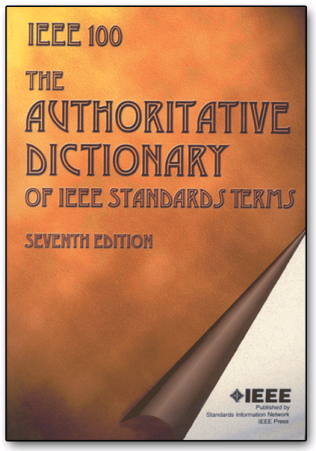
# IEEE 100
# The Authoritative Dictionary of IEEE Standards Terms

**Seventh Edition**




IEEE
Published by
Standards Information Network
IEEE Press

DELL-1020
11,212,146

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# Introduction

IEEE standards establish an authoritative common language that defines quality and sets technical criteria. By guaranteeing consistency and conformity through open consensus, IEEE standards add value to products, facilitate trade, drive markets, and ensure safety. That's why leading companies, organizations, and industries around the globe rely on them.

Critical components of this common language are the terms and definitions that are at the foundation of the vast body of IEEE standards. In the past decade alone, hundreds of terms—describing the latest tools, techniques, and best practices—have been added to the lexicon of IEEE standards.

In this newly updated *Authoritative Dictionary of IEEE Standards Terms,* professional experts and students alike will gain an in-depth understanding and appreciation for the breadth of coverage of IEEE standards terms and definitions not found in any other single source.

The seventh edition of IEEE 100 has been revised to include nearly 35 000 technical terms and definitions from over 800 standards—covering areas such as power and energy, communications, information technology, and transportation systems. In addition to an extensive list of widely used acronyms and abbreviations, this new edition also contains detailed abstracts of each term's associated standard(s). What's more, all definitions are augmented by a combination of indispensable information, including:

- Preferred and popular usage of each term
- Variations in meanings among different technical specialties
- Cross-indexing to related works
- Key explanatory notes for further term clarification

In preparing this latest edition of the Dictionary, we realized that the standards community desired more than just a compilation of IEEE standardized terms and definitions. They needed an authoritative resource created by the organization that develops and produces the standards from which the terms and definitions are derived—the IEEE. In addition, we determined the Dictionary needed to be not only user friendly, but also rich in information. In other words, it needed to be the *Authoritative Dictionary of IEEE Standards Terms*.

Susan K. Tatiner
Director, IEEE Standards Publishing Programs

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Kim Breitfelder
Don Messina

Additional assistance was provided by the IEEE Standards editorial staff.

# How to Use This Dictionary

The terms defined in the Dictionary are listed in *letter-by-letter* alphabetical order. Spaces are ignored in this style of alphabetization, so *cable value* will come before *cab signal*. Descriptive categories associated with the term in earlier editions of the Dictionary 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.

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 the Dictionary 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.

## Categories sorted by abbreviation

| | |
|---|---|
| AES | aerospace and electronic systems |
| AHDL | computer—Analog Hardware Descriptive Language |
| AMR | automatic meter reading and energy management |
| AP | antennas and propagation |
| ATL | computer—Abbreviated Test Language for All Systems |
| BA | computer—bus architecture |
| BT | broadcast technology |
| C | computer |
| CAS | circuits and systems |
| CE | consumer electronics |
| CHM | components, hybrids, and manufacturing technology |
| COM | communications |
| CS | control systems |
| DA | computer—design automation |
| DEI | dielectrics and electrical insulation |
| DESG | dispersed energy storage and generation |
| DIS | computer—distributed interactive simulation |
| ED | electron devices |
| EDU | education |
| EEC | electrical equipment and components |
| ELM | electricity metering |
| EM | engineering management |
| EMB | engineering in medicine and biology |
| EMC | electromagnetic compatibility |
| GRS | geoscience and remote sensing |
| GSD | graphic symbols and designations |
| IA | industry applications |
| IE | industrial electronics |
| II | information infrastructure |
| IM | instrumentation and measurement |
| IT | information theory |

| | |
|---|---|
| IVHS | intelligent vehicle highway systems |
| LEO | lasers and electro-optics |
| LM | computer—local and metropolitan area networks |
| MAG | magnetics |
| MIL | military |
| MM | computer—microprocessors and microcomputers |
| MTT | microwave theory and techniques |
| NEC | National Electrical Code |
| NESC | National Electrical Safety Code |
| NFPA | National Fire Protection Association |
| NI | nuclear instruments |
| NIR | non-ionizing radiation |
| NN | neural networks |
| NPS | nuclear and plasma sciences |
| ODM | computer—optical disk and multimedia platforms |
| OE | oceanic engineering |
| PA | computer—portable applications |
| PE | power engineering |
| PEL | power electronics |
| PQ | power quality |
| PSPD | power surge protective devices |
| PV | photovoltaics |
| QUL | quantities, units, and letter symbols |
| R | reliability |
| RA | robotics and automation |
| REM | rotating electrical machinery |
| RL | roadway lighting |
| S&P | computer—security and privacy |
| SB | stationary batteries |
| SE | computer—software engineering |
| SMC | systems, man, and cybernetics |
| SP | signal processing |
| Std100 | Standard 100 legacy data |
| SUB | substations |
| SWG | power switchgear |
| T&D | transmission and distribution |
| TF | time and frequency |
| TRR | transformers, regulators, and reactors |
| TT | test technology |
| UFFC | ultrasonics, ferroelectrics, and frequency control |
| VT | vehicular technology |

## Categories sorted by name

| | |
|---|---|
| aerospace and electronic systems | AES |
| antennas and propagation | AP |
| automatic meter reading and energy management | AMR |
| broadcast technology | BT |
| circuits and systems | CAS |
| communication | COM |
| components, hybrids, and manufacturing technology | CHM |
| computer | C |
| computer—Abbreviated Test Language for All Systems | ATL |
| computer—Analog Hardware Descriptive Language | AHDL |
| computer—bus architecture | BA |
| computer—design automation | DA |
| computer—distributed interactive simulation | DIS |
| computer—local and metropolitan area networks | LM |
| computer—microprocessors and microcomputers | MM |
| computer—optical disk and multimedia platforms | ODM |
| computer—portable applications | PA |
| computer—security and privacy | S&P |
| computer—software engineering | SE |
| consumer electronics | CE |

| | |
|---|---|
| control systems | CS |
| dielectrics and electrical insulation | DEI |
| dispersed energy storage and generation | DESG |
| education | EDU |
| electrical equipment and components | EEC |
| electricity metering | ELM |
| electromagnetic compatibility | EMC |
| electron devices | ED |
| engineering in medicine and biology | EMB |
| engineering management | EM |
| geoscience and remote sensing | GRS |
| graphic symbols and designations | GSD |
| industrial electronics | IE |
| industry applications | IA |
| information infrastructure | II |
| information theory | IT |
| instrumentation and measurement | IM |
| intelligent vehicle highway systems | IVHS |
| lasers and electro-optics | LEO |
| magnetics | MAG |
| microwave theory and techniques | MTT |
| military | MIL |
| National Electrical Code | NEC |
| National Electrical Safety Code | NESC |
| National Fire Protection Association | NFPA |
| neural networks | NN |
| non-ionizing radiation | NIR |
| nuclear and plasma sciences | NPS |
| nuclear instruments | NI |
| oceanic engineering | OE |
| photovoltaics | PV |
| power electronics | PEL |
| power engineering | PE |
| power quality | PQ |
| power switchgear | SWG |
| quantities, units, and letter symbols | QUL |
| reliability | R |
| roadway lighting | RL |
| robotics and automation | RA |
| rotating electrical machinery | REM |
| signal processing | SP |
| Standard 100 legacy data | Std100 |
| stationary batteries | SB |
| substations | SUB |
| surge-protective devices | PSPD |
| systems, man, and cybernetics | SMC |
| test technology | TT |
| time and frequency | TF |
| transformers, regulators, and reactors | TRR |
| transmission and distribution | T&D |
| ultrasonics, ferroelectrics, and frequency control | UFFC |
| vehicular technology | VT |

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**H channel** A wideband channel (i.e., a channel that contains multiples of 64 kbit/s).
(C/COM/LM) 8802-9-1996, 802.9a-1995w

**HCI** *See:* human/computer interface.

**HCL** *See:* relay, high, common, low.

**HCP** Horizontal coupling plane. *See also:* coupling plane.
(EMC) C63.16-1993

**HC threshold voltage** *See:* high conduction threshold voltage.

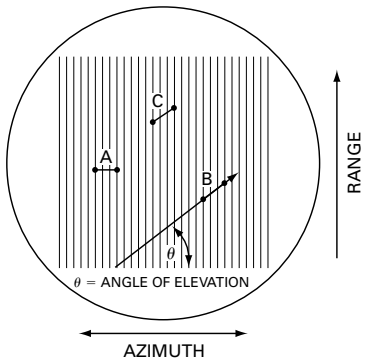
**HDA** *See:* head/disk assembly.

**HDAM** *See:* hierarchical direct access method.

**HDBH** *See:* high day busy-hour load.

**HDBH load** *See:* high day busy-hour load; time-consistent traffic measures.

**H-display (1) (navigation aid terms)** A type of radar display format. (AES/GCS) 172-1983w
**(2)** A B-display modified to include an indication of angle of elevation. The target appears as two closely spaced blips approximating a short bright line, the slope of which is in proportion to the tangent of the angle of target elevation.



**H-display**
(AES) 686-1997, [42]

**HDL** *See:* hardware description language; hardware design language.

**HDLC** *See:* high-level data link control.

**head (1)** A device that reads, records, or erases data on a storage medium. *Note:* For example, a small electromagnet used to read, write, or erase data on a magnetic drum or tape, or the set of perforating, reading, or marking devices used for punching, reading, or printing on paper tape.
(C) [20], [85]
**(2) (hydroelectric power plants)** The difference in hydraulic energy between two points, which includes the elevation head, pressure head, and velocity head.
(PE/EDPG) 1020-1988r
**(3) (data management)** The first data item in a list. *Synonym:* header. (C) 610.5-1990w
**(4) (A)** A device that reads, writes, or erases data on a storage medium. For example, a small electromagnet (magnetic head) used to read, write, or erase data on a magnetic drum or magnetic tape, or a device such as a laser that reads and writes data on an optical storage medium. *See also:* write head; read/write head; read head; magnetic head. **(B)** A device within an output device, such as a printer or display device, that controls the creation of images on the device. *See also:* scan head; plotting head; display head; print head. (C) 610.10-1994
**(5)** *See also:* head water benefits; gross head; rated head; critical head; net head.

**head and torso simulator (HATS)** A device that accurately reproduces the sound transmission and pick-up characteristics of the median head and torso of adult humans.
(COM/TA) 1206-1994, 1329-1999

**head crash** The sudden and complete failure of a disk drive caused by a physical collision between the read/write head and the surface of the recording medium. *Note:* Usually results in destruction of the head and part or all of the data on the medium. *See also:* disk crash. (C) 610.10-1994w

**head/disk assembly** In a magnetic disk device, an assembly that includes the magnetic disk, magnetic head, and an access mechanism. (C) 610.10-1994w

**headed brush (rotating machinery)** A brush having a top (cylindrical, conical, or rectangular) with a smaller cross section than the cross section of the body of the brush. *Note:* The length of the head shall not exceed 25 percent of the overall length. *See also:* brush. (EEC/LB) [101]

**headend (1) (A) (broadband local area networks)** The central location that has access to signals traveling in both inbound and outbound directions. The logical root of the broadband coaxial cable system. **(B) (broadband local area networks)** The physical location where the inbound and outbound paths are accessible. The headend is also called the central retransmission facility. (LM/C) 802.7-1989
**(2)** A point where two or more half-duplex data paths are joined on the communications network. (C) 610.7-1995
**(3)** In 10BROAD36, the location in a broadband system that serves as the root for the branching tree comprising the physical medium; the point to which all inbound signals converge and the point from which all outbound signals emanate.
(C/LM) 802.3-1998

**headend port (broadband local area networks)** (or ports) An interface where connection(s) may be made to insert signals or remove signals from the cable plant. The headend ports are usually referred to with a direction (inbound or outbound). Headend ports provide central access to the cable system.
(LM/C) 802.7-1989r

**head-end system (railways)** A system in which the electrical requirements of a train are supplied from a generator or generators, located on the locomotive or in one of the cars, customarily at the forward part of the train. *Note:* The generators may be driven by steam turbine, internal-combustion engine, or, if located in one of the cars, by a mechanical drive from a car axle. *See also:* axle-generator system.
(EEC/PE) [119]

**header (1)** A transverse raceway for electric conductors, providing access to predetermined cells of a cellular metal floor, thereby permitting the intallation of electric conductors from a distribution center to the cells. (NESC/NEC) [86]
**(2) (A) (software)** A block of comments placed at the beginning of a computer program or routine. **(B) (software)** Identification or control information placed at the beginning of a file or message. *Contrast:* trailer. (C) 610.12-1990
**(3) (A) (data management)** Pertaining to data that describes and pertains to other data. For example, the header record for a file might describe the format for the remaining records in the file. **(B) (data management)** *See also:* head.
(C) 610.5-1990
**(4)** *See also:* running header. (C) 610.2-1987
**(5)** A structure attached to or integral to the top of the heatsink used for structural performance and marking.
(C/BA) 1101.3-1993
**(6)** The contiguous control bits preceding a frame, packet, block, or other data stream of bits that contain information about the message such as the address, type of frame, and/or sequencing. *Contrast:* trailer. (C) 610.7-1995

**header card** A punch card that contains information identifying data in the cards that follow. *Contrast:* trailer card.
(C) 610.10-1994w

**header hub (HH)** The highest-level hub in a hierarchy of hubs. The HH broadcasts signals transmitted to it by lower level hubs or DTEs such that they can be received by all DTEs that may be connected to it either directly or through intermediate hubs. (LM/C) 802.3-1998, 610.7-1995

**header label** An internal label, immediately preceding the first record of a file, that identifies the file and contains data used in file control. (C) 610.5-1990w

**HEADER packet** A packet originating in the MTM-Bus Master that is the first packet of an MTM-Bus message. The HEADER packet includes an address and a command field. The address identifies which S-module(s) are to interpret and

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Library of Congress Cataloging-in-Publication Data

IEEE 100 : the authoritative dictionary of IEEE standards terms.—7th ed.
p. cm.
ISBN 0-7381-2601-2 (paperback : alk. paper)
1. Electric engineering—Dictionaries. 2. Electronics—Dictionaries. 3. Computer engineering—Dictionaries. 4. Electric engineering—Acronyms. 5. Electronics—Acronyms. 6. Computer engineering—Acronyms. I. Institute of Electrical and Electronics Engineers.

TK9 .I28 2000
621.3'03—dc21 00-050601

plicitly in a transaction-initiation message and returned in a transaction-completion message. (C/MM) 1212.1-1993

**transaction initiation (request)** A request generated by the initiator to start an action by the responder. An initiation message usually transfers a command and sometimes data. For a disk read I/O transaction, for example, the initiation transfers the address and command. (C/MM) 1212.1-1993

**transaction, I/O** *See:* I/O transaction.

**transaction layer (1)** The layer above the packet layer for use by applications. It is unspecified in this standard. *See also:* transaction. (C/BA) 1355-1995

**(2)** The layer, in a stack of three protocol layers defined for the Serial Bus, that defines a request-response protocol to perform bus operations of type read, write, and lock. (C/MM) 1394-1995

**transaction matrix** A matrix that identifies possible requests for database access and relates each request to information categories or elements in the database. (C) 610.12-1990

**transaction record** A record, representing one transaction, used to process data stored in a master file. *See also:* update transaction; null transaction; change transaction; delete transaction; add transaction. (C) 610.2-1987

**transactor** A magnetic device with an air-gapped core having an input winding which is energized with an alternating current and having an output winding which produces a voltage that is a function of the input current. *Note:* The term "transactor" is a contraction of the words "transformer" and "reactor." (SWG/PE/PSR) C37.110-1996, C37.100-1992

**transadmittance** For harmonically varying quantities at a given frequency, the ratio of the complex amplitude of the current at one pair of terminals of a network to the complex amplitude of the voltage across a different pair of terminals. *See also:* interelectrode transadmittance. (IM/HFIM) [40]

**transadmittance compression ratio (electron tube)** The ratio of the magnitude of the small-signal forward transadmittance of the tube to the magnitude of the forward transadmittance at a given input signal level. (ED) 161-1971w

**transadmittance, forward** *See:* forward transadmittance.

**transceiver (1) (data transmission)** The combination of radio transmitting and receiving equipment in a common housing, usually for portable or mobile use, and employing common circuit components for both transmitting and receiving. (PE) 599-1985w

**(2) (navigation aids)** A combination transmitter and receiver in a single housing, with some components being used by both parts. *See also:* transponder. (AES/GCS) 172-1983w

**(3) (A)** A device that both transmits and receives data. **(B)** A device that connects a host interface to a network. **(C)** A device that applies electronic signals to the cable and may sense collisions. *Note:* Definition (C) is contextually specific to IEEE Std 802.3. (C) 610.7-1995

**transceiver cable** A four-pair, shielded cable which interconnects a workstation to a transceiver or fan-out box. *Note:* This term is contextually specific to IEEE Std 802.3. *See also:* coaxial cable; trunk cable; drop cable; attachment unit interface cable. (C) 610.7-1995

**transceiver chatter** *See:* chatter.

**transconductance** The real part of the transadmittance. *Note:* Transconductance is, as most commonly used, the interelectrode transconductance between the control grid and the plate. At low frequencies, transconductance is the slope of the control-grid-to-plate transfer characteristic. *See also:* interelectrode transconductance; electron-tube admittances. (ED) 161-1971w

**transconductance meter (mutual-conductance meter)** An instrument for indicating the transconductance of a grid-controlled electron tube. *See also:* instrument. (EEC/PE) [119]

**transcribe (electronic computation)** To convert data recorded in a given medium to the medium used by a digital computing machine or vice versa. (C) 162-1963w

**transcriber (electronic computation)** Equipment associated with a computing machine for the purpose of transferring input (or output) data from a record of information in a given language to the medium and the language used by a digital computing machine (or from a computing machine to a record of information). (Std100) 270-1966w

**transducer (1)** (electrical heating applications to melting furnaces and forehearths in the glass industry) A device that is actuated by power from one system and supplies power in any other form to a second system. (IA) 668-1987w

**(2) (communication and power transmission)** A device by means of which energy can flow from one or more transmission systems or media to one or more other transmission systems or media. *Note:* The energy transmitted by these systems or media may be of any form (for example, it may be electric, mechanical, or acoustical), and it may be of the same form or different forms in the various input and output systems or media. (MIL/C/AP/ANT) [2], [85], 145-1983s

**(3) (metering)** A device to receive energy from one system and supply energy (of either the same or of a difference kind) to another system, in such a manner that the desired characteristics of the energy input appear at the output. (ELM) C12.1-1988

**(4) (thyristor)** A device which under the influence of a change in energy level of one form or in one system, produces a specified change in energy level of another form or in another system. (IA/IPC) 428-1981w

**(5)** A device for converting energy from one form to another. (C) 610.10-1994w

**(6)** A device converting energy from one domain into another. The device may either be a sensor or an actuator. (IM/ST) 1451.2-1997

**(7)** A device converting energy from one domain into another, calibrated to minimize the errors in the conversion process. A sensor or an actuator. (IM/ST) 1451.1-1999

**transducer, active** *See:* active transducer.

**Transducer Block** An instance of a subclass of `IEEE1451_TransducerBlock`. (IM/ST) 1451.1-1999

**transducer conversion loss** The ratio of the SAW power generated in the substrate at the transducer output to the power available in the circuit at the transducer input in decibels. (UFFC) 1037-1992w

**Transducer Electronic Data Sheet (TEDS) (1)** A data sheet describing a transducer stored in some form of electronically readable memory. (IM/ST) 1451.2-1997

**(2)** Several of the IEEE 1451.X standards use TEDS to provide a machine-readable specification of the characteristics of the transducer interface. (IM/ST) 1451.1-1999

**transducer gain (1)** The ratio of the power that the transducer delivers to the specified load under specified operating conditions to the available power of the specified source. *Notes:* 1. If the input and/or output power consist of more than one component, such as multifrequency signals or noise, then the particular components used and their weighting must be specified. 2. This gain is usually expressed in decibels. *See also:* transducer. (Std100) 270-1966w

**(2) (two-port linear transducer)** At a specified frequency, the ratio of the actual signal power transferred from the output port of the transducer to its load, to the available signal power from the source driving the transducer. (ED) 161-1971w

**transducer, ideal** *See:* ideal transducer.

**Transducer Independent Interface** The digital interface used to connect a Smart Transducer Interface Module to a Network Capable Application Processor. (IM/ST) 1451.2-1997

**transducer interface** The physical connection by which a transducer communicates with the control or data systems that it is a member of, including the physical connector, the signal wires used and the rules by which information is passed across the connection. (IM/ST) 1451.2-1997

**transducer, line** *See:* line transducer.

**transducer loss** The ratio of the available power of the specified source to the power that the transducer delivers to the speci-

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