IEEE Std 100-1996

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.

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Introduction

Since the first edition in 1941 of the American Standard Definitions of Electrical Terms, the work now known as IEEE Std 100, The IEEE Standard Dictionary of Electrical and Electronics Terms, has evolved into the unique compendium of terms that it is today.

The current edition includes all terms defined in approved IEEE standards through December 1996. Terms are categorized by their technical subject area. They are also associated with the standards or publications in which they currently appear. In some cases, terms from withdrawn standards are included when no current source can be found. Earlier editions of IEEE Std 100 included terms from sources other than IEEE standards, such as technical journals, books, or conference proceedings. These terms have been maintained for the sake of consistency and their sources are listed with the standards in the back of the book.

The practice of defining terms varies from standard to standard. Many working groups that write standards prefer to work with existing definitions, while others choose to write their own. Thus terms may have several similar, although not identical, definitions. Definitions have been combined wherever it has been possible to do so by making only minor editorial changes. Otherwise, they have been left as written in the original standard.

Users of IEEE Std 100 occasionally comment on the surprising omission of a particular term commonly used in an electrical or electronics field. This occurs because the terms in IEEE Std 100 represent only those defined in the existing or past body of IEEE standards. To respond to this, some working groups obtain authorization to create a glossary of terms used in their field. All existing, approved standard glossaries have been incorporated into this edition of IEEE Std 100, including the most current glossaries of terms for computers and power engineering.

IEEE working groups are encouraged to refer to IEEE Std 100 when developing new or revised standards to avoid redundancy. They are also encouraged to investigate deficiencies in standard terms and create standard glossaries to alleviate them.

The sponsoring body for this document was Standards Coordinating Committee 10 on Definitions (SCC10), which consisted of the following members:

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within specified limits. *Note:* For control systems and many of their components, the lower frequency often approaches zero. *See also:* control system, feedback. (IA/IM/PE) [120], [60], [69], [93], 421A-1978s

(8) (pulse terminology) The two portions of a pulse waveform that represents the first nominal state from which a pulse departs and to which it ultimately returns. Typical closed-loop frequency response of an excitation control system with the synchronous machine open circuited. (Std100)

(9) (signal-transmission system) The range of frequencies within which performance, with respect to some characteristic, falls within specific limits. *Note:* For systems capable of transmitting at zero frequency the frequency at which the system response is less than that at zero frequency by a specified ratio. For carrier-frequency systems: the difference in the frequencies at which the system response is less than that at the frequency of reference response by a specified ratio. For both types of systems, bandwidth is com m only defined at the points where the response is three decibels less than the reference value (0.707 root-mean-square voltage ratio). *See also:* equivalent noise bandwidth. (IE) [43]

(10) (oscilloscopes) The difference between the upper and lower frequency at which the response is 0.707 (−3 dB) of the response at the reference frequency. Usually both upper and lower limit frequencies are specified rather than the difference between them. When only one number appears, it is taken as the upper limit. *Notes:* 1. The reference frequency shall be at least 20 times greater for the lower bandwidth limit and at least 20 times less for the upper bandwidth limit than the limit frequency. The upper and lower reference frequencies are not required to be the same. In cases where exceptions must be made, they shall be noted. 2. This definition assumes the amplitude response to be essentially free of departures from a smooth roll-off characteristic. 3. If the lower bandwidth limit extends to zero frequency, the response at zero frequency shall be equal to the response at the reference frequency, not −3 dB from it. (IM) [40]

(11) (dispersive and nondispersive delay lines) A specified frequency range over which the amplitude response does not vary more than a defined amount. *Note:* Typically, amplitude range is 1 dB bandwidth, 3 dB bandwidth. (UFFC) [22]

(12) (A) (analog computer) Of a signal, the difference between the limiting frequencies encountered in the signal. **(B) (analog computer)** Of a device, the range of frequencies within which performance in respect to some characteristic falls within specific limits. (C) 165-1977w

(13) (data transmission) The range of frequencies within which performance, with respect to some characteristic, falls within specific limits. Bandwidth is commonly defined at the points where the response is three decibels less than the reference value. (PE) 599-1985w

(14) (broadband local area networks) The frequency range that a component, circuit, or system passes or uses. For example, voice transmission by telephone requires a bandwidth of about 3000 Hz (3 kHz). A television channel occupies a bandwidth of 6 000 000 Hz (6 MHz). Cable systems occupy 5−300 MHz or higher of the electromagnetic spectrum. (C/LM) 802.7-1989

(15) The range of frequencies, expressed in hertz, that can pass over a given channel. *See also:* pass band. (C) 610.7-1995

(16) A specified frequency range over which the amplitude response does not vary more than a defined amount. *Note:* Typically, amplitude variations to specify bandwidth are 1 dB or 3 dB (dispersive and nondispersive delay lines). (UFFC) 1037-1992

(17) (fiber optics) *See also:* fiber bandwidth. 812-1984w

bandwidth allocation protocols The protocols used to allocate bandwidth on a ringlet. This involves inhibiting send-packet transmissions from one or more nodes when another node is being starved (never gets an opportunity to transmit its send packet). (C/MM) 1596-1992

bandwidth balancing mechanism A procedure to facilitate effective sharing of the bandwidth, whereby a node occasionally skips the use of empty Queued Arbitrated (QA) slots (C/LM) 8802-6-1994

bandwidth, coherent *See:* bandwidth, dispersive.

bandwidth, dispersive (dispersive delay line) The operating frequency range over which the delay dispersion is defined. *Synonyms:* bandwidth, coherent; bandwidth, frequency selective. (UFFC) [22]

bandwidth, effective (bandpass filter in a signal transmission system) The width of an assumed rectangular bandpass filter having the same transfer ratio at a reference frequency and passing the same mean square of a hypothetical current and voltage having even distribution of energy over all frequencies. *Note:* For a nonlinear system, the bandwidth at a specified input level. *See also:* network analysis; signal. (AP/IE) [43], 145-1983s

bandwidth, frequency selective The inverse of the product $2\pi\sigma_\tau$, where σ_τ is the time delay spread. *Synonyms:* bandwidth, coherent; bandwidth, dispersive. (AP) 211-1990

bandwidth-limited operation (fiber optics) The condition prevailing when the system bandwidth, rather than the amplitude (or power) of the signal, limits performance. The condition is reached when the system distorts the shape of the waveform beyond specified limits. For linear systems, bandwidth-limited operation is equivalent to distortion-limited operation. *See also:* attenuation-limited operation; distortion-limited operation. (Std100) 812-1984w

bandwidth, root-mean-square The root mean squared (rms) deviation of the power spectrum of the received signal relative to zero frequency or the spectral center, in units of radians per second. This bandwidth, β, is defined as

$$\beta^2 = \frac{\int_{-\infty}^{\infty} [2\pi(f - f_0)]^2 \, |S(f)|^2 \, df}{\int_{-\infty}^{\infty} |S(f)|^2 \, df}$$

where $S(f)$ is the Fourier transform of the signal $s(t - \tau_0)$ with true time delay τ_0 and f_0 is the center frequency of the spectrum. *Note:* β^2 is the normalized second moment of the spectrum $|S(f)|^2$ about the mean. (AE) 686-1990w

bang snuffer (nonlinear, active, and nonreciprocal waveguide components). A switch used in radar receivers to suppress carrier leakage during the transmit period. *See also:* gate. (MTT) 457-1982w

bank (1) (A) (navigation) Lateral inclination of an aircraft in flight. *See also:* list. **(B)** An aggregation of similar devices (for example, transformers, lamps, etc.) connected together and used in cooperation. *Note:* In automatic switching, a bank is an assemblage of fixed contacts over which one or more wipers or brushes move in order to establish electric connections. *See also:* relay level. (AE) [119]

(2) (A) One or more disk drives lined up in a row. **(B)** Any group of similar devices that are connected together for use as a single device. For example, a row of light-emitting diodes connected to form a display. **(C)** A contiguous section of addressable memory. For example, eight memory devices, each of which is 64 kB by 1; forming a 64 kB × 8 memory bank. (C) 610.10-1994

bank-and-wiper switch (telephone switching systems) A switch in which an electromagnetic ratchet or other mechanisms are used, first, to move the wipers to a desired group of terminals, and second, to move the wipers over the terminals of this group to the desired bank contacts. (EEC/PE) [119]

banked winding *See:* bank winding.

bank winding (banked winding) A compact multilayer form of coil winding, for the purpose of reducing distributed capacitance, in which single turns are wound successively in each of two or more layers, the entire winding proceeding from one end of the coil to the other, without return. (IM) [120]