

IEEE 100

THE

AUTHORITATIVE

DICTIONARY

OF IEEE STANDARDS TERMS

SEVENTH EDITION



Published by
Standards Information Network
IEEE Press

IEEE 100 : the authoritative
dictionary of IEEE standards

SF REF
REF TK 9 .I28 2000

IEEE 100 : the authoritative
dictionary of IEEE standards

SF REF
REF TK 9 .I28 2000

NIXON PEABODY LLP
SAN FRANCISCO
CALIFORNIA

GAYLORD

IEEE 100 The Authoritative Dictionary of IEEE Standards Terms

Seventh Edition



Published by
Standards Information Network
IEEE Press

(2) The condition of information that has an enciphered summary appended to it that is used to ensure the integrity of the data, the authenticity of the originator, and the unambiguous relationship between the originator and the data.

(C/PA) 1328.2-1993w, 1326.2-1993w, 1224.2-1993w, 1327.2-1993w

signed binary arithmetic See: sign-magnitude arithmetic.

significance (1) (test, measurement, and diagnostic equipment) The value or weight given to a position, or to a digit in a position, in a positional numeration system. In most positional numeration systems positions are grouped in sequence of significance, usually more significant towards the left.

(MIL) [2]
(2) See also: weight.

significant (1) (binary floating-point arithmetic) The component of a binary floating-point number that consists of an explicit or implicit leading bit to the left of its implied binary point and a fraction field to the right. (C/MM) 754-1985r

(2) (mathematics of computing) The component of a floating-point number that consists of an explicit or implicit leading digit to the left of its implied radix point and a fraction field to the right. *Synonyms*: fixed-point part; mantissa. *Contrast*: exponent.

(C/MM) 854-1987r, 1084-1986w

significant (nuclear power generating station) Demonstrated to be important by the safety analysis of the station.

(PE/NP) 381-1977w, 308-1991I

Significant Event Evaluation and Information Network (SEE-IN) An information database maintained by the Institute of Nuclear Power Operations (INPO).

(PE/NP) 933-1999

significant aging mechanism An aging mechanism that, if in the normal and abnormal service environment, causes degradation during the installed life of the equipment that progressively and appreciably renders the equipment vulnerable to failure to perform its safety function(s) during design basis event conditions (DBE).

(PE/NP) 1205-1993

significant code A code that identifies a particular item and also yields further information about the properties or classification of the item. *Contrast*: nonsignificant code.

(C) 610.5-1990w

significant digit (1) (mathematics of computing) A digit that contributes to the accuracy or precision of a numeral. See also: least significant digit; most significant digit.

(C) [20], 610.5-1990w, 1084-1986w

(2) (metric practice) Any digit that is necessary to define a value or quantity.

(QUL) 268-1982s

(3) Any digit in a number that is necessary to define a numerical value.

(SCC14) SI 10-1997

significant-digit arithmetic A method of making calculations using a modified form of floating-point representation in which the number of significant digits in the result is determined by the number of significant digits in the operands, the operations performed, and the degree of precision available.

(C) 1084-1986w

significant figure* See: significant digit.

* Deprecated.

significant human interface An interface between personnel and equipment, facilities, software, or documentation, where the resulting human performance is a determinant in the achievement of system performance.

sign-magnitude arithmetic Computer arithmetic using numerals expressed in sign-magnitude notation. *Synonym*: signed binary arithmetic.

(C) 1084-1986w

sign-magnitude notation A numeration system in which the left-most bit is interpreted as the sign bit and the remaining bits represent the magnitude. *Contrast*: twos-complement notation.

(C) 1084-1986w

sign-off See: logoff.

sign-on See: login.

sign position The position at which the sign of a number is located.

(C) [20], [85], 1084-1986w

simple manual ground and test device A device with one or two terminal sets with provisions for connecting either terminal set through manually installed cables to the device ground connection system, complete with necessary isolation barriers and suitable interlocking. *Note*: Cables are synonymous with manually installed cords of any type.

(SWG/PE) C37.20.6-1997

simple message An MTM-Bus message that consists of no more than a HEADER and, optionally, an ACKNOWLEDGE/PACKET COUNT packet pair.

(TT/C) 1149.5-1995

simple network management protocol (SNMP) A protocol used for the management of network nodes and devices, used extensively on internet and other networks. The protocol provides for the communication of status and setup information between a management console and a managed device using values of objects defined in the management information base (MIB) for the managed object.

(C/MM) 1284.1-1997

simple parallel circuit A linear, constant-parameter circuit consisting of resistance, inductance, and capacitance in parallel. *Synonym*: simple GCL circuit. See also: network analysis.

(Std100) 270-1966w

simple path A path in which all vertices except the first and last in the sequence are distinct.

(C) 610.5-1990w

simple rectifier A rectifier consisting of one commutating group if single-way or two commutating groups if double-way. See also: rectification.

(IA) [62]

simple rectifier circuit A rectifier circuit consisting of one commutating group if single-way, or two commutating groups if double-way. See also: rectifier circuit element; rectification.

(IA) [12]

simple scanning (facsimile) Scanning of only one scanning spot at a time during the scanning process.

(ELM) C12.1-1982s

simple series circuit A resistance, inductance, and capacitance in series. See also: network analysis.

(Std100) 270-1966w

simple sine-wave quantity A physical quantity that is varying with time t as either $A \sin(\omega t + \theta_A)$ or $A \cos(\omega t + \theta_B)$ where A , ω , θ_A , θ_B are constants. (Simple denotes that A , θ_A , θ_B are constants.) *Notes*: 1. It is immaterial whether the sin or cos form is used, so long as no ambiguity or inconsistency is introduced. 2. A is the amplitude or maximum value, $\omega t + \theta_A$ (or $\omega t + \theta_B$) the phase, θ_A (or θ_B) the phase angle. However, when no ambiguity may arise, phase angle may be abbreviated phase. 3. In certain special applications, for example, modulation, $\omega t + \theta$ is called the angle (of a sine wave), (not phase angle) in order to clarify particular uses of the word "phase." Another permissible term for $(\omega t + \theta)$ is argument (sine wave).

(Std100) 270-1966w

simple sound source A source that radiates sound uniformly in all directions under free-field conditions.

(SP) [32]

simple target A target which can be represented by only one major scattering center so that its radar cross section is relatively insensitive to viewing aspect over small angular displacements. *Note*: Examples are a sphere or an object shorter than a half wavelength. Also called a point target.

(AES) 686-1997

simple thyristor converter A thyristor converter that consists of one commutating group.

(IA/IPC) 444-1973w

simple tone (A) (pure tone) A sound wave, the instantaneous sound pressure of which is a simple sinusoidal function of the time. (B) (pure tone) A sound sensation characterized by its singleness of pitch. *Note*: Whether or not a listener hears a tone as simple or complex is dependent upon the ability, experience, and listening attitude. See also: complex tone.

(SP) [32]

simplex (1) A communication channel that permits information transfer in one direction only. Duplex channels consist of two simplex channels simultaneously operating in opposing directions.

(SUB/PE) 999-1992w

(2) (local area networks) A link segment configuration capable of transferring signals in one direction only.

(C) 8802-12-1998

simplex channel (data transmission) (simplex operation) A method of operation in which communication between two stations takes place in one direction at a time. *Note*: This includes ordinary transmit-receive operation, press-to-talk operation, voice-operated carrier and other forms of manual or automatic switching from transmit to receive.

(PE) 599-1985w

simplex circuit (1) (data transmission) A circuit derived from a pair of wires by using the wires in parallel with ground return.

(PE) 599-1985w

(2) In networking, a circuit permitting the transmission of signals in one specific direction only. See also: four-wire circuit; leased circuit; channel; two-wire circuit; foreign exchange circuit; dial-up circuit.

(C) 610.7-1995

Simplex Fiber Optic Link Segment A single fiber path between two Medium Attachment Units (MAUs) or PHYs, including the terminating connectors, consisting of one or more fibers joined serially with appropriate connection devices, for example, patch cables and wall plates.

(C/LM) 802.3-1998

simplex lap winding (rotating machinery) A lap winding in which the number of parallel circuits is equal to the number of poles.

(PE) [9]

simplex link segment A path between two Medium Dependent Interfaces (MDIs), including the terminating connectors, consisting of one or more segments of twisted pair cable joined serially with appropriate connection devices, for example, patch cords and wall plates.

(C/LM) 802.3-1998

simplex operation (1) (radio transmitters) A method of operation in which communication between two stations takes place in one direction at a time. *Note*: This includes ordinary transmit-receive operation, press-to-talk operation, voice-operated carrier and other forms of manual or automatic switching from transmit to receive. See also: radio transmission; telegraphy.

(AP/BT/ANT) 145-1983s, 182-1961w

(2) See also: one-way-only operation.

(C) 610.7-1995

simplex signaling (telephone switching systems) A method of signaling over a pair of conductors by producing current flow in the same direction through both of the conductors.

(COM) 312-1977w

simplex supervision (telephone switching systems) A form of supervision employing simplex signaling.

(COM) 312-1977w

simplex transmission Transmission in which data is sent in one specific direction only. *Contrast*: duplex transmission; half-duplex transmission.

(C) 610.7-1995

simplex wave winding (rotating machinery) A wave winding in which the number of parallel circuits is two, whatever the number of poles.

(PE) [9]

simplicity (software) The degree to which a system or component has a design and implementation that is straightforward and easy to understand. *Contrast*: complexity.

(C) 610.12-1990

simply connected region (two-dimensional space) A region, such that any closed curve in the region encloses points all of which belong to the region.

(Std100) 270-1966w

simply mesh-connected circuit A circuit in which two, and only two, current paths extend from the terminal of entry of each phase conductor, one to the terminal of entry that precedes and the other to the terminal of entry that follows the first terminal in the normal sequence, and from which the amplitude of the voltages to the first terminal is normally the smallest (when the number of phases is greater than three). See also: network analysis.

(Std100) 270-1966w

SIMSCRIPT A high-order language designed for use in performing general-purpose digital simulations. *Note*: Allows for the description of a system in terms of its "attributes," which are properties associated with "entities," which are groups of "sets." See also: ECSS II.

(C) 610.13-1993w

SIMULA A general-purpose programming language based on ALGOL 60, with special features designed to aid the description and simulation of active processes.

(C) 610.13-1993w

(2) (electric power supply) Energy generated from water, as, wind, or other source which cannot be stored and which is beyond the immediate needs of the electric system producing the energy. (PE/PSE) 346-1973w

dump power Power generated from water, gas, wind, or other source that cannot be stored or conserved and that is beyond the immediate needs of the electric system producing the power. *See also:* generating station. (T&D/PE) [10]

dunnage material *See:* bunker material.

duodecimal (A) Pertaining to a characteristic or property involving a selection, choice, or condition in which there are twelve possibilities. (B) Pertaining to the numeration system with a radix of twelve. (C) [20], [85]

(2) (A) (mathematics of computing) Pertaining to a selection in which there are 12 possible outcomes. (B) (mathematics of computing) Pertaining to the numeration system with a radix of 12. (C) 1084-1986

duolater coil *See:* honeycomb coil.

duosexadecimal (A) Pertaining to a selection in which there are 32 possible outcomes. (B) Pertaining to the numeration system with a radix of 32. *Synonym:* duotricenary. (C) 1084-1986

duotricenary *See:* duosexadecimal.

duplex (1) A simultaneous, two-way, independent transmission in both directions. *Synonym:* full duplex. (SUB/PE) 999-1992w

(2) (data transmission) Pertaining to a simultaneous two-way independent transmission in both directions. (PE) 599-1985w

(3) A type of printing that involves the process of creating images or impressions on both sides of the printing media. (C/MM) 1284.1-1997

duplex artificial line (balancing network) A balancing network, simulating the impedance of the real line and distant terminal apparatus, that is employed in a duplex circuit for the purpose of making the receiving device unresponsive to outgoing signal currents. *See also:* telegraphy. (PE/EEC) [119]

duplex benchboard A combination assembly of a benchboard and a vertical control switchboard placed back to back and enclosed with a top and ends (not grille). Access space with entry doors is provided between the benchboard and vertical control switchboard. (SWG/PE) C37.100-1992, C37.21-1985r

duplex cable A cable composed of two insulated single-conductor cables twisted together. *Note:* The assembled conductors may or may not have a common covering of binding or protecting material. (T&D/PE) [10], 30-1937w

duplex channel A communications channel capable of simultaneous duplex communication. (C/LM) 802.3-1998

duplex circuit *See:* data circuit.

duplex current-limiting reactor A center tapped reactor used in two circuit branches fed by a common circuit and wound in such a way as to employ negative coupling under normal operating conditions to reduce circuit impedance and positive coupling under fault conditions to increase circuit impedance. (PE/TR) C57.16-1996

duplex data circuit A pair of associated transmit and receive channels that provide a means of two-way data communications. *See also:* virtual circuit. (C) 610.7-1995

duplexer (nonlinear, active, and nonreciprocal waveguide components) (radar) A device that utilizes the finite delay between the transmission of a pulse and the echo thereof so as to permit the connection of the transmitter and receiver to a common antenna. A duplexer commonly employs either a circulator and receiver protector or a balanced network of transmit-receive switches and a receiver protector. (MTT) 457-1982w

duplexing *See:* double storage.

duplexing assembly, radar *See:* transmit-receive switch.

duplex lap winding (rotating machinery) A lap winding in which the number of parallel circuits is equal to twice the number of poles. (PE) [9]

duplex operation (1) (data transmission) (A) (general) The operation of transmitting and receiving apparatus at one location in conjunction with associated transmitting and receiving equipment at another location; the processes of transmission and reception being concurrent. (B) (radio communication) (two-way radio communication circuit) The operation utilizing two radio-frequency channels, one for each direction of transmission, in such manner that intelligence may be transmitted concurrently in both directions. (AP/PE/VT/ANT) 145-1983s, 599-1985w, [37]

(2) A mode of operation of a data link or a data circuit in which data is transmitted in both directions simultaneously. (C) 610.7-1995

duplex signaling (telephone switching systems) A form of polar-duplex signaling for a single physical circuit. (COM) 312-1977w

duplex switchboard A control switchboard consisting of panels placed back to back and enclosed with a top and ends (not grille). Access space with entry doors is provided between the rows of panels. (SWG/PE) C37.100-1992, C37.21-1985r

duplex system A telegraph system that affords simultaneous independent operation in opposite directions over the same. *See also:* telegraphy. (EEC/PE) [119]

duplex transmission Transmission in which data may be sent simultaneously in both directions on a transmission medium. *Contrast:* half-duplex transmission; simplex transmission. (C) 610.7-1995

duplex type (breaker-and-a-half arrangement) A unit substation which has two stepdown transformers, each connected to an incoming high-voltage circuit. The outgoing side of each transformer is connected to a radial (stub-end) feeder. These feeders are joined on the feeder side of the power circuit breakers by a normally open-tie circuit breaker. (PE/TR) C57.12.80-1978r

duplex wave winding (rotating machinery) A wave winding in which the number of parallel circuits is four, whatever the number of poles. (PE) [9]

duplicate (data management) To copy data from a source to a destination that has similar physical form as the source. *Synonym:* reproduce. *See also:* copy. (C) 610.5-1990w

duplicate lines (power transmission) Lines of substantially the same capacity and characteristics, normally operated in parallel, connecting the same supply point with the same distribution point. *See also:* center of distribution. (T&D/PE) [10]

duplicate service (power transmission) Two services, usually supplied from separate sources, of substantially the same capacity and characteristics. *Note:* The two services may be operated in parallel on the consumer's premises, but either one alone is of sufficient capacity to carry the entire load. *See also:* loop service; dual service; service; emergency service. (T&D/PE) [10]

duplication check (1) A check based on the consistency of two independent performances of the same task. (C/EEC/IE) [20], [126]

(2) (data management) A check that requires that the results of two independent performances of the same operations be identical. (C) 610.5-1990w

duration (pulse terminology) The absolute value of the interval during which a specified waveform or feature exists or continues. (IM/WM&A) 194-1977w

duration of unscheduled interrupt The length of the delay caused by an unscheduled or unexpected interrupt. (PE/TR) C57.16-1996

dust-ignition-proof (class II locations) Enclosed in a manner that will exclude ignitable amounts of dusts or amounts that might affect performance or rating and that, where installed

and protected in accordance with this Code, will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure. (NEC/NESC) [86]

dust-ignition proof machine A totally enclosed machine whose enclosure is designed and constructed in a manner that will exclude ignitable amounts of dusts or amounts that might affect performance or rating, and that, when installation and protection are in conformance with the National Electrical Code (ANSI C1-1975; section 502-1), will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specific dust on or in the vicinity of the enclosure. *See also:* asynchronous machine. (PE/IA/APP) [9], [82]

dustproof (1) (general) So constructed or protected that the accumulation of dust will not interfere with successful operation. *See also:* luminaire. (SWG/PE/IA/NP/IA/C) C37.30-1971s, 308-1980s, [60]

(2) (enclosure) An enclosure so constructed or protected that any accumulation of dust that may occur within the enclosure will not prevent the successful operation of, or cause damage to, the enclosed equipment. (IA/MT) 45-1983s

(3) (luminaire) Luminaire so constructed or protected that dust will not interfere with its successful operation. *See also:* luminaire. (EEC/IE) [126]

(4) So constructed or protected that dust will not interfere with its successful operation. (NESC/NEC) [86]

dustproof enclosure An enclosure so constructed or protected that any accumulation of dust that may occur within the enclosure will not prevent the successful operation of, or cause damage to, the enclosed equipment. (IA/MT) 45-1998

dust seal (rotating machinery) A sealing arrangement intended to prevent the entry of a specified dust into a bearing. *See also:* direct-current commutating machine; asynchronous machine. (PE) [9]

dust-tight enclosure (1) (electric installations on shipboard) An enclosure constructed so that dust cannot enter the enclosing case. (SWG/PE) C37.30-1971s

(2) An enclosure constructed so that dust cannot enter. (IA/MT) 45-1998

(3) (power and distribution transformers) An enclosure so constructed that dust will not enter the enclosing case under specified conditions. (NESC/SWG/EEC/IE/PE/TR) [126], C57.12.80-1978r, [86], C37.100-1981s

duty (1) (general) A statement of loads including no-load and rest and de-energized periods, to which the machine or apparatus is subjected including their duration and sequence in time. (PE) [9]

(2) (rating of electric equipment) A statement of the operating conditions to which the machine or apparatus is subjected, their respective durations, and their sequence in time. (Std100/EI) 96-1969w, [83]

(3) (power and distribution transformers) A requirement of service that defines the degree of regularity of the load. (PE/ICTL/TR) C57.12.80-1978r

(4) (excitation systems) Those voltage and current loadings imposed by the synchronous machine upon the excitation system including short circuits and all conditions of loading. *Note:* The duty will include the action of limiting devices to maintain synchronous machine loading at or below that defined by American National Standard Requirements for Cylindrical Rotor Synchronous Generators. (REM/IM/WM&A) C50.13-1965s, 181-1977w

(5) A requirement of service that defines the degree of regularity of the current through the reactor. (PE/TR) C57.16-1996

duty continuous (thyristor converter) A duty where the converter equipment carries a direct current of fixed value for an interval sufficiently long for the components of the converter

to reach equilibrium temperatures corresponding to the said value of current. (IA/IPC) 444-1973w

duty cycle (1) (general) The time interval occupied by a device on intermittent duty in starting, running, stopping, and idling. (AP/ANT) 145-1983s

(2) (rotating machinery) A variation of load with time which may or may not be repeated, and in which the cycle time is too short for thermal equilibrium to be attained. *See also:* asynchronous machine. (PE) [9]

(3) (pulse systems) The ratio of the sum of all pulse durations to the total period, during a specified period of continuous operation. *See also:* navigation. (AES) [42]

(4) (welding) The percentage of the time during which the welder is loaded. For instance, a spot welder supplied by a 60-Hertz system (216 000 cycles per hour) making four hundred 15-cycle welds per hour would have a duty cycle of 2.8 percent (400 multiplied by 15, divided by 216 000, multiplied by 100). A seam welder operating 2 cycles "on" and 2 cycles "off" would have a duty cycle of 50 percent. (NESC/NEC) [86]

(5) (large lead storage batteries) The load currents a battery is expected to supply for specified time periods. (PE/EDPG) 450-1995, 1115-1992, 485-1983s

(6) The ratio of the sum of all pulse durations to the total period during a specified period of continuous operation. (PEL/ET) 388-1992r

(7) A prescribed sequence of operations for a specific time with specified time intervals between sequences. (SWG/PE) C37.100-1992

(8) (of a valve actuator motor) The duty cycle of a valve actuator motor (VAM) consists of the number of consecutive valve strokes required for the valve's intended service. Plant operation or testing may require successive stroking of the VAM. (PE/NP) 1290-1996

(9) The ratio of the active or ON time within a specified period to the duration of the specified period. *Note:* For a pulsed radar, the ratio of transmitted pulse width to pulse repetition interval. (AES) 686-1997

(10) (radar) *See also:* duty factor.

duty-cycle rating (rotating machinery) The statement of the loads and conditions assigned to the machine by the manufacturer, at which the machine may be operated on duty cycles. *See also:* asynchronous machine. (PE) [9]

duty cycle test A test to determine if a device can repeatedly function, extinguish follow current, and avoid thermal runaway. (PE) C62.34-1996

duty cycle time [of a valve actuator motor (VAM)] A VAM's duty cycle time is the time for one stroke multiplied by the duty cycle. (PE/NP) 1290-1996

duty-cycle voltage rating The designated maximum permissible voltage between its terminals at which an arrester is designed to perform its duty cycle. (SPD/PE) C62.11-1999

duty factor (1) (pulse techniques) The ratio of the pulse duration to the pulse period of a periodic pulse train. *See also:* pulse carrier; pulse. (COM) [25]

(2) (electron tube) The ratio of the ON period to the total period during which an electronic valve or tube is operating. *See also:* pulse; ON period. (Std100) [84]

(3) (automatic control) The ratio of working time to the time taken for the complete sequence of a duty cycle. (PE/EDPG) [3]

(4) (waveguide) The ratio of the average power to the peak pulse power passing through the transverse section of the waveguide. *Synonym:* duty cycle. (MTT) 146-1980w

(5) The ratio of pulse duration to the pulse period of a periodic pulse train. A duty factor of 1.0 corresponds to continuous-wave (CW) operation. (NIR) C95.1-1999

(6) *See also:* duty cycle. (AES) 686-1997

duty factor control system (automatic control) A control system in which the signal to the final controlling element consists of periodic pulses whose duration is varied to relate, in some prescribed manner, the time average of the signal to the

gyromagnetic filter (nonlinear, active, and nonreciprocal waveguide components) (garnet, YIG) A filter whose operation depends on the gyromagnetic effect.

(MTT) 457-1982w

gyromagnetic limiter (nonlinear, active, and nonreciprocal waveguide components) (ferrite, garnet, YIG) A power limiter whose operation depends on saturation effects in a gyromagnetic material.

(MTT) 457-1982w

gyromagnetic material (nonlinear, active, and nonreciprocal waveguide components) (medium) A material (medium), such as ferrite or garnet, capable of exhibiting the gyromagnetic effect.

(MTT) 457-1982w

gyromagnetic permeability tensor (nonlinear, active, and nonreciprocal waveguide components) A tensor used to describe the permeability properties exhibited by a gyromagnetic material, appropriate to electromagnetic wave propagation.

(MTT) 457-1982w

gyromagnetic resonance absorption (nonlinear, active, and nonreciprocal waveguide components) That amount of power continuously absorbed in a gyromagnetic material subjected to a magnetostatic field when a disturbance causes a steady precession of the magnetization of that material at a

rate near the gyromagnetic resonance frequency.

(MTT) 457-1982w

gyromagnetic resonance field (nonlinear, active, and nonreciprocal waveguide components) The magnetostatic field that, when applied to a gyromagnetic material, causes gyromagnetic resonance to occur at a particular frequency.

(MTT) 457-1982w

gyromagnetic resonance frequency (nonlinear, active, and nonreciprocal waveguide components) The damped natural frequency for precession of the magnetization of a gyromagnetic material subjected to a particular magnetostatic field.

(MTT) 457-1982w

gyromagnetic resonance linewidth (nonlinear, active, and nonreciprocal waveguide components) The difference between magnetostatic field levels slightly above and slightly below gyromagnetic resonance for which the gyromagnetic resonance absorption falls to half the peak value. This resonance occurs in a gyromagnetic material with uniformly precessing magnetization at a fixed frequency.

(MTT) 457-1982w

gyro operating null (dynamically tuned gyro) The condition where minimum change in drift rate occurs due to changes in wheel speed.

(AES/GYAC) 528-1994

H See: H beacon.

HAL (A) A high-order problem-oriented language used in aerospace applications; characterized by its strong orientation toward mathematical computations and built-in vector/matrix arithmetic. **(B)** Abbreviation for High-order Ada Language; a computer language similar to Ada. (C) 610.13-1993

halation (cathode-ray tubes) An annular area surrounding a spot, that is due to the light emanating from the spot being reflected from the front and rear sides of the face plate. *See also:* cathode-ray tube. (Std100) [84]

half-adder A combinational logic element having two outputs, *S* and *C*, and two inputs, *A* and *B*, such that the outputs are related to the inputs according to the following equations:

S = AORB (exclusive OR)

C = *A* + *B*

S denotes sum without carry, *C* denotes carry. Two half-adders may be used for performing binary addition.

(C) [20]

half adder An adder that accepts two inputs, producing a sum and a carry as outputs according to the table below. *Synonym:* two-input adder. *Contrast:* quarter adder; full adder. *See also:* half subtracter.

input #1	0	0	1	1
input #2	0	1	0	1
output sum	0	1	1	0
output carry	0	0	0	1

half adder

(C) 610.10-1994w

half-adjust (mathematics of computing) To round a number by changing the least significant digit to zero and adding one to the next digit if the value of the least significant digit was half the radix or greater. (C) 1084-1986w

half-amplitude recovery time The time interval from the start of a full-amplitude pulse to the instant a succeeding pulse can attain an amplitude of 50% of the maximum amplitude of a full-amplitude pulse. (NI/NPS) 309-1999

half carry (mathematics of computing) A carry process in which a carry digit generated in the most significant digit place of the less-significant half of a sum is transferred to the least significant digit place of the more significant half.

(C) 1084-1986w

half cell An electrode immersed in a suitable electrolyte. *See also:* electrolytic cell. (EEC/PE) [119]

half coil *See:* armature bar.

half duplex (1) (data transmission) Pertaining to a transmission over a circuit capable of transmitting in either direction, but only one direction at a time. (COM/PE) 599-1985w

(2) Transmission over a circuit capable of transmitting in either direction, but only in one direction at a time. *Contrast:* duplex. (SUB/PE) 999-1992w

(3) A mode of operation of a CSMA/CD local area network (LAN) in which DTEs contend for access to a shared medium. Multiple, simultaneous transmissions in a half duplex mode CSMA/CD LAN result in interference, requiring resolution by the CSMA/CD access control protocol. (C/LM) 802.3-1998

(4) (local area networks) A link segment capable of transferring signals in either direction along the link, but not in both directions simultaneously. Requires line turnaround to change signal direction. (4-UTP links are full duplex in control mode, but only half duplex in data mode.). (C) 8802-12-1998

(5) An operating condition that allows communication in either send and receive directions with more than 20 dB switched loss in either direction. (COM/TA) 1329-1999

H

half-duplex channel (data transmission) (half duplex operation) A channel of a duplex system arranged to permit operation in either direction but not in both directions simultaneously. (PE) 599-1985w

half-duplex operation (telegraph system) Operation of a duplex system arranged to permit operation in either direction but not in both directions simultaneously. *See also:* telegraphy. (EEC/PE) [119]

half-duplex repeater A duplex telegraph repeater provided with interlocking arrangements that restrict the transmission of signals to one direction at a time. *See also:* telegraphy. (EEC/PE) [119]

half-duplex transmission Transmission in which data may be sent in either direction but only in one direction at a time on a transmission medium. *Contrast:* simplex transmission; duplex transmission. (C) 610.7-1995

half-height disk drive A disk drive that uses the same width, but approximately one-half the front panel height as a standard disk drive, known as a full-height disk drive. (C) 610.10-1994w

half-power beamwidth In a radiation pattern cut containing the direction of the maximum of a lobe, the angle between the two directions in which the radiation intensity is one-half the maximum value. *See also:* principal half-power beamwidths. (AP/ANT) 145-1993

half section A bisected tee or pi section. A basic L-section building block of image-parameter filters. (CAS) [13]

half subtracter A subtracter that accepts two inputs, producing a sum and a borrow digit as output according to the table below. *Contrast:* full subtracter. *See also:* half adder.

input #1	0	0	1	1
input #2	0	1	0	1
output sum	0	1	1	0
output carry	0	1	0	0

half subtracter

(C) 610.10-1994w

halftone characteristic (facsimile) A relation between the density of the recorded copy and the density of the subject copy. *Note:* The term may also be used to relate the amplitude of the facsimile signal to the density of the subject copy or the record copy when only a portion of the system is under consideration. In a frequency-modulation system an appropriate parameter is to be used instead of the amplitude. *See also:* recording. (COM) 168-1956w

halftones *See:* level; storage tube.

halftoning (computer graphics) A technique for displaying an image with many gray levels on a monochrome display device in which the gray levels are approximated by variable-sized black and white dots. *See also:* dithering.

(C) 610.6-1991w

half-wave dipole A wire antenna consisting of two straight collinear conductors of equal length, separated by a small feeding gap, with each conductor approximately a quarter-wavelength long. *Note:* This antenna gets its name from the fact that its overall length is approximately a half-wavelength. In practice, the length is usually slightly smaller than a half-wavelength—enough to cause the input impedance to be pure real (*jX* = 0). (AP/ANT) 145-1993

half-wave rectification (power supplies) In the rectifying process, half-wave rectification passes only one-half of each incoming sinusoid, and does not pass the opposite half-cycle. The output contains a single half-sine pulse for each input cycle. A single rectifier provides half-wave rectification. Because of its poorer efficiency and larger alternating-current component, half-wave rectification is usually employed in

front contact (1) (general) A part of a relay against which, when the relay is energized, the current-carrying portion of the movable neutral member is held so as to form a continuous path for current. *See also:* a contact.

(2) **(relay systems)** A contact that is closed when the relay is picked up. *Synonym:* a contact. (PE/PSR) C37.90-1978s

(3) **(utility-consumer interconnections)** A contact that is open when the relay is deenergized. (PE/PSR) C37.95-1973s

front end (communication satellite) The first stage of amplification or frequency conversion immediately following the antenna in a receiving system. (COM) [24]

frontend Pertaining to one part of a process which has two parts, the frontend and the backend; the frontend usually denotes what the user sees and the backend denotes some special process. *Contrast:* backend; frontend. *See also:* backend computer. (C) 610.10-1994w

front end computer A communications computer associated with a host computer. It may perform line control, message handling, code conversion, error control and applications functions such as control and operation of special purpose terminals. *See also:* communications computer. (LM/COM) 168-1956w

front-end computer A computer that interfaces between a group of terminals, communication links, and a host computer and performs communications, error checking code conversion, and other special purpose functions. *Synonym:* front-end processor. *Contrast:* backend computer. *See also:* communications computer. (C) 610.7-1995, 610.10-1994w

front-end processor *See:* front-end computer.

front-of-wave impulse sparkover voltage The impulse sparkover voltage with a wavefront that rises at a uniform rate and causes sparkover on the wavefront. (SPD/PE) C62.11-1999

front-of-wave lightning impulse test (power and distribution transformers) A voltage impulse, with a specified rate-of-rise, that is terminated intentionally by sparkover of a gap that occurs on the rising front of the voltage wave with a specified time to sparkover, and a specified minimum crest voltage. Complete front-of-wave tests (transformer) involve application of the following sequence of impulse waves: one reduced full wave; two front-of-waves; two chopped waves; one full wave. (PE/TR) C57.12.80-1978r

front-of-wave lightning impulse voltage shape A voltage impulse, with a specified rate-of-rise, that is terminated intentionally by sparkover of a gap that occurs on the rising front of the voltage wave with a specified time to sparkover, and a specified minimum crest voltage. (PE/C) 1313.1-1996

front pitch (rotating machinery) The coil pitch at the connection end of a winding (usually in reference to a wave winding). (PE) [9]

front porch (television) The portion of a composite picture signal that lies between the leading edge of the horizontal blanking pulse and the leading edge of the corresponding synchronizing pulse. *See also:* television. (BT/AV) [34]

front relay contacts Sometimes used for relay contacts, normally open. (EEC/REE) [87]

front-to-back ratio (1) (general) The ratio of the directivity of an antenna to directive gain in a specified direction toward the back. [35]

(2) **(data transmission)** For a directional antenna, the ratio of its effectiveness toward the front to its effectiveness toward the back. (PE) 599-1985w

(3) The ratio of the maximum directivity of an antenna to its directivity in a specified rearward direction. *Notes:* 1. This definition is usually applied to beamtype patterns. 2. If the rearward direction is not specified, it shall be taken to be that of the maximum directivity in the rearward hemisphere relative to the antenna's orientation. (AP/ANT) 145-1993

FRS *See:* fragility response spectrum.

FRU *See:* field replaceable unit.

fruit *See:* fruit pulse.

fruit pulse A pulse reply received as the result of interrogation of a transponder by interrogators not associated with the responder in question. *Synonym:* fruit. (IM/WM&A) 194-1977w

F scan *See:* F-display.

F-scope A cathode-ray oscilloscope arranged to present an F-display. (AES/RS) 686-1990

FSK *See:* frequency shift keying.

fsm *See:* finite state machine.

FS to AM converter *See:* facsimile receiving converter.

FTAM regime The initial regime negotiated between a pair of FTAM ASEs, within which a series of file selection regimes may be established to select or create individual files. (C/PA) 1238.1-1994w

FTC circuit *See:* fast-time-constant circuit.

FTP *See:* file transfer protocol.

F2 layer The single ionized layer normally existing in the F region in the night hemisphere and the higher of the two layers normally existing in the F region in the day hemisphere. *See also:* F region. (AP/PROP) 211-1997

F2V A transaction that is originated at the Futurebus+ (the Bridge acts as a Futurebus+ slave), and has its destination at the VME64 (the Bridge acts as a VME64 master). (C/BA) 1014.1-1994w

F-type connector A 75-Ω connector used to connect coaxial cable to equipment. (LM/C) 802.7-1989r

fuel (fuel cells) A chemical element or compound that is capable of being oxidized. *See also:* electrochemical cell. (AES/IA/APP) [41], [73]

fuel adjustment clause (electric power utilization) (power operations) A clause in a rate schedule that provides for adjustment of the amount of the bill as the cost of fuel varies from a specified base amount per unit. (PE/PSE) 858-1987s, 346-1973w

fuel-and-oil quantity electric gauge A device that measures, by means of bridge circuits and an indicator with separate pointers and scales, the quantity of fuel and oil in the aircraft tanks. (EEC/PE) [119]

fuel battery An energy-conversion device consisting of more than one fuel cell connected in series, parallel, or both. *See also:* fuel cell. (AES/IA/APP) [41], [73]

fuel-battery power-to-volume ratio The kilowatt output per envelope volume of the fuel battery (exclusive of the fuel, oxidant, storage, and auxiliaries). *See also:* fuel cell. (AES/IA/APP) [41], [73]

fuel-battery power-to-weight ratio The kilowatt output per unit weight of the fuel battery (exclusive of the fuel, oxidant, storage, and auxiliaries). *See also:* fuel cell. (AES/IA/APP) [41], [73]

fuel cell An electrochemical cell that can continuously change the chemical energy of a fuel and oxidant to electric energy by an isothermal process involving an essentially invariant electrode-electrolyte system. (AES/IA/APP) [41], [73]

fuel-cell Coulomb efficiency The ratio of the number of electrons obtained from the consumption of a mole of the fuel to the electrons theoretically available from the stated reaction.

$$\text{Coulomb efficiency} = \frac{\int_0^{t_m} i dt}{nF} \times 100$$

where

t_m = time required to consume a mole of fuel

i = instantaneous current

n = number of electrons furnished in the stated reaction by the fuel molecule

F = Faraday's constant = 96485.3 ± 10.0 absolute joules per absolute volt gram equivalent

See also: fuel cell.

(AES/IA/APP) [41], [73]

fuel-cell standard voltage (at 25°C) The voltage associated with the stated reaction and determined from the equation

$$E^0 = \frac{-J\Delta G^0}{nF}$$

where

E^0 = fuel-cell standard voltage

J = Joule's equivalent = 4.1840 absolute joules per calorie

ΔG^0 = standard free energy changes in kilocalories/mole of fuel

n = number of electrons furnished in the stated reaction by the fuel molecule

F = Faraday's constant = 96485.3 ± 10.0 absolute joules per absolute volt gram equivalent

See also: fuel cell.

(AES/IA/APP) [41], [73]

fuel-cell system An energy conversion device consisting of one or more fuel cells and necessary auxiliaries. *See also:* fuel cell. (AES/IA/APP) [41], [73]

fuel-cell-system energy-to-volume ratio The kilowatt-hour output per displaced volume of the fuel-cell system (including the fuel, oxidant, and storage). *See also:* fuel cell. (AES/IA/APP) [41], [73]

fuel-cell-system energy-to-weight ratio The kilowatt-hour output per unit weight of the fuel-cell system (including the fuel, oxidant, and storage). *See also:* fuel cell. (AES/IA/APP) [41], [73]

fuel-cell-system power-to-volume ratio The kilowatt output per displaced volume of the fuel-cell system (exclusive of the fuel, oxidant, and storage). *See also:* fuel cell. (AES/IA/APP) [41], [73]

fuel-cell-system power-to-weight ratio The kilowatt output per unit weight of the fuel-cell system (exclusive of the fuel, oxidant, and storage). *See also:* fuel cell. (AES/IA/APP) [41], [73]

fuel-cell-system standard thermal efficiency The efficiency of a system made up of a fuel cell and auxiliary equipment. *Note:* This efficiency is expressed as the ratio of 1) the electric energy delivered to the load circuit to 2) the enthalpy change for the stated cell reaction.

$$\text{thermal efficiency} = \frac{\int_0^{t_m} (E_{IL} \times i_L) dt}{\Delta H^0}$$

where

t_m = time required to consume a mole of fuel

E_{IL} = fuel-cell-system working voltage

i_L = instantaneous current into the load

ΔH^0 = enthalpy change for the stated cell reaction at standard conditions

See also: fuel cell.

(AES/IA/APP) [41], [73]

fuel-cell working voltage The voltage at the terminals of a single fuel-cell delivering current into system auxiliaries and load. *See also:* fuel cell. (AES/IA/APP) [41], [73]

fuel-control mechanism (gas turbines) All devices, such as power-amplifying relays, servomotors, and interconnections required between the speed governor and the fuel-control valve. *See also:* speed-governing system. (PE/EDPG) 282-1968w, [5]

fuel-control system (gas turbines) Devices that include the fuel-control valve and all supplementary fuel-control devices and interconnections necessary for adequate control of the fuel entering the combustion system of the gas turbine. *Note:* The supplementary fuel-control devices may or may not be directly actuated by the fuel-control mechanism. *See also:* speed-governing system. (PE/EDPG) 282-1968w, [5]

fuel-control valve (gas turbines) A valve or any other device operating as a final fuel-metering element controlling fuel input to the gas turbine. *Notes:* 1. This valve or device may be directly or indirectly controlled by the fuel-control mechanism. 2. Variable-displacement pumps, or other devices that

operate as the final fuel-control element in the fuel-control system, and that control fuel entering the combustion system are fuel-control valves. *See also:* speed-governing system. (PE/EDPG) [5], 282-1968Dw

fuel economy The ratio of the chemical energy input to a generating station to its net electric output. *Note:* Fuel economy is usually expressed in British thermal units per kilowatthour. *See also:* generating station. (T&D/PE) [10]

fuel elements, nuclear *See:* nuclear fuel elements.

fuel-pressure electric gauge A device that measures the fuel pressure (usually in pounds per square inch) at the carburetor of an aircraft engine. *Note:* It provides remote indication by means of a self-synchronous generator and motor. (EEC/PE) [119]

fuel replacement energy (1) (power operations) Energy generated to substitute for energy which would otherwise have been generated by a different fuel source. (PE/PSE) 858-1987s

(2) Energy generated at a hydroelectric plant as a substitute for energy which would otherwise have been generated by a thermal-electric plant. (T&D/PE/PSE) 346-1973w

fuel reprocessing, nuclear *See:* nuclear fuel reprocessing.

fuel stop valve (gas turbines) A device that, when actuated, shuts off all fuel flow to the combustion system, including that provided by the minimum fuel limiter. *See also:* speed-governing system. (PE/EDPG) 282-1968w, [5]

fulguration *See:* electrodesiccation.

full adder An adder that accepts three inputs (two operands and a carry digit), producing a sum and a carry as outputs according to the table below. *Synonym:* three-input adder. *Contrast:* quarter adder; half adder. *See also:* full subtracter.

input #1	0	0	1	1	0	0	1	1
input #2	0	1	0	1	0	1	0	1
input carry	0	0	0	0	1	1	1	1
output sum	0	1	1	0	1	0	0	1
output carry	0	0	0	1	0	1	1	1

full adder

(C) 610.10-1994w

full automatic plating Mechanical plating in which the cathodes are automatically conveyed through successive cleaning and plating tanks. (EEC/PE) [119]

full availability (telephone switching systems) Availability that is equal to the number of outlets in the desired group. (COM) 312-1977w

full backup To perform a backup in which all data within a system is stored on the backup copy. *Contrast:* incremental backup. (C) 610.5-1990w

full binary tree *See:* complete binary tree.

full data transport address The combination of a *functional address* and a *channel address*, that specifies whether data is being read or written, to which function, and to which channel. (IM/ST) 1451.2-1997

full-direct trunk group (telephone switching systems) A full trunk group between end offices. (COM) 312-1977w

full duplex (1) (communication circuits) (telecommunications) (data transmission) Method of operation where each end can simultaneously transmit and receive. *Note:* Refers to a communications system or equipment capable of transmission simultaneously in two directions. (PE) 599-1985w

(2) A mode of operation of a network, DTE, or Medium Attachment Unit (MAU) that supports duplex transmission as defined in IEEE Std 100-1996. This mode of operation allows for simultaneous communication between a pair of stations, provided that the Physical Layer is capable of supporting simultaneous transmission and reception without interference. (C/LM) 802.3-1998

(3) **(local area networks)** A link segment capable of transferring signals in both directions simultaneously. (C) 8802-12-1998

(4) An operating condition which allows simultaneous communication in both send and receive directions with 3 dB or less switched loss in either direction.

(COM/TA) 1329-1999

full-duplex operation (local area networks) A mode of operation in a network link that supports duplex transmission as defined in IEEE Std 610.7-1995. (C) 802.12c-1998

full duplex transmission See: duplex transmission.

full-energy peak (1) A peak in the spectrum resulting from the complete (total) absorption of a photon of a given energy in the active volume of the Ge crystal and the collection of all of the resulting charge. (NI) N42.14-1991

(2) The peak in a pulse height spectrum that corresponds to total absorption of a gamma photon in the NaI(Tl) detector. (NI) N42.12-1994

(3) (for a monoenergetic photon spectrum for a semiconductor spectrometer system) The distribution of events within the peak of the pulse-height distribution spectrum representing response to the monoenergetic photon source. *Note:* Notwithstanding other definitions or procedures for subtracting background and other distortions, the full energy peak intensity is defined as not including any events that exceed a Gaussian distribution by more than a factor of two σ .

(NPS/NID) 759-1984r

full energy peak efficiency (1) (x-ray energy spectrometers) (of a semiconductor radiation detector) The ratio of the number of events in the full energy peak of the spectral distribution to the total number of photons incident on the active detector volume during the same time interval.

(NPS/NID) 759-1984r

(2) The ratio between the number of counts in the net area of the full-energy peak to the number of photons of that energy emitted by a source with specified characteristics for a specified source-to-detector distance. (NI) N42.14-1991

full field In a propulsion system, the motor connection having all of its basic functions performed by devices that are operated by electromagnets. (IA/MT) 45-1998

full-field relay A relay that functions to maintain full field excitation of a motor while accelerating on reduced armature voltage. *See also:* relay. (IA/ICTL/IAC) [60]

full float (constant potential) operation Operation of a dc system with the battery, battery charger, and load all connected in parallel and with the battery charger supplying the normal dc load plus any self-discharge or charging current, or both, required by the battery. (The battery will deliver current only when the load exceeds the charger output.) (PE/EDPG) 1115-1992

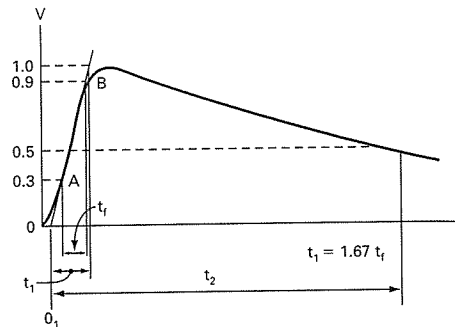
full float operation Operation of a dc system with the battery, battery charger, and load all connected in parallel and with the battery charger supplying the normal dc load plus any charging current required by the battery. (The battery will deliver current only when the load exceeds the charger output.) (SCC29) 485-1997

full functional dependency A functional dependency in which no attribute of the determinant can be omitted without voiding the dependent condition. (C) 610.5-1990w

full-height disk drive A disk drive that requires the whole height of the front panel of a standard computer cabinet bay. *Note:* Approximately 3.5 in, a full-height disk drive is twice the size of a half-height disk drive. (C) 610.10-1994w

Full Implementation Refers to the implementation of an operation on an Object. A Full Implementation means that all the referenced visible functionality of the operation is implemented as specified for the operation. (IM/ST) 1451.1-1999

full impulse voltage An aperiodic transient voltage that rises rapidly to a maximum value and falls, usually less rapidly, to zero. *See also:* full-wave voltage impulse.



full impulse voltage

(PE/PSIM) 4-1978s

full-impulse wave (surge arresters) An impulse wave in which there is no sudden collapse. (PE) [8], [84]

full justification In text formatting, justification resulting in even margins on both the left and right margins. (C) 610.2-1987

full lightning impulse A lightning impulse not interrupted by any type of discharge. (PE/PSIM) 4-1995

full load (test, measurement, and diagnostic equipment) The greatest load that a circuit is designed to carry under specific conditions: any additional load is overload. (ML/PE) [2], 599-1985w

full-load speed (electric drive) The speed that the output shaft of the drive attains with rated load connected and with the drive adjusted to deliver rated output at rated speed. *Note:* In referring to the speed with full load connected and with the drive adjusted for a specified condition other than for rated output at rated speed, it is customary to speak of the full-load speed under the (stated) conditions. *See also:* electric drive. (IA/ICTL/IAC) [60]

full magnetic controller An electric controller having all of its basic functions performed by devices that are operated by electromagnets. (IA/MT) 45-1998

full-page display device A display device that can display the contents of a full 8.5×11 in page at one time. (C) 610.10-1994w

full-pitch winding (rotating machinery) A winding in which the coil pitch is 100%; that is, equal to the pole pitch. *See also:* direct-current commutating machine; asynchronous machine. (PE) [9]

full range (accelerometer) (gyros) The algebraic difference between the upper and lower values of the input range. (AES/GYAC) 528-1994

full-range current-limiting fuse A fuse capable of interrupting all currents from the rated interrupting current down to the minimum continuous current that causes melting of the fusible element(s), with the fuse applied at the maximum ambient temperature specified by the fuse manufacturer. (SWG/PE) C37.40-1993

full scale In an analog computer, the nominal maximum value of a computer variable or the nominal maximum value at the output of a computing element. *Note:* Sometimes used to indicate the entire computing voltage range, for example, 20 V is full scale for a computer whose voltages ranges from +10 V to -10 V. (C) 610.10-1994w, 165-1977w

full scale input (accelerometer) (gyros) The maximum magnitude of the two input limits. (AES/GYAC) 528-1994

full-scale range The difference between the maximum and the minimum recordable input values as specified by the manufacturer. (IM/WM&A) 1057-1994w

full-scale signal A signal that spans the entire manufacturer's specified amplitude range of the instrument. (IM/WM&A) 1057-1994w

full-scale value (1) The largest value of the actuating electrical quantity that can be indicated on the scale or, in the case of instruments having their zero between the ends of the scale, the full-scale value is the arithmetic sum of the values of the

actuating electrical quantity corresponding to the two ends of the scale. *Note:* Certain instruments, such as power-factor meters, are necessarily excepted from this definition. *See also:* instrument; accuracy rating. (EEC/ERI/AII) [111], [102]

(2) **(mechanical demand registers)** The maximum scale capacity of the register. If a multiplier exists, the full-scale value will be the product of the maximum scale marking and the multiplying constant. (ELM) C12.4-1984

full-screen editing A method of text editing that allows the user to view a full display screen of text at one time and to enter or alter text by using either commands or cursor control. Scrolling functions allow the user to move up and down within the document. *Contrast:* line editing. (C) 610.2-1987

full-screen editor A text editor that allows the user to view a full display screen of data at one time and to enter or alter text by using either commands or cursor control. Scrolling functions allow the user to move up and down within the document. *Synonym:* screen editor. *Contrast:* line editor. (C) 610.2-1987

full span-max span (spectrum analyzer) A mode of operation in which the spectrum analyzer scans an entire selected frequency band. (IM) 748-1979w

full speed (data transmission) Referring to transmission of data in teleprinter systems at the full rated speed of the equipment. (PE) 599-1985w

full subtracter A subtracter that accepts three inputs (two operands and a borrow digit), producing a difference and a borrow as outputs according to the table below. *Contrast:* half subtracter. *See also:* full adder.

input #1	0	0	1	1	0	0	1	1
input #2	0	1	0	1	0	1	0	1
input carry	0	0	0	0	1	1	1	1
output differences	0	1	1	0	1	0	0	1
output borrow	0	1	0	0	1	1	0	1

full subtracter

(C) 610.10-1994w

full tree *See:* complete tree.

full-trunk group (telephone switching systems) A trunk group, other than a final trunk group, that does not overflow calls to another trunk group. (COM) 312-1977w

full-voltage starter A starter that connects the motor to the power supply without reducing the voltage applied to the motor. *Note:* Full-voltage starters are also designated as across-the-line starters. *See also:* starter. (IA/ICTL/IAC) [60]

full-wave lightning impulse test (power and distribution transformers) Application of the "standard lightning impulse" wave, a full wave having a front time of 1.2 microseconds and a time to half value of 50 microseconds, described as a 1.2/50 impulse. (PE/TR) C57.12.80-1978r

full-wave rectification (rectifying process) (power supplies) Full-wave rectification inverts the negative half-cycle of the input sinusoid so that the output contains two half-sine pulses for each input cycle. A pair of rectifiers arranged as shown with a center-tapped transformer or a bridge arrangement of four rectifiers and no center tap are both methods of obtaining full-wave rectification. *See also:* rectifier; rectification. (AES/IA/PE) [41], [62], [78]

full-wave rectifier *See:* full-wave rectification.

full-wave rectifier circuit A circuit that changes single-phase alternating current into pulsating unidirectional current, utilizing both halves of each cycle. *See also:* rectification. (IA/NPS) 59-1962w, 325-1971w, [12]

full-wave voltage impulse (surge arresters) A voltage impulse that is not interrupted by sparkover, flashover, or puncture. *See also:* full impulse voltage. (PE) [8]

full width at fiftieth maximum (FWFM) (x-ray energy spectrometers) Same as full width at half maximum (FWHM), except that measurement is made at one fiftieth of the maximum ordinate rather than one half. (NPS/NID) 759-1984r

full width at half maximum (FWHM) (1) (A) (germanium gamma-ray detectors) (x-ray energy spectrometers) (charged-particle detectors) The full width of a distribution measured at half the maximum ordinate. For a normal distribution, it is equal to $2(2 \ln 2)^{1/2}$ times the standard deviation σ . (B) The full width of a distribution measured at 50% of its peak height. If the distribution is a spectral line due to radiation, it is assumed that the background level was averaged over the base of that line and the average subtracted from the ordinates of the distribution before the FWHM was determined. For a normal distribution,

$$\text{FWHM} = 2(2 \ln 2)^{0.5} = 2.355 \sigma$$

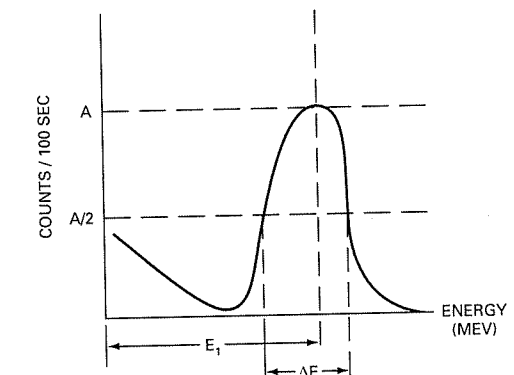
where σ = standard deviation and also the root-mean-square value of the distribution. (NPS/NID) 759-1984, 300-1988

(2) **(germanium detectors)** The full width of a gamma-ray peak distribution measured at half the maximum ordinate above the continuum. (PE/EDPG) 485-1983s

(3) **(scintillation counters)** The full width of a distribution measured at half the maximum ordinate. For a normal distribution, it is equal to $2(2 \ln 2)^{1/2}$ times the standard deviation (σ). *Note:* The expression full width at half maximum, given either as an absolute value or as a percentage of the value of the argument at the maximum of the distribution curve, is frequently used in nuclear physics as an approximate description of a distribution curve. Its significance can best be made clear by reference to a typical distribution curve, shown in the figure, of the measurement of the energy of the gamma rays from Cs^{137} with a scintillation counter spectrometer. The measurement is made by determining the number of gamma-ray photons detected in a prescribed interval of time, having measured energies falling within a fixed energy interval (channel width) about the values of energy (channel position) taken as argument of the distribution function. The abscissa of the curve shown is energy in megaelectronvolts (MeV) units and the ordinate is counts per given time interval per megaelectronvolt energy interval. The maximum of the distribution curve shown has an energy E_1 megaelectronvolts. The height of the peak is A_1 counts/100 seconds/megaelectronvolts. The full width at half maximum ΔE is measured at a value of the ordinate equal to $A_1/2$. The percentage full width at half maximum is $100 \Delta E / E_1$. It is an indication of the width of the distribution curve, and where (as in the example cited) the gamma-ray photons are monoenergetic, it is a measure of the resolution of the detecting instrument. When the distribution curve is a Gaussian curve, the percentage full width at half maximum is related to the standard deviation σ by

$$100 \frac{\Delta E}{E_1} = 100 \times 2(2 \ln 2)^{1/2} \times \sigma$$

See also: scintillation counter.



full width at half maximum

(NPS) 398-1972r

(4) The full width of a gamma photon peak distribution measured at an ordinate half way between the maximum ordinate of the peak and the background. (NI) N42.12-1994