Convenience receptacle used for supplying power in the home, shop, or laboratory from power-company mains. 3. A point on the wiring system which can be tapped to provide electrical current for appliances or lights.

**outlet box**—Metal box which houses a switch or receptacle.

**outline drawing**—A drawing showing approximately overall shape, but no detail.

**out of phase**—1. Two or more waveforms that have the same shape, but do not pass through corresponding values at the same instant. 2. Relationship between periodic waves of the same frequency, but which do not pass through their maximum and minimum (or other corresponding) values at the same instant.

**out-of-service jack**—A jack, associated with a test jack, into which a shorted plug may be inserted to remove a circuit from service.

**outphaser**—In electronic organs, a circuit that changes a sawtooth wave to something approaching a square wave by adding to the sawtooth a second sawtooth of twice the frequency and half the amplitude in reverse phase, thus canceling the even harmonics.

**outphasing**—In electronic organs, a term applied to a method sometimes used for producing certain voices. Special circuitry, placed between the keying-system output and the formant filters, either adds or subtracts harmonics or subharmonics of the tone-generator signal.

**output**—1. The current, voltage, power, or driving force delivered by a circuit or

device. 2. The terminals or other places where the circuit or device may deliver the current, voltage, power, or driving force. 3. Information transferred from the internal to the secondary or external storage of a computer. 4. The electrical quantity, produced by a transducer, which is a function of the measurand. 5. Useful energy delivered. 6. The useful energy delivered by a circuit or device. Output can mean energy produced at the output terminals of an amplifier—a source of energy. 7. In logic circuits frequently used to mean a change in condition between conducting and nonconducting. (It is like calling the coil of a relay the input and the contacts the output.) 8. The signal level at the output of an amplifier or other device. 9. A port or set of terminals at which a system or component delivers useful energy or a useful signal. Also the energy or signal delivered. The useful signal delivered by a recorder using a particular type of tape, usually at an arbitrarily fixed level of harmonic distortion (1 or 3 percent) and relative to the performance of a tape with standard characteristics. 10. The transfer of information from an information process. 11. The act of providing information from a device to the outside world. Generally accompanied by a device that inputs the information being output by the first device.

**output amplifier**—A circuit that energizes high-power-level devices upon application of a low-power-level input signal.

**output axis**—The axis around which the spinning wheel of a gyroscope precesses after the wheel has received an input.

**output block**—1. In a computer, a portion of the internal storage reserved for holding data which is to be transferred out. 2. A block of computer words treated as a unit and intended to be transferred from internal storage to an external location. 3. A block used as an output buffer.

**output capability**—The intensity of the strongest signal that a device can put out without exceeding certain limits of overload distortion.

**output capacitance**—1. Of an  $n$ -terminal electron tube, the short-circuit transfer capacitance between the output terminal and all other terminals, except the input terminal, connected together. 2. The shunt capacitance at the output terminal of a device.

**output capacitive loading**—The maximum capacitance that can be placed on the output of an operational amplifier at unity gain without increasing the phase shift to the point of inducing oscillation. The limiting value increases in direct proportion to the closed-loop gain.

**output capacity**—The number of loads

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that can be driven by the output circuit.

**output device**—1. The part of a machine which translates the electrical impulse representing data processed by the machine into permanent results such as printed forms, punched cards, and magnetic writing on tape. 2. Any device as a solenoid, motor starter, etc., receives data from a programmable controller. 3. The unit of a computer, such as a card punch, that converts electrical signals into the form used by the output device, such as holes punched into a tape. **output equipment**—Equipment provides information in visible, audio or printed form from a computer.

**output gap**—An interaction gap which usable power can be extracted from an electron stream.

**output impedance**—1. The impedance measured at the output terminals of a transducer with the load disconnected and all impressed driving forces (including those connected to the input) taken as zero. 2. Also called dynamic output impedance. The impedance presented to the load. It is calculated from the ratio of the change in output voltage (at the prescribed terminals) to the change in load current causing the change. The impedance is specified in ohms dc to a stated maximum ac. 3. The impedance a device presents to its load.

**output indicator**—A meter or device that indicates variations in the signal strength at the output circuits.

**output limit**—The maximum output available when an operational amplifier is operated in the saturation region. **output load current**—The maximum current that the amplifier will deliver to a load. This rating includes the amount, however small, which is returned to the feedback loop.

**output meter**—An alternating-current voltmeter that measures the signal strength at the output of a receiver amplifier.

**output-meter adapter**—A device can be slipped over the plate prong of an output tube of a radio receiver to provide a conventional terminal to which an output meter can be connected and aligned.

**output offset voltage**—1. The difference between the dc voltages at the two output terminals (or at the output terminal and ground in an amplifier that has one output terminal) when both input terminals are grounded. 2. The output voltage of a negative-feedback op-amp circuit with the input voltage to the circuit is zero. The ideal op amp has zero output offset voltage.

**output port**—In a fluidic device, the point at which the output signal appears.

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bine with holes in the valence band. If an actual population inversion between portions of the valence and conduction bands (or between adjacent localized states of acceptors or donors near these bands) is achieved, stimulated emission and laser amplification or oscillation can take place. This is the radiation process of importance in injection lasers.

**recombination velocity**—On a semiconductor surface, the normal component of the electron (or hole) current density at the surface divided by the excess electron (or hole) charge density at the surface.

**reconditioned-carrier reception**—Also called exalted-carrier reception. Reception in which the carrier is separated from the sidebands in order to eliminate amplitude variations and noise, and then is increased and added to the sidebands in order to provide a relatively undistorted output. This method is frequently employed with a reduced-carrier signal-sideband transmitter.

**record**—1. A character or characters that are grouped together in the flow of data in a system; for example, one line of type of the contents of a punched card. A record may be of fixed length, as with punched cards, or of variable length, as with a line of type. 2. A group of related facts or fields of information handled as a unit; thus a listing of information, usually printed or in printable form. 3. The process of putting data into a computer storage device. 4. To preserve for later reproduction. 5. Relating to data that is treated as a unit of logical information. The delineation of a record may be arbitrary and determined by the designer of the information format. (A record may be recorded on all or part of a block or more than one block.) 6. A collection of related items of data (fields) treated as a unit.

**record changer**—1. A device which will automatically play a number of phonograph records in succession. 2. A type of automatic turntable capable of playing a number of records (usually 6 to 10) in sequence.

**record code**—A special control code used to mark the separation between adjacent records.

**record compensator**—Also called a record equalizer. An electrical network that compensates for different frequency-response curves in various recording techniques.

**recorded tape**—Also called a prerecorded tape. 1. A tape that contains music, dialogue, etc., and is sold to audiophiles and others for their listening pleasure. 2. A commercially available recorded tape.

**recorded value**—The value recorded by the marking device on a chart with reference to the division lines marked on the chart.

**recorded wavelength**—In a phonograph record, the length of groove required for a signal of given frequency to complete one cycle. At any particular distance from the record center, i.e., at a particular groove velocity, the recorded wavelength decreases with increasing frequency. Similarly for a given frequency, the recorded wavelength decreases with progress toward the record center (i.e., as groove velocity decreases).

**record equalizer**—See Record Compensator.

**recorder**—Also called recording instrument. 1. An instrument that makes a permanent record of varying electrical impulses—e.g., a code recorder, which punches code messages into a paper tape; a sound recorder, which preserves music and voices on disc, film, tape, or wire; a facsimile recorder, which reproduces pictures and text on paper; and a video recorder, which records television pictures on film or tape. 2. A device which makes a record of changes in varying electrical quantities or signals.

**record gap**—In a computer, a space between records on a tape. It is usually produced by acceleration or deceleration of the tape during the write operation.

**recording ammeter**—An ammeter that provides a permanent recording of the value of either an alternating or a direct current.

**recording blank**—See Recording Disc.

**recording channel**—One of several independent recorders in a recording system, or independent recording tracks on a recording medium.

**recording-completing trunk**—A trunk for the purpose of extending a connection from a local line to a toll operator; it is used for recording the call and completing the toll connection.

**recording curve**—See Equalization.

**recording demand meter**—Also called demand recorder. An instrument that records the average value of the load in a circuit during successive short periods.

**recording density**—The number of bits recorded per unit of length in a single linear track in a recording medium.

**recording disc**—Also called a recording blank (unrecorded) disc made for recording purposes.

**recording head**—A magnetic head that transforms electrical variations into magnetic variations for storage on magnetic media. (See also Cutter.) See art, p. 835.

**recording instrument**—Also called a recorder or graphic instrument. An instrument which makes a graphic record of the value of one or more quantities as a function of another variable (usually time).

**recording lamp**—A light source used in the variable-density system of sound recording on movie film. Its intensity varies

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