

TOWNSEND & TOWNSEND & CREW
IEEE Std 100-1996
DENVER

The IEEE Standard Dictionary of Electrical and Electronics Terms

Sixth Edition

Standards Coordinating Committee 10, Terms and Definitions
Jane Radatz, Chair

This standard is one of a number of information technology dictionaries being developed by standards organizations accredited by the American National Standards Institute. This dictionary was developed under the sponsorship of voluntary standards organizations, using a consensus-based process.

ISBN 1-55937-833-



RECEIVED
JUL 14 1997

TOWNSEND & TOWNSEND
AND CREW
LIBRARY-DENVER

When the IEEE Standards Board approved this standard on 10 December 1996, it had the following membership.

Donald C. Loughry, Chair **Richard J. Holleman, Vice Chair**
Andrew G. Salem, Secretary

Gilles A. Baril
Clyde R. Camp
Joseph A. Cannatelli
Stephen L. Diamond
Harold E. Epstein
Donald C. Fleckenstein
Jay Forster*
Donald N. Heirman
Ben C. Johnson

E. G. "Al" Kiener
Joseph L. Koepfinger*
Stephen R. Lambert
Lawrence V. McCall
L. Bruce McClung
Marco W. Migliaro
Mary Lou Padgett
John W. Pope

Jose R. Ramos
Arthur K. Reilly
Ronald H. Reimer
Gary S. Robinson
Ingo Rüsçh
John S. Ryan
Chee Kiow Tan
Leonard L. Tripp
Howard L. Wolfman

*Member Emeritus

Also included are the following nonvoting IEEE Standards Board liaisons:

Satish K. Aggarwal
Alan H. Cookson
Chester C. Taylor

Kim Breitfelder (1995-present), *IEEE Std 100 Editor*
Stephen Huffman (1993-1995), *IEEE Std 100 Editor*

Assistance was provided by the IEEE Standards editorial staff.

How to use this dictionary

The terms defined in this dictionary are listed in *letter-by-letter* alphabetical order. Spaces are ignored in this style of alphabetization, so *cab* *value* will come before *cab* *signal*. Descriptive categories associated with the term in earlier editions of IEEE Std 100 will follow the term in parentheses. New categories appear after the definitions (see Categories, below), followed by the designation of the standard or standards that include the definition. If a standard designation is followed by the letter *s*, it means that edition of the standard was superseded by a newer revision and the term was not included in the revision. If a designation is followed by the letter *w*, it means that edition of the standard was withdrawn and not replaced by a revision. A bracketed number refers to the non-IEEE standard sources given in the back of the book.

Acronyms and abbreviations are no longer listed in a separate section in the dictionary; rather, they are incorporated alphabetically with other terms. Each acronym or abbreviation refers to its expanded term, where it is defined. Acronyms and abbreviations for which no definition was included in past editions have been deleted from this edition of IEEE Std 100.

Abstracts of the current set of approved IEEE standards are provided in the back of the book. It should be noted that updated information about IEEE standards can be obtained at any time from the IEEE Standards World Wide Web site at <http://standards.ieee.org/>.

Categories

The category abbreviations that are used in this edition of IEEE Std 100 are defined below. This information is provided to help elucidate the context of the definition. Older terms for which no category could be found have had the category "Std100" assigned to them. Note that terms from sources other than IEEE standards, such as the National Electrical Code® (NEC®) or the National Fire Protection Association, may not be from the most recent editions; the reader is cautioned to check the latest editions of all sources for the most up-to-date terminology.

Category

AE
AHDL
AMR
AP
ATL
BA
BT
C
CAS
CE
CHM
COM
CS
DA
DEI
DESG
DIS
ED
EDU
EEC
ELM
EM
EMB
EMC
GRS
GSD
IA
IE
II
IM
IT
IVHS
LEO
LM
MAG
MIL
MM
MTT
NEC
NESC
NFPA
NI
NIR
NN
NPS
ODM
OE
PA
PE
PEL
PQ
PSPD
PV
QUL
R
RA
REM

demand meter.
(EEC/PE) [119]

contact/phone that has a linear throughout its entire operating (NPS) 325-1996

The time a contact remains closing following a specified (PE/SWG) C37.100-1992

for repeatedly establishing circuit.
8-1981w, C57.12.80-1978r of an electrical signal estab- rical circuit with a nominal um for its main contacts.
(VT) 16-1955w

contactor.
perated other than by hand interrupting an electric power *See also:* control switch.
(VT) 16-1955w

cal switching device) The e actuating quantity in the causing actuation of the re- mary arcing contacts have arting time is the numerical ime.
(PE/SWG) C37.100-1992

aveguide) A piston with walls of a waveguide. *See* (AP) [35]

out the application of an metal coating upon a base contact with another metal nd of the metal to be de- (EEC/PE) [119]

that is located at or near e whether the main con- ion. Typically, colors are osition; red shall signify

(PE/SWG) C37.100-1992

o: depolarization; depo- sive after-potential; pos- (EEC/PE) [119]

erence between the work y the electronic charge.
(ED) 161-1971w

ed by one contact against g member is in the final contact pressure is usu- s of the force that must ile the actuating member ition, and with the mat- r to separate the mating (IA) [60]

eracted by one contact actuating member is in *Note:* The initial contact pressed in terms of the lding contact while the contact-touch position act surface against the essure device. *See also:* (IA) [60]

wherein two or more ete for the control of a . (PE) [6]

two different solids in to greater conductivity

across the contact in one direction than in the other. *See also:* rectifier. (AP) 145-1983s

contacts (1) Conducting parts which co-act to complete or to interrupt a circuit. (EEC/PE) [119]

(2) (A) (**nonoverlapping**) Combinations of two sets of con- tacts, actuated by a common means, each set closing in one of two positions, and so arranged that the contacts of one set open before the contacts of the other set close. *See also:* elec- tric controller. (B) (**auxiliary**) (**switching device**) Contacts in addition to the main circuit contacts that function with the movement of the latter. *See also:* contactor. (C) (**overlap- ping, industrial control**) Combinations of two sets of con- tacts, actuated by a common means, each set closing in one of two positions, and so arranged that the contacts of one set open after the contacts of the other set have been closed. *See also:* electric controller. (IA) [60]

contact, Schottky-barrier A metal-semiconductor contact structure in which the rectification that occurs is heavily in- fluenced by the difference in the work functions of the ma- terials. The contacts frequently consist of an interfacial metal/ semiconductor compound such as a silicide. (NPS) 325-1996

contact surface That surface of a contact through which current is transferred to the coating contact. (PE/SWG) C37.100-1992

contact, surface-barrier A metal-insulator-semiconductor con- tact structure in which the rectification properties are domi- nated or heavily influenced by charge trapped at the interfaces and in the insulator. (NPS) 325-1996

contact voltage (human safety) A voltage accidentally ap- pearing between two points with which a person can simul- taneously make contact. (PE) [8], [84]

contact-wear allowance The total thickness of material that may be worn away before the co-acting contacts cease to perform adequately. *See also:* contactor. (PE/SWG) C37.100-1992, C37.30-1971s

contact wire (trolley wire) A flexible contact conductor, cus- tomarily supported above or to one side of the vehicle. *See also:* contact conductor. (VT) 16-1955w

container (1) A parent widget that defines a region containing zero or more subobjects of a given type. (C) 1295-1993

(2) An ordered set of 1, 2, 4, or 8 contiguous bytes fully packed with one or more signed or unsigned field formats. (C/MM) 1596.5-1993

containment (1) (**safety systems equipment in nuclear power generating stations**) (**valve actuators**) That portion of the engineered safety features designed to act as the principal barrier, after the reactor system pressure boundary, to prevent the release, even under conditions of a reactor accident, of unacceptable quantities of radioactive material beyond a con- trolled zone. (PE) 323-1974s, 334-1974s, 382-1985, 383-1974r, 627-1980r, 650-1979s

(2) (**radiological monitoring instrumentation**) A structure or vessel which encloses the components of the reactor cool- ant pressure boundary or which serves as a leakage limiting barrier to radioactive material that could be released from the reactor coolant pressure boundary, or both. (NI) N320-1979r

(3) (**data management**) The result of placing all occurrences of a repeating group within the same logical record. (C) 610.5-1990

(4) A relationship between two objects such that one is said to belong to, or form part of, the other. All objects except software_collection objects shall be contained within exactly one object. (C/PA) 1387.2-1995

contamination (rotating machinery) This deteriorates electri- cal insulation by actually conducting current over insulated surfaces, or by attacking the material reducing its electrical insulating quality or its physical strength, or by thermally insulating the material forcing it to operate at higher than normal temperatures. *Note:* Included here are: wetness or ex-

treme humidity, oil or grease, conducting dusts and particles, non-conducting dusts and particles, and chemicals of in- dustry. (PE) 432-1976s

contend To actively and simultaneously vie for the attention of the MTM-Bus Master module (said of a group or one or more S-modules). (C/TT) 1149.5-1995

contending requester *See:* requester.

contending slave *See:* interrupt-acknowledge cycle.

content addressable storage *See:* associative memory.

content addressed storage *See:* associative storage.

content, average information *See:* information theory; average information content, per symbol.

content, conditional information *See:* information theory.

content coupling A type of coupling in which some or all of the contents of one software module are included in the con- tents of another module. *Contrast:* common-environment coupling; control coupling; data coupling; hybrid coupling; pathological coupling. (C) 610.12-1990

contention (1) (**data transmission**) A condition on a multipoint communication channel when two or more locations try to transmit at the same time. (PE) 599-1985w

(2) (**station control and data acquisition**) An operational condition in which two or more devices simultaneously try to use the same resource (e.g., communication channel, disk, memory). (PE/SUB) C37.1-1994

(3) A condition on a communications channel when two or more stations may try to seize the channel at the same time. (COM/LM) 168-1956w

(4) A condition that occurs when two or more devices simul- taneously request the services of another device, network me- dium, or resource that can handle only one request at a time. *See also:* collision. (C) 610.7-1995

(5) An operational condition on a data communication chan- nel in which no station is designated a master station. In con- tention, each station on the channel shall monitor the signals on the channel and wait for a quiescent condition before ini- tiating a bid for circuit control. (PE/SWG) C37.100-1992

contention interval *See:* slot time.

contention resolution The management of contention for a communications resource so as to minimize collisions, re- solve access order, and maximize utilization. (C) 610.7-1995

contents list In word processing, a list of stored information available for user selection. (C) 610.2-1987

context editing A method of line editing in which the line to be viewed or altered is identified by specifying part or all of its contents. (C) 610.2-1987

context free The mode of API operation in which the underlying FTAM initiator establishes an FTAM Regime for the sole purpose of executing the requested operation, closing the re- gime once the operation is complete. (C/PA) 1238.1-1994

context sensitive The mode of API operation in which the un- derlying FTAM initiator performs the requested operation, using a pre-existing FTAM Regime that is established and maintained independently of individual operation invoca- tions. (C/PA) 1238.1-1994

contiguous allocation A storage allocation technique in which programs or data to be stored are allocated a block of storage of equal or greater size, so that logically contiguous programs and data are assigned physically contiguous storage locations. *Contrast:* paging. (C) 610.12-1990

contiguous memory An area of storage that occupies consec- utive or adjacent address locations. (C) 610.10-1994

contingency The unexpected failure or outage of a system com- ponent(s) (generator, transmission line, breaker, switch, etc.). (PE) 858-1993

continuation reference A reference that describes how the per- formance of all or part of a directory operation can be con-

one input channel.
 1963w, 270-1966w
 cryotron. *See also:*
 (ED) [46]
 one of the semi-
 current. *See also:*
 [62], 223-1966w
 al of time during
 ay is allowed to be
 vigation systems)
 : navigation.
 (AE) [42]
thyristor This struc-
 ture transistor (IG-
 and drain by a volt-
 (ED) 581-1978w
and nonreciprocal
 form, a two-port
 unction. *See also:*
 (MTT) 457-1982w
 n elementary logic
 one input and one
 e.
 (C) 610.10-1994
 some portion of a
 e. (B) The circuit
 (AE) 686-1990w
 time interval, be-
 the gate pulse and
 rent) has dropped
 ue during switch-
 ON state by a gate
 characteristic.
 [62], 223-1966w
 interval between
 ge (current) has
 its initial value to
 ing of a thyristor
 gate pulse. *Note:*
 time of the ON
 e *also:* principal
 [62], 223-1966w
tor The time in-
 nning of the gate
 nt has decreased
 the ON state to
 rincipal voltage-

gate nontrigger current

bine-control servomotor from opening beyond the position for which the device is set. (PE) [5]

gate nontrigger current (thyristor) The maximum gate current that will not cause the thyristor to switch from the OFF state to the ON state. *See also:* gate trigger current; principal current. (ED/IA) [46], [58], [62], 223-1966w

gate nontrigger voltage (thyristor) The maximum gate voltage that will not cause the thyristor to switch from the OFF state to the ON state. *See also:* gate trigger voltage; principal voltage-current characteristic. (ED/IA) [46], [58], [62], 223-1966w

gate protective action (thyristor converter) Protective action that takes advantage of the switching property in the converter protection network. (IA) 444-1973r

gate suppression (thyristor power converter) Removal of gating pulses. (IA) 444-1973r

gate terminal (thyristor) A terminal that is connected to a gate. *See also:* anode. (ED/IA) [46], [58], 223-1966w

gate trigger current (thyristor) The minimum gate current required to switch a thyristor from the OFF state to the ON state. *See also:* principal current. (ED/IA) [46], [58], [62], 223-1966w

gate trigger voltage (thyristor) The gate voltage required to produce the gate-trigger current. *See also:* principal voltage-current characteristic. (ED/IA) [46], [58], [62], 223-1966w

gate turn-off current (gate turn-off thyristor) The minimum gate current required to switch a thyristor from the ON state to the OFF state. *See also:* principal current. (ED/IA) [46], [58], [62], 223-1966w

gate turn-off voltage (gate turn-off thyristor) The gate voltage required to produce the gate turn-off current. *See also:* principal voltage-current characteristic. (ED/IA) [46], [58], [62], 223-1966w

gate voltage (thyristor) The voltage between a gate terminal and a specified main terminal. *See also:* principal voltage-current characteristic. (ED/IA) [46], [58], [62], 223-1966w

gateway (1) A functional unit that interconnects a local area network (LAN) with another network having different higher layer protocols. (C/LM) 8802-6-1994

(2) (A) A dedicated computer that attaches to two or more networks and that routes packets from one to the other. (B) In networking, a device that connects two systems that use different protocols. *Contrast:* bridge. *See also:* mail gateway; router. (C) 610.7-1995

gather write A write operation in which information from non-adjacent storage areas is placed into a single physical record. *Contrast:* scatter read. (C) 610.10-1994

gating (1) The process of selecting those portions of a wave that exist during one or more selected time intervals or that have magnitudes between selected limits. *See also:* modulation; wavefront. (AP) 145-1983s

(2) The application of enabling or inhibiting pulses during part of a cycle of equipment operation. (AE) 686-1990w

gating signal (keying signal) A signal that activates or deactivates a circuit during selected time intervals. (EEC/PE) [119]

gating techniques (thyristor) Those techniques employed to provide controller (thyristor) gating signals. (IA) 428-1981w

gauss (centimeter-gram-second electromagnetic-unit system) The gauss is 10^{-4} webers per square meter or one maxwell per square centimeter. (Std100) 270-1966w

Gaussian beam (1) (fiber optics) A beam of light whose electric field amplitude distribution is gaussian. When such a beam is circular in cross section, the amplitude is $E(r) = E(0) \exp[-(r/w)^2]$ where r is the distance from beam center and w is the radius at which the amplitude is $1/e$ of its value on the axis; w is called the beamwidth. *See also:* beam diameter. (C) 610.7-1995

(2) **(laser maser)** A beam of radiation having an approximately spherical wave front at any point along the beam and having transverse field intensity over any wave front that is a Gaussian function of the distance from the axis of the beam. (LEO) 586-1980w

Gaussian density function (radar) Sometimes referred to as normal probability distribution, the Gaussian probability-density function is given by

$$f(X) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{x^2}{2\sigma^2}\right)$$

Often used to describe statistical nature of random noise, where σ = standard deviation. (AE) 686-1982s

Gaussian distribution (radar) A probability distribution characterized by the probability density function

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{(x-m)^2}{2\sigma^2}\right]$$

where x is the random variable, m is the mean, and σ is the standard deviation; often used for analytical modeling of radar noise and various measurement errors. *Synonym:* normal distribution. (AE) 686-1990w

Gaussian filter A polynomial filter whose magnitude-frequency response approximates the ideal Gaussian response, the degree of approximation depending on the complexity of the filter. The ideal Gaussian response is given by

$$\left|H(j\omega)\right| = \exp[-0.3466(\omega/\omega_c)^2]$$

where ω_c 3 dB frequency. Gaussian filters, because of their good transient characteristics (small overshoot and ringing), find applications in pulse systems. (CAS) [13]

Gaussian noise Noise characterized by a wide frequency range with regard to the desired signal of communication channel, statistical randomness, and other stochastic properties. (C) 610.7-1995

Gaussian pulse (fiber optics) A pulse that has the waveform of a gaussian distribution. In the time domain, the waveform is

$$f(t) = A \exp[-(t/a)^2]$$

where A is a constant, and a is the pulse half duration at the $1/e$ points. *See also:* full width (duration) half maximum. (Std100) 812-1984w

Gaussian random noise *See:* random noise.

Gaussian response (amplifiers) A particular frequency-response characteristic following the curve $y(f) = e^{-af^2}$. *Note:* Typically, the frequency response approached by an amplifier having good transient response characteristics. *See also:* amplifier; response, Gaussian. (IM) [40]

Gaussian system (units) A system in which centimeter-gram-second electrostatic units are used for electric quantities and centimeter-gram-second electromagnetic units are used for magnetic quantities. *Note:* When this system is used, the factor c (the speed of light) must be inserted at appropriate places in the electromagnetic equations. (Std100) 270-1966w

Gauss' law (electrostatics) States that the integral over any closed surface of the normal component of the electric flux density is equal in a rationalized system to the electric charge Q_0 within the surface. Thus,

$$\int (\mathbf{D} \cdot \mathbf{n}) dA = \int \rho_0 dV = Q_0$$

Here, \mathbf{D} is the electric flux density, \mathbf{n} is a unit normal to the surface, dA the element of area, ρ_0 is the space charge density in the volume V enclosed by the surface.

(Std100) 270-1966w

gaussmeter A magnetometer provided with a scale graduated in gauss or kilogauss. *See also:* magnetometer.

(2) (**fiber optics**) A repeater that is designed for digital transmission. *Synonym:* regenerator. *See also:* optical repeater.

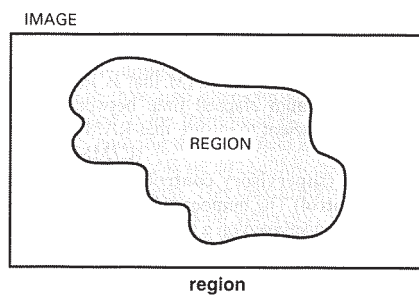
(Std100) 812-1984w

(3) A repeater whose function is to re-time and re-transmit the received signal impulses that have been restored to their original strength. (C) 610.7-1995

regenerative track That part of a track on a magnetic drum or magnetic disk, used in conjunction with a read/write head, such that the heads are connected to function as circulating storage. *Synonym:* revolver track. (C) 610.10-1994

regenerator *See:* regenerative repeater.

region (1) A connected subset of an image.



(C) 610.4-1990

(2) (A) As relates to the address space of a process, a sequence of addresses. (B) As relates to a file, a sequence of offsets.

(C/PA) 9945-1-1996

(3) As relates to the address space of a process, a sequence of addresses. As relates to a file, a sequence of offsets.

(C/PA) 1003.5b-1995

regional bell operating company (RBOC) a regional telephone company that may or may not be made up of individual operating companies. (AMR) 1390-1995

regional center (1) (telephone switching systems) A toll office to which a number of sectional centers are connected. Regional centers are classified as Class 1 offices. *See also:* office class.

(COM) 312-1977w

(2) Class 1 office in the North American hierarchical routing plan; a control center connecting sectional centers of the telephone system. *See also:* end office; primary center; sectional center; toll center. (C) 610.7-1995

region, Geiger-Mueller *See:* Geiger-Mueller region.

region growing (image processing and pattern recognition)

An image segmentation technique in which regions are formed by repeatedly taking the union of subregions that are similar in gray levels or textures. *See also:* region partitioning. (C) 610.4-1990

region of limited proportionality (radiation counter tubes)

The range of applied voltage below the Geiger-Mueller threshold, in which the gas amplification depends upon the charge liberated by the initial ionizing event.

(ED) 161-1971w

region partitioning (image processing and pattern recognition)

An image segmentation technique in which regions are formed by repeatedly taking the union of sub-regions that are similar in gray levels or textures and by repeatedly splitting apart subregions that are dissimilar. *See also:* region growing.

(C) 610.4-1990

region, proportional *See:* proportional region.

regions of electromagnetic spectrum (1) (illuminating engineering) For convenience of reference, the electromagnetic spectrum is arbitrarily divided as follows:

Vacuum ultraviolet

Extreme ultraviolet 10–100 nm

Far ultraviolet 100–200 nm

◦ Middle ultraviolet 200–300 nm

Near ultraviolet 300–380 nm

Visible 380–770 nm

Near (short wavelength) 770–1400 nm infrared

Intermediate infrared 1400–5000 nm

Far (long wavelength) 5000–1 000 000 nm infrared

Note: The spectral limits indicated above have been chosen as a matter of practical convenience. There is a gradual transition from region to region without sharp delineation. Also, the division of the spectrum is not unique. In various fields of science, the classifications may differ due to the phenomena of interest. Another division of the ultraviolet spectrum often used by photobiologists is given by the International Commission on Illumination (CIE):

• UV-A 315 to 400 nm

• UV-B 280 to 315 nm

• UV-C 100 to 280 nm

(EEC/IE) [126]

(2) (**light-emitting diodes**) For convenience of reference the electromagnetic spectrum near the visible spectrum is divided as follows.

Spectrum Wavelength in Nanometers

far ultraviolet	10–280
middle ultraviolet	280–315
near ultraviolet	315–380
visible	380–780
infrared	790–10 ⁹

Note: The spectral limits indicated above should not be construed to represent sharp delineations between the various regions. There is a gradual transition from region to region. The above ranges have been established for practical purposes. *See also:* radiant energy. (EEC/IE) [126]

register (1) (electronic computation) A device capable of retaining information, often that contained in a small subset (for example, one word), of the aggregate information in a digital computer. *See also:* address register; circulating register; index register; shift register. (C) 162-1963w

(2) (**telephone switching systems**) A part of an automatic switching system that receives and stores signals from a calling device or other source for interpretation and action.

(COM) 312-1977w

(3) A term used to describe quadlet addresses that can be read or written by software. In the context of this document, a register does not imply a specific hardware implementation. If a bus standard allows transactions to be split, and sufficient time is allowed between the request and response subactions, the functionality of the register can be emulated by a processor on the module. (C/MM) 1212-1991s

(4) A storage device or storage location having a specified storage capacity. *See also:* strobe. (C) 610.10-1994

(5) A set of records (paper, electronic, or a combination) maintained by a Registration Authority containing assigned names and the associated information.

(C/LM) 802.10g-1995

register architecture A computer architecture whose design is based on the maintenance of data items in registers. *Contrast:* stack architecture. (C) 610.10-1994

register-arithmetic and logic unit An arithmetic and logic unit which also contains a register array. (C) 610.10-1994

register array *See:* register file.

register-based device A servant-only device that supports VXI-bus configuration registers. Register-based devices are typically controlled by message-based devices via device-dependent register reads and writes. (C/MM) 1155-1992

register constant (meter) The factor by which the register reading must be multiplied in order to provide proper consideration of the register, or gear, ratio and of the instrument transformer ratios to obtain the registration in the desired unit. *Note:* It is commonly denoted by the symbol *K_r*. *See also:* electricity meter; moving element. (ELM) C12.1-1982s

registered images Two or more images of the same scene that have been positioned with respect to one another so that corresponding points in the images represent the same point in the scene. (C) 610.4-1990