

**MAC:** Abbreviation for **medium access control**.

**machine-independent:** In telecommunications, computer, and data processing systems, pertaining to operations, procedures, computer programs, and processing that do not depend upon specific hardware for their successful execution. [From Weik '89]

**machine instruction:** An instruction that is written in a machine language and can be executed directly by the processor for which it was designed without translation or interpretation.

**machine language:** A language that need not be modified, translated, or interpreted before it can be used by the processor for which it was designed. *Note 1:* The operation codes and addresses used in instructions written in machine language can be directly sensed by the arithmetic and control unit circuits of the processor for which the language is designed. *Note 2:* Instructions written in an assembly language or a high-level language must be translated into machine language before they can be executed by a processor. *Note 3:* Machine languages are usually used by computer designers rather than computer users.

**machine learning:** The ability of a device to improve its performance based on its past performance.

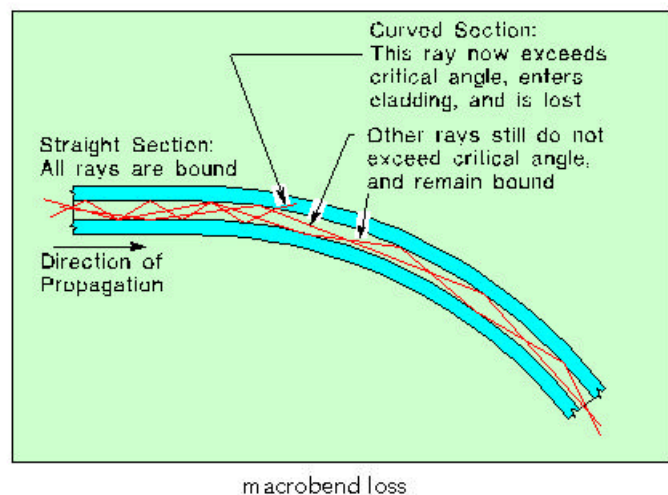
**machine-oriented language:** *Synonym* **computer-oriented language**.

**machine-readable medium:** A medium capable of storing data in a form that can be accessed by an automated sensing device. *Note:* Examples of machine-readable media include (a) magnetic disks, cards, tapes, and drums, (b) punched cards and paper tapes, (c) optical disks, and (d) magnetic ink characters. *Synonym* **automated data medium**.

**machine word:** *Synonym* **computer word**.

**macroband:** A relatively large-radius bend in an optical fiber, such as might be found in a splice organizer tray or a fiber-optic cable that has been bent. *Note:* A macroband will result in no significant radiation loss if it is of sufficiently large radius. The definition of "sufficiently large" depends on the type of fiber. Single-mode fibers have a low numerical aperture, typically less than 0.15, and are therefore more susceptible to bend losses than other types. Normally, they will not tolerate a minimum bend radius of less than 6.5 to 7.5 cm (2.5 to 3 inches). Certain specialized types of single-mode fibers, however, can tolerate a far shorter minimum bend radius without appreciable loss. A graded-index multimode fiber having a core diameter of 50  $\mu\text{m}$  and a numerical aperture of 0.20 will typically tolerate a minimum bend radius of not less than 3.8 cm (1.5 inches). The fibers commonly used in customer-premises applications (62.5- $\mu\text{m}$  core) typically have a relatively high numerical aperture, (approximately 0.27), and can tolerate a bend radius of less than an inch (2.5 cm). [After FAA]

**macroband loss:** In an optical fiber, that loss attributable to macrobanding. *Synonym* **curvature loss**.



**magic cookie:** *Synonym* **cookie**.

**magnetic card:** A card with a magnetizable surface on which data can be stored and retrieved.

**magnetic circuit:** 1. The complete closed path taken by magnetic flux. 2. A region of ferromagnetic material, such as the core of a transformer or solenoid, that contains essentially all of the magnetic flux.

**magnetic core storage:** In computer technology, a storage device that uses ferromagnetic materials such as iron, iron oxide, or ferrite and in such shapes as wires, toroids, and rods.

**magnetic disk:** *See* **diskette**, **hard disk**.

**magnetic drum:** A right circular cylinder with a magnetizable surface on which digital data can be stored and retrieved.

**magnetic remanence:** [A] magnetic representation of residual information remaining on a magnetic medium after the medium has been cleared. [INFOSEC-99]

**magnetic storm:** A perturbation of the Earth's magnetic field, caused by solar disturbances, usually lasting for a brief period (several days) and characterized by large deviations from the usual value of at least one component of the field. *Note:* Magnetic storms can affect radio propagation because they disturb the ionosphere.

**magnetic tape:** 1. A tape with a magnetizable surface on which data can be stored and retrieved. 2. A tape or ribbon of any material impregnated or coated with magnetic or other material on which information may be placed in the form of magnetically polarized spots. [JP1]

**magneto-ionic double refraction:** The combined effect of the Earth's magnetic field and atmospheric ionization, whereby a linearly polarized wave entering the ionosphere is split into two components called the ordinary wave and the extraordinary wave. *Note:* The component waves follow different paths, experience different attenuations, have different phase velocities, and, in general, are elliptically polarized in opposite senses.

**magneto-optic:** *See* **magneto-optic effect**.

**magneto-optic effect:** Any one of a number of phenomena in which an electromagnetic wave interacts with a magnetic field, or with matter under the influence of a magnetic field. *Note:* The most important magneto-optic effect having application to optical communication is the Faraday effect, in which the plane of polarization is rotated under the influence of a magnetic field parallel to the direction of propagation. This effect may be used to modulate a lightwave.

**mail bombing:** *Synonym spamming. See flooding, spam.*

**mailbox-type facility:** A facility in which a message from an originating user is stored until the destination user requests delivery of that message.

**mail exchange record (MX record):** An entry in a domain name system database that directs the routing of mail by mail transfer agents. [After Bahorsky]

**mail exploder:** Part of an e-mail delivery system that allows a message to be automatically and efficiently delivered to a list of addresses, thus implementing mailing lists. [After Bahorsky] *Synonym exploder.*

**mail gateway:** A computer that connects two or more electronic mail systems (especially dissimilar mail systems on two different networks) and transfers messages between them. *Note:* The mapping and translation can be quite complex, and can require a store-and-forward scheme whereby the message is received from one system completely before it is transmitted to the next system after suitable translations. [After Bahorsky]

**mailing list:** Any one of a number of automated e-mail distribution programs that provide a forum for information exchange for professional, educational, and special interest groups. *Note:* Subscribers post messages to the list address and messages are then distributed to all subscribers.

**mailing list server:** *Synonym list server.*

**mail path:** A series of machine names used to direct electronic mail from one user to another. [Bahorsky]

**mail reflector:** **1.** *Synonyms e-mail exploder, mail exploder.* **2.** A program that forwards e-mail to individuals at a (usually) unchanging e-mail address, even when the individuals change Internet service providers.

**mailserver:** A computer that provides e-mail management and storage space for messages pertaining to a group of subscribers. [Bahorsky]

**mail user agent:** The software used to access and manage a user's electronic mail. [After Bahorsky]

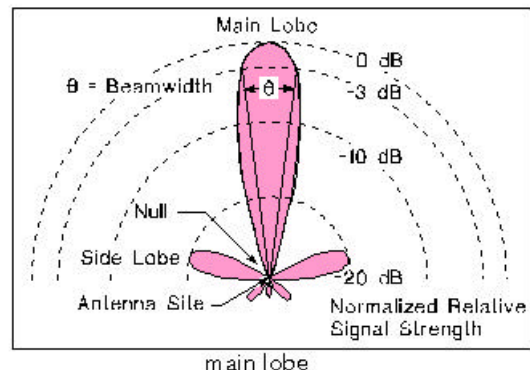
**main beam:** *Synonym main lobe.*

**main distribution frame (MDF):** A distribution frame on one part of which the external trunk cables entering a facility terminate, and on another part of which the internal user subscriber lines and trunk cabling to any intermediate distribution frames terminate. *Note 1:* The MDF is used to cross-connect any outside line with any desired terminal of the multiple cabling or any other outside line. *Note 2:* The MDF usually holds central office protective devices and functions as a test point between a line and the office. *Note 3:* The MDF in a private exchange performs functions similar to those performed by the MDF in a central office. *Synonym (in telephony) main frame.*

**main frame:** *Synonym (in telephony) main distribution frame.*

**mainframe:** A large computer, usually one to which other computers and/or terminals are connected to share its resources and computing power.

**main lobe:** Of an antenna radiation pattern, the lobe containing the maximum power (exhibiting the greatest field strength). *Note:* The horizontal radiation pattern, *i.e.*, that which is plotted as a function of azimuth about the antenna, is usually specified. The width of the main lobe is usually specified as the angle encompassed between the points where the power has fallen 3 dB below the maximum value. The vertical radiation pattern, *i.e.*, that which is plotted as a function of elevation from a specified azimuth, is also of interest and may be similarly specified. *Synonym main beam.*



**main station:** A user instrument, *e.g.*, telephone set or terminal, with a distinct call number designation, connected to a local loop, used for originating calls, and on which incoming calls from the exchange are answered.

**main storage:** In a computer, program-addressable storage from which instructions and other data may be loaded directly into registers for subsequent execution or processing. *Note 1:* Main storage includes the total program-addressable execution space that may include one or more storage devices. *Note 2:* "Main storage" usually refers to large and intermediate computers, whereas "memory" usually refers to microcomputers, minicomputers, and calculators.

**maintainability:** **1.** A characteristic of design and installation, expressed as the probability that an item will be retained in or restored to a specified condition within a given period of time, when the maintenance is performed in accordance with prescribed procedures and resources. **2.** The ease with which maintenance of a functional unit can be performed in accordance with prescribed requirements.

**maintenance:** **1.** Any activity, such as tests, measurements, replacements, adjustments and repairs, intended to restore or retain a functional unit in a specified state in which the unit can perform its required functions. **2.** [For materiel], All action taken to retain materiel in a serviceable condition or to restore it to serviceability. It includes inspection, testing, servicing, classification as to serviceability, repair, rebuilding, and reclamation. [JP1] **3.** [For materiel], All supply and repair action taken to keep a force in condition to carry out its mission. [JP1] **4.** [For materiel], The routine recurring work required to keep a facility (plant, building, structure, ground facility, utility system, or other real property) in such condition that it may be continuously used, at its original or designed capacity and efficiency for its intended purpose. [JP1]

**maintenance control circuit (MCC):** In a communications link, a circuit used by maintenance personnel for coordination. *Note:* An MCC is not available to operations or technical control personnel.

**maintenance hook:** **1.** A trapdoor in software that allows easy maintenance and development of additional features and that may allow entry into the program at unusual points or without the usual checks. [2382-pt.8] **2.** Special instructions (trapdoors) in software allowing easy maintenance and additional feature development. Since maintenance hooks frequently allow entry into the code without the usual checks, they are a serious security risk if they are not removed prior to live implementation. [INFOSEC-99]

**maintenance key:** Key intended only for in-shop use. [INFOSEC-99]

**major lobe:** *See main lobe.*

**make interval:** **1.** In dial-pulse signaling, that portion of the dial pulse in which the network applies a low resistance between the tip and ring conductors at the network interface (NI). [T1.407-1997] **2.** In dial-pulse signaling, that portion of the dial pulse in which the pulsing circuit is in its low-impedance condition. [T1.405-1989]

**malicious applets:** Small application programs automatically downloaded and executed that perform an unauthorized function on an information system (IS). [INFOSEC-99]

**malicious code:** Software or firmware capable of performing an unauthorized function on an information system (IS). [INFOSEC-99]

**malicious logic:** **1.** A program implemented in hardware, firmware, or software, and whose purpose is to perform some unauthorized or harmful action. *Note:* Examples of malicious logic are a logic bomb, a Trojan horse, a virus, a worm. [2382-pt.8] **2.** Hardware, software, or firmware capable of performing an unauthorized function on an information system. [INFOSEC-99]

**MAN:** *Acronym for metropolitan area network.*

**managed object:** **1.** In a network, an abstract representation of network resources that are managed. *Note:* A managed object may represent a physical entity, a network service, or an abstraction of a resource that exists independently of its use in management. **2.** In telecommunications management, a resource within the telecommunications environment that may be managed through the use of operation, administration, maintenance, and provisioning application protocols.

**management domain:** A collection of one or more management systems, and zero or more managed systems and management subdomains, that is administered by a single organization. [T1.215-1994]

**management information system (MIS):** An organized assembly of resources and procedures required to collect, process, and distribute data for use in decision making.

**management inhibit:** A procedure used in signaling traffic management to keep a signaling link unavailable to user-part-generated signaling traffic except for test and maintenance traffic. [T1.226-1992]

**management system:** An application process within a management domain that affects monitoring and control functions on managed objects, management subdomains, or both. A management system may also communicate with its peers (that may be resident in other management domains). *Synonym* **managing system.** [T1.215-1994]

**managing system:** *Synonym* **management system.**

**Manchester code:** A code in which (a) data and clock signals are combined to form a single self-synchronizing data stream, (b) each encoded bit contains a transition at the midpoint of a bit period, (c) the direction of transition determines whether the bit is a "0" or a "1," and (d) the first half is the true bit value and the second half is the complement of the true bit value.

**mandatory fixed part:** Part of a message that contains those parameters that are mandatory and of fixed length for a particular message type. [T1.110-1987]

**mandatory variable part:** Part of a message that contains mandatory parameters of variable length. [T1.110-1987]

**mandrel wrapping:** In multimode fiber optics, a technique used to modify the modal distribution of a propagating optical signal. *Note:* A cylindrical rod wrap consists of a specified number turns of fiber on a mandrel of specified size, depending on the fiber characteristics and the desired modal distribution. It has application in optical transmission performance tests, to simulate, *i.e.*, establish, equilibrium mode distribution in a launch fiber (a fiber used to inject a test signal in another fiber that is under test). If the launch fiber is fully filled ahead of the mandrel wrap, the higher-order modes will be stripped off, leaving only lower-order modes. If the launch fiber is underfilled, *e.g.*, as a consequence of being energized by a laser diode or edge-emitting LED, there will be a redistribution to higher-order modes until modal equilibrium is reached.

**manipulation detection:** A procedure that is used to detect whether data have been modified either accidentally or intentionally. *Synonym* **modification detection.** [2382-pt. 8]

**manipulation detection code (MDC):** In cryptosystems, a bit string that is a function of data to which it is attached for the purpose of manipulation detection. *Note 1:* The resulting message (data plus MDC) may then be encrypted to achieve secrecy or data authentication. *Note 2:* The function used to generate the MDC must be public. [After 2382-pt.8]

**man-machine system:** A system in which the functions of a human operator and a machine are integrated.

**manual remote rekeying:** [A] procedure by which a distant crypto-equipment is rekeyed electrically, with specific actions required by the receiving terminal operator. [INFOSEC-99]

**margin:** **1.** In communications systems, the maximum degree of signal distortion that can be tolerated without affecting the restitution, *i.e.*, without its being interpreted incorrectly by the decision circuit. **2.** The allowable error rate, deviation from normal, or degradation of the performance of, a system or device.

**marine broadcast station:** A coast station which makes scheduled broadcasts of time, meteorological, and hydrographic information. [NTIA]

**marine utility station:** A station in the maritime mobile service consisting of one or more hand-held radiotelephone units licensed under a single authorization. Each unit is capable of operation while being hand-carried by an individual.

**maritime air communications:** Communications systems, procedures, operations, and equipment that are used for message traffic between aircraft stations and ship stations in the maritime service. *Note:* Commercial, private, naval, and other ships are included in maritime air communications.

**maritime broadcast communications net:** A communications net that is used for international distress calling, including international lifeboat, lifecraft, and survival-craft high-frequency (HF); aeronautical emergency very high-frequency (VHF); survival ultra high-frequency (UHF); international calling and safety very high-frequency (VHF); combined scene-of-search-and-rescue; and other similar and related purposes. *Note:* Basic international distress calling is performed at either medium frequency (MF) or at high frequency (HF).

**maritime mobile-satellite service:** A mobile-satellite service in which mobile Earth stations are located on board ships; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service. [NTIA] [RR]

**maritime mobile service:** A mobile service between coast stations and ship stations, or between ship stations, or between associated on-board communication stations; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service. [NTIA] [RR]

**maritime radionavigation-satellite service:** A radionavigation-satellite service in which Earth stations are located on board ships. [NTIA] [RR]

**maritime radionavigation service:** A radionavigation service intended for the benefit and for the safe operation of ships. [NTIA] [RR]

**mark:** **1.** In telegraphy, one of the two significant conditions of encoding. *Note 1:* The complementary significant condition is called "space." *Note 2:* In modern digital communications, the two corresponding significant conditions of encoding are called "1" and "0." *Synonyms* **marking pulse, marking signal.** **2.** A symbol or symbols that indicate the beginning or the end of a field, of a word, or of a data item in a file, record, or block.

**marker beacon:** A transmitter in the aeronautical radionavigation service which radiates vertically a distinctive pattern for providing position information to aircraft. [NTIA] [RR]

**marking bias:** The uniform lengthening of all marking signal pulse widths at the expense of the pulse widths of all spacing pulses.

**marking end distortion:** *See end distortion.*

**marking pulse:** *Synonym mark.*

**marking signal:** *Synonym mark.*

**mark sequence:** A string of mark bits (sent immediately before message transmission starts) to alert the customer installation (CI) to initiate certain actions. [T1.401-1998]

**marquee:** **1.** In computer display, a line of alphanumeric characters that scrolls through, and within, a defined area (window). **2.** An HTML tag that enables the display of a marquee.

**Martian:** **1.** [*Slang*] Pertaining to packets that are delivered to the wrong network as the result of bogus routing entries. [After Bahorsky] **2.** [*Slang*] A packet that has a completely bogus (nonregistered or ill-formed) Internet address. [After Bahorsky]

**m-ary code:** *See n-ary code.*

**m-ary signaling:** *See n-ary code.*

**maser:** *Acronym for microwave amplification by stimulated emission of radiation.* A member of the general class of microwave oscillators based on molecular interaction with electromagnetic radiation.

**mask:** **1.** In communications systems, to obscure, hide, or otherwise prevent information from being derived from a signal. *Note 1:* Masking is usually the result of interaction with another signal, such as noise, static, jamming, or other forms of interference. *Note 2:* Masking is not synonymous with erasing or deleting. **2.** In computing and data processing systems, a pattern of bits that can be used to retain or suppress segments of another pattern of bits. [From Weik '89]

**masked threshold:** The level at which an indistinguishable signal of interest becomes distinguishable from other signals or noise. *Note:* In acoustics, the masked threshold is usually expressed in dB.

**masking:** **1.** In television and video technology, a process in which color signals are used to modify each other for the purpose of altering their color rendition. *Note:* The process is often accomplished by suitable cross coupling between primary color-signal channels. [After IEEE 100] [After SMPTE] **2.** One way of partial compensation for photo-receptor cot sensitivity, nonoptimum color filters, nonideal display phosphors, unwanted dye absorption, etc. [After SMPTE]

**masquerade:** The pretense by an entity to be a different entity in order to gain unauthorized access. [2382-pt.8]

**masquerading:** [A] form of spoofing. [INFOSEC-99]

**master clock:** A device that generates periodic, accurately spaced signals that are used for such purposes as timing, regulation of the operations of a processor, or generation of interrupts.

**master file (MF):** the unique mandatory file containing access conditions and optionally DFs (dedicated files) and/or EFs (extended frames). [T1.707-1998]

**master frequency generator:** In frequency-division multiplexing (FDM), equipment used to provide system end-to-end carrier frequency synchronization and frequency accuracy of tones. *Note:* The following types of oscillators are used in the Defense Communications System FDM systems:

- Type 1 - A master carrier oscillator as an integral part of the multiplexer set.
- Type 2 - A submaster oscillator equipment or slave oscillator equipment as an integral part of the multiplexer set.
- Type 3 - An external master oscillator equipment that has extremely accurate and stable characteristics.

*Synonym master oscillator.*

**mastergroup:** *See group.*

**master key:** Within a hierarchy of encrypting keys and transaction keys, the highest level of key-encrypting key. [After X9.24]

**master oscillator:** *Synonym master frequency generator.*

**master-slave timing:** Timing in which one station or node supplies the timing reference for all other interconnected stations or nodes.

**master station:** **1.** In a data network, the station that is designated by the control station to ensure data transfer to one or more slave stations. *Note:* A master station controls one or more data links of the data communications network at any given instant. The assignment of master status to a given station is temporary and is controlled by the control station according to the procedures set forth in the operational protocol. Master status is normally conferred upon a station so that it may transmit a message, but a station need not have a message to send to be designated the master station. **2.** In navigation systems using precise time dissemination, a station that has the clock used to synchronize the clocks of subordinate stations. **3.** In basic mode link control, the data station that has accepted an invitation to ensure a data transfer to one or more slave stations. *Note:* At a given instant, there can be only one master station on a data link.

**matched junction:** A waveguide component having four or more ports, and so arranged that if all ports except one are terminated in the correct impedance, there will be no reflection of energy from the junction when the fourth port is driven by a transmission line having a matching impedance.

**matching gel:** *See gel.*

**material absorption:** See absorption.

**material dispersion:** See dispersion.

**material dispersion coefficient** [ $M(\lambda)$ ]: In an optical fiber, pulse broadening per unit length of fiber and unit spectral width, usually expressed in picoseconds per (nanometer•kilometer). *Note 1:* For many silica-based fibers,  $M(\lambda)$  approaches zero at a specific wavelength  $\lambda_0$  between 1.3  $\mu\text{m}$  and 1.5  $\mu\text{m}$ . At wavelengths shorter than  $\lambda_0$ ,  $M(\lambda)$  is negative and increases with wavelength; at wavelengths longer than  $\lambda_0$ ,  $M(\lambda)$  is positive and decreases with wavelength. *Note 2:* Pulse broadening caused by material dispersion in a unit length of optical fiber is given by the product of  $M(\lambda)$  and spectral width ( $\Delta\lambda$ ). *Note 3:* The material dispersion coefficient  $M(\lambda)$  is given by

$$M(\lambda) = \frac{1}{c} \frac{dN}{d\lambda} = -\frac{\lambda}{c} \frac{d^2\eta}{d\lambda^2},$$

where  $\eta$  is the refractive index of the material,  $N$  is the group index expressed as

$$N = \eta - \lambda \frac{d\eta}{d\lambda},$$

where  $\lambda$  is the wavelength of interest, and  $c$  is the velocity of light in vacuo.

**material scattering:** Of an electromagnetic wave, scattering that is attributable to the intrinsic properties of the material through which the wave is propagating. *Note 1:* Ionospheric scattering and Rayleigh scattering are examples of material scattering. *Note 2:* In an optical fiber, material scattering is caused by micro-inhomogeneities in the refractive indices of the materials used to fabricate the fiber, including the dopants used to modify the refractive index profile.

**matrixing:** The accomplishment of a color coordinate transformation by computational, electrical, optical, or by other means. [After IEEE 100] [After SMPTE]

**matte:** An image or signal that represents or carries only transparent information that is intended to overlay or control another image or signal. [After SMPTE]

**MAU:** Abbreviation for medium access unit.

**maximal-ratio combiner:** A diversity combiner in which (a) the signals from each channel are added together, (b) the gain of each channel is made proportional to the rms signal level and inversely proportional to the mean square noise level in that channel, and (c) the same proportionality constant is used for all channels. *Synonyms* ratio-squared combiner, post-detection combiner, predetection combining, selective combiner.

**maximum block transfer time:** The maximum allowable waiting time between initiation of a block transfer attempt and completion of a successful block transfer.

**maximum calling area:** Geographic calling limits permitted to a particular access line based on requirements for the particular line. *Note:* Maximum calling area restrictions are imposed for network control purposes.

**maximum disengagement time:** The maximum allowable waiting time between initiation of a disengagement attempt and successful disengagement.

**maximum justification rate:** *Synonym* maximum stuffing rate.

**maximum keying frequency:** In facsimile systems, the frequency in hertz numerically equal to the spot speed divided by twice the X-dimension of the scanning spot.

**maximum modulating frequency:** In a facsimile transmission system, the highest picture frequency that is required. *Note:* The maximum modulating frequency and the maximum keying frequency are not necessarily equal.

**maximum stuffing rate:** In a bit-stream, the maximum rate at which stuffing bits can be inserted into the stream. *Synonym* maximum justification rate.

**maximum time interval error (MTIE):** The maximum error for all possible measurement intervals within the measurement period. [T1.101-1999]

**maximum usable frequency (MUF):** In radio transmission using reflection from the regular ionized layers of the ionosphere, the upper frequency limit that can be used for transmission between two points at a specified time. *Note:* MUF is a median frequency applicable to 50% of the days of a month, as opposed to 90% cited for the lowest usable high frequency (LUF) and the optimum traffic frequency (FOT).

**maximum user signaling rate:** The maximum rate, in bits per second, at which binary information can be transferred in a given direction between users over the telecommunications system facilities dedicated to a particular information transfer transaction, under conditions of continuous transmission and no overhead information. *Note 1:* For a single channel, the signaling rate is given by

$$SCSR = \frac{\log_2 N}{T},$$

where  $SCSR$  is the single-channel signaling rate in bits per second,  $T$  is the minimum time interval in seconds for which each level must be maintained, and  $n$  is the number of significant conditions of modulation of the channel. *Note 2:* In the case where an individual end-to-end telecommunications service is provided by parallel channels, the parallel-channel signaling rate is given by

$$PCSR = \sum_{i=1}^m \frac{\log_2 N_i}{T_i},$$

where  $PCSR$  is the total signaling rate for  $m$  channels,  $m$  is the number of parallel channels,  $T_i$  is the minimum interval between significant instants for the  $i$ -th channel, and  $n_i$  is the number of significant conditions of modulation for the  $i$ -th channel. *Note 3:* In the case where an end-to-end telecommunications service is provided by tandem channels, the end-to-end signaling rate is the lowest signaling rate among the component channels.

**Maxwell's equations:** A set of partial differential equations that describe and predict the behavior of electromagnetic waves in free space, in dielectrics, and at conductor-dielectric boundaries. *Note:* Maxwell's equations expand upon and unify the laws of Ampere, Faraday, and Gauss, and form the foundation of modern electromagnetic theory.

**Mbone:** *Abbreviation for multicast backbone* on the Internet. A part of the Internet designed to support IP multicasting by coordinating the transmission of messages to a single destination instead of allowing packets to travel by different routes. [Bahorsky]

**MCC:** *Abbreviation for maintenance control circuit.*

**MCM:** *Abbreviation for multicarrier modulation.*

**MDF:** *Abbreviation for main distribution frame.*

**meaconing:** A system of receiving radio beacon signals and rebroadcasting them on the same frequency to confuse navigation. The meaconing stations cause inaccurate bearings to be obtained by aircraft or ground stations. [JP 1-02]

**mean power (of a radio transmitter):** The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions. [NTIA] [RR] *Note:* Normally, a time of 0.1 second, during which the mean power is greatest, will be selected.

**mean time between failures (MTBF):** **1.** An indicator of expected system reliability calculated on a statistical basis from the known failure rates of various components of the system. *Note:* MTBF is usually expressed in hours. **2.** Of a system, over a long performance measurement period, the measurement period divided by the number of failures that have occurred during the measurement period. **3.** For population of items, during a measurement period, the total functioning life of the population of items divided by the total number of failures within the population during the measurement period. *Note 1:* The total functioning life of the population may be calculated as the summation of the operating life of every item in the population over the measurement period. When computing the MTBF, any measure of operating life may be used, such as time, cycles, kilometers, or events. *Note 2:* For example, if a total of 1,000 events, such as data transfers, radio transmissions, or system boots, occurs in a population of items during a measurement period of 100 hours and there are a total of 10 failures among the entire population, the MTBF for each item is  $(1000)(100)/10 = 10^4$  hours.

**mean time between outages (MTBO):** In a system, the mean time between equipment failures that result in loss of system continuity or unacceptable degradation. *Note:* The  $MTBO$  is calculated by the equation,

$$MTBO = \frac{MTBF}{1 - FFAS} ,$$

where  $MTBF$  is the nonredundant mean time between failures and  $FFAS$  is the fraction of failures for which the failed equipment is automatically bypassed.

**mean time to repair (MTTR):** The total corrective maintenance time divided by the total number of corrective maintenance actions during a given period of time.

**mean time to service restoral (MTSR):** The mean time to restore service following system failures that result in a service outage. *Note:* The time to restore includes all time from the occurrence of the failure until the restoral of service.

**measured blocking threshold:** A value for measured blocking above which there is a statistically significant probability that the design blocking objective is not being met. [T1.Rpt 11-1991]

**measured-rate service:** Telephone service for which charges are made in accordance with the total connection time of the line.

**measurement period:** *See performance measurement period.*

**mechanically induced modulation:** Optical signal modulation induced by mechanical means. *Note:* An example of deleterious mechanically induced modulation is speckle noise created in a multimode fiber by an imperfect splice or imperfectly mated connectors. Mechanical disturbance of the fiber ahead of the joint will introduce changes in the modal structure, resulting in variations of joint loss.

**mechanically intermateable connectors:** Connectors that are mechanically mateable, without creating mechanical damage, and without regard to attenuation properties.

**mechanical splice:** Of optical fibers, a splice, *i.e.*, permanent joint, accomplished by aligning the mating fibers in some kind of mechanical fixture. *Note 1:* The fibers may be secured by mechanical means or with an optical adhesive. *Note 2:* When the fibers are secured by mechanical means, the gap between them is usually filled with an index-matching gel to reduce Fresnel reflection. Likewise, the optical adhesives that are used in conjunction with mechanical splices are formulated to have a refractive index that approximates that of the glass, and also serve to reduce Fresnel reflection. [After FAA]

**media converter:** *Synonym medium access unit (MAU).*

**media stream:** A sequence of presentation units intended to convey some specific content. [T1.801.04-1997]

**mediation:** A process within the communications management network that acts on information passing between network elements (NEs) and operating systems (OSs) via a data communication network. Mediation uses standard interfaces and can be shared among several NEs, or several OSs, or between NEs and OSs. [T1.201-1987] [T1.204-1988]

**mediation function:** In telecommunications network management, a function that routes or acts on information passing between network elements and network operations. *Note 1:* Examples of mediation functions are communications control, protocol conversion, data handling, communications of primitives, processing that includes decision-making, and data storage. *Note 2:* Mediation functions can be shared among network elements, mediation devices, and network operation centers.

**medium:** **1.** In telecommunications, the transmission path along which a signal propagates, such as a wire pair, coaxial cable, waveguide, optical fiber, or radio path. **2.** The material on which data are or may be recorded, such as plain paper, paper tapes, punched cards, magnetic tapes, magnetic disks, or optical disks.

**medium access unit (MAU):** In a communications system, the equipment that adapts or formats the signal for transmittal over the communication medium. *Note 1:* An example of a MAU is an optical transmitter, which accepts an electrical signal at its input port and converts it to an optical signal accessible at its output port. *Note 2:* Some prefer to limit the term



*medium access unit* to FDDI usage, with the term *media converter* being preferred for general usage. *Synonym media converter.*

**medium frequency (MF):** Frequencies from 300 kHz to 3000 kHz. *See electromagnetic spectrum.*

**medium interface connector (MIC):** In communications systems, the connector at the interface point between the bus interface unit and the terminal, *i.e.*, the medium interface point.

**medium interface point (MIP):** In communication systems, the location at which the standards for the interface parameters between a terminal and the line facility are implemented.

**medium-power talker:** A hypothetical talker, within a log-normal distribution of talkers, whose volume lies at the medium power of all talkers determining the volume distribution at the point of interest. *Note:* When the distribution follows a log-normal curve (values expressed in decibels), the mean and standard deviation can be used to compute the medium-power talker. The talker volume distribution follows a log-normal curve and the medium-power talker is uniquely determined by the average talker volume. The medium-power talker volume,  $V$ , is given by  $V = V_o + 0.115\sigma^2$ , where  $V_o$  is the average of the talker volume distribution in volume units (vu), and  $\sigma^2$  is the variance of the distribution.

**medium-term bit error rate:** Bit error rate that can be encountered for relatively short time periods (*e.g.*, minutes), due to temporary malfunctions of, for example, transmission equipment. [T1.110-1987]

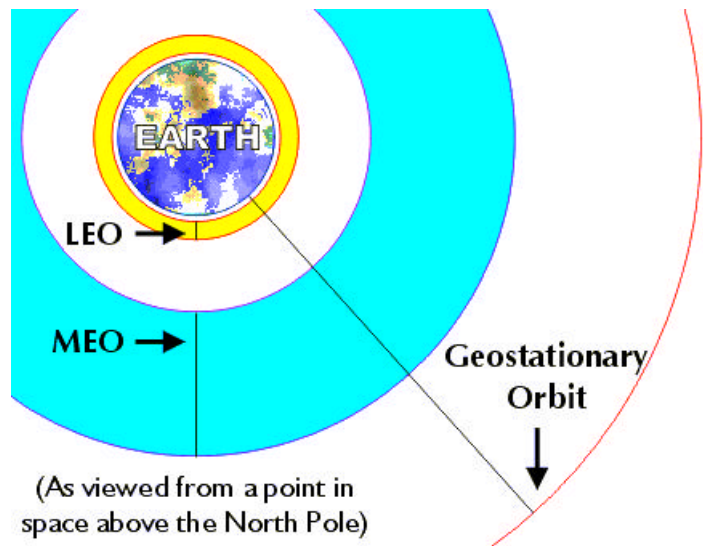
**megahertz (MHz):** A unit of frequency denoting one million ( $10^6$ ) Hz.

**memory:** **1.** All of the addressable storage space in a processing unit and other internal memory that is used to execute instructions. **2.** *Loosely*, the volatile, main storage in computers. *See random access memory.*

**memory scavenging:** The collection of residual information from data storage. [INFOSEC-99]

**menu:** A displayed list of options from which a user selects actions to be performed.

**MEO:** *Abbreviation for medium Earth orbit.* An orbital path configuration, between altitudes of 8,000 and 20,000 km, used by communication satellites that provide communications capabilities for such services as cellular telephone communications and GPS (global positioning system) signals.



Classification	Orbital Altitude (km above the Earth)
LEO	500-2,000
MEO	8,000-20,000
Geostationary orbit	35,786

**MERCAST:** *Acronym for merchant-ship broadcast system.*

**merchant-ship broadcast system (MERCAST):** A maritime shore-to-ship broadcast system in which the ocean areas are divided into primary broadcast areas each covered by a high-powered shore radio station that broadcasts simultaneously on one medium frequency (MF) and one or more high frequencies (HF) for routing messages to ocean-going ships. *Note:* In some instances, coast stations may repeat the messages. [From Weik '89]

**meridional ray:** In fiber optics, a ray that passes through the optical axis of an optical fiber (in contrast with a skew ray, which does not).

**mesh network:** *See network topology.*

**mesh topology:** *See network topology.*

**mesochronous:** The relationship between two signals such that their corresponding significant instants occur at the same average rate.

**message:** **1.** Any thought or idea expressed briefly in a plain or secret language, prepared in a form suitable for transmission by any means of communication. [JP 1-02] *Note:* A message may be a one-unit message or a multiunit message. **2.** [In telecommunications,] Record information expressed in plain or encrypted language and prepared in a format specified for intended transmission by a telecommunications system. [JP1] **3.** An arbitrary amount of information whose beginning and end are defined or implied. **4.** A completed call, *i.e.*, a communication in which a conversation or exchange of information took place between the calling and called parties. [47 CFR Pt.36-A]

**message alignment indicator:** In a signal message, data transmitted between the user part and the message transfer part to identify the boundaries of the signal message.

**message authentication:** Determining that a message has not been changed since leaving its point of transmission, where: (a) the identity of the originator is verified, and (b) the source, uniqueness, and integrity of the message are verified. [After X9.49]

**message authentication code (MAC):** **1.** A bit string that is a function of both data (either plaintext or ciphertext) and a secret key, and that is attached to the data in order to allow data authentication. *Note:* The function used to generate the message authentication code must be a one-way function. [2382-pt.8] **2.** Data associated with an authenticated message allowing a receiver to verify the integrity of the message. [INFOSEC-99]

**message body:** **1.** For the single message format, the message words. **2.** For the multiple message format, the parameter messages. [After T1.401-1998]

**message broadcast:** An electronic-mail conference capability using data terminals. *Note:* Control can be maintained by the user or by the network.

**message center:** *See* communications center.

**message digest:** *See* digest.

**message element:** **1.** In e-mail, a specified portion of a message (*e.g.*, the header, the body). [ANSBIT] **2.** In cryptography, a predefined meaning or data representation within a message. [After X9.19]

**message externals:** Information outside of the message text, such as the header, trailer, *etc.* [INFOSEC-99]

**message feedback:** A method of checking the accuracy of transmission of data by sending received data back to the sending end for comparison with the original data that have been stored there for this purpose. [From Weik '89]

**message format:** A predetermined or prescribed spatial or time-sequential arrangement of the parts of a message that is recorded in or on a data storage medium. *Note:* Messages prepared for electrical transmission are usually composed on a printed blank form with spaces for each part of the message and for administrative entries.

**message frame:** A frame that consists of the channel seizure signal, the mark signal, the message, the checksum word, and any possible filler marks. [T1.401-1998]

**message handling system (MHS):** In the ITU-T X.400 Recommendations, the family of services and protocols that provides the functions for global electronic-mail (e-mail) transfer among local mail systems.

**message heading:** In radio communications, the message part or parts that (a) precede the text, *i.e.*, the message body, in time or space according to established conventions and (b) may include several data items, such as address groups, routing indicators, action addressee designators, information addressee designators, exempted addressee designators, prosigns, prowords, clear indicators, date-time groups, originator designators, special instructions, and protocol symbols. *Note:* Several message heading data items may be combined into a message preamble. [From Weik '89]

**message indicator:** [A] sequence of bits transmitted over a communications system for synchronizing crypto-equipment. Some off-line cryptosystems, such as the [...] one-time pad systems, employ message indicators to establish decryption starting points. [INFOSEC-99]

**message part:** **1.** In radio communications, one of the three major subdivisions of a message, namely the heading, the text, or the ending. *Note:* Each message part may have separate components and each component may have elements and contents. **2.** In cryptosystems, text that results from the division of a long message into several shorter messages of different lengths as a transmission security measure. *Note:* Message parts are usually prepared in such a manner as to appear unrelated externally. Statements that identify the parts for assembly at reception are encrypted in the texts. [From Weik '89]

**message register leads:** Terminal equipment leads at the interface used solely for receiving dc message register pulses from a central office at a PBX so that message unit information normally recorded at the central office only is also recorded at the PBX. . . . [47CFR]

**message service:** Switched service furnished to the general public (as distinguished from private line service). Except as otherwise provided, this includes exchange switched services and all switched services provided by interexchange carriers and completed by a local telephone company's access services, *e.g.*, MTS, WATS, Execunet, open-end FX and CCSA/ONALS. [47 CFR Pt.36-A] *Synonym* message toll service.

**message signal unit (MSU):** A signal unit that contains service information and signaling information fields and is retransmitted by the signaling link control if it is received in error. The value of length indicator is always greater than 2. [T1.226-1992]

**message switching:** A method of handling message traffic through a switching center, either from local users or from other switching centers, whereby the message traffic is stored and forwarded through the system.

**message toll service:** *Synonym* message service.

**message transfer agent (MTA):** An OSI application process used to store and forward messages as described in the X.400 message handling system. [Bahorsky] *Synonym* Internet mail agent.

**message transfer part:** The part of a common-channel signaling system that transfers signal messages and performs associated functions, such as error control and signaling link security.

**message type:** An assigned value used to identify the feature generating the message. [T1.401-1998]

**message type code:** The mandatory one-octet field that uniquely defines the function and format of each ISDN user-part message. [T1.110-1987]

**message unit:** **1.** A unit of measure for charging telephone calls, based on parameters such as the length of the call, the distance called, and/or the time of day. **2.** Unit of measurement used for charging for measured message telephone exchange traffic within a specified area. [47 CFR Pt.36-A]

**message word:** The smallest unit of data in the message body. This normally contains the actual feature data that a subscriber at the customer installation (CI) is supposed to receive, according to the feature service description. [T1.401-1998]

**messaging service:** In integrated services digital networks (ISDN), an interactive telecommunications service that provides for information interchange among users by means of store-and-forward, electronic mail, or message-handling functions. *Synonym* [loosely] electronic messaging service.

**meta:** Of or relating to that portion of an HTML document that is not viewable by users through normal use of the browser window, but is readable by search engines and used to facilitate indexing. [After Bahorsky]

**meta certificate:** A certificate, issued to a signatory authority, that displays all co-signature requirements for its signatory certificates. [After X9.45]



**metallic circuit:** A circuit in which metallic conductors are used and in which the ground or earth forms no part.

**metallic member:** A noncommunications metallic cable component such as a shield, vapor barrier, or strength member. [T1.316-1997]

**metallic test access unit (MTAU):** The functions associated with accessing a metallic facility for the purpose of testing. MTAU functionality may be embedded within a network element (NE) or may consist of stand-alone equipment. [T1.216-1998]

**metallic voltage:** A potential difference between metallic conductors, as opposed to a potential difference between a metallic conductor and ground.

**meta name:** A meta key word that is incorporated in the head of an HTML document, and that includes the document's name and facilitates indexing for search engines. [After Bahorsky]

**meta-signaling VCs (vacant codes):** The standardized vacant codes that convey meta-signaling information across a user-network interface (UNI). [T1.627-1993]

**meteor burst communications:** Communications by the propagation of radio signals reflected by ionized meteor trails. [NTIA]

**meteorological aids service:** A radiocommunication service used for meteorological, including hydrological, observations and exploration. [NTIA] [RR]

**meteorological-satellite service:** An Earth exploration-satellite service for meteorological purposes. [NTIA] [RR]

**metric system:** A decimal system of weights and measures based on the meter as a unit of length and the kilogram as a unit of mass. *Note:* The modern form of the metric system is the International System of Units (SI). *See International System of Units.*

**metropolitan area network (MAN):** A data communications network that (a) covers an area larger than a campus area network and smaller than a wide area network (WAN), (b) interconnects two or more LANs, and (c) usually covers an entire metropolitan area, such as a large city and its suburbs.

**metropolitan service area:** The area around and including a relatively large city and in which substantially all of the message telephone traffic between the city and the suburban points within the area is classified as exchange in one or both directions. [47 CFR Pt.36-A]

**MF:** *Abbreviation for medium frequency.*

**MFD:** *Abbreviation for mode field diameter.*

**MFJ:** *Abbreviation for Modification of Final Judgment.*

**MFSK:** *Abbreviation for multiple frequency-shift keying.*

**MHS:** *Abbreviation for message handling system.*

**MHz:** *Abbreviation for megahertz.*

**MIC:** *Abbreviation for medium interface connector.*

**microbend:** In an optical waveguide, sharp curvatures involving local axial displacements of a few micrometers and spatial wavelengths of a few millimeters. *Note:* Microbends can result from waveguide coating, cabling, packaging, and installation. Microbending can cause significant radiative loss and mode coupling.

**microbending:** *See microbend.*

**microbend loss:** In an optical fiber, the optical power loss caused by a microbend. [2196]

**microcircuit:** *Synonym integrated circuit.*

**microcode:** A sequence of microinstructions that is fixed in storage that is not program-addressable, and that performs specific processing functions.

**microcomputer:** A computer (a) in which the processing unit is a microprocessor and (b) that usually consists of a microprocessor, a storage unit, an input channel, and an output channel, all of which may be on one chip.

**microfinishing film:** A film of dimensionally stable plastic, to which are adhered carefully graded abrasive or polishing powders, *i.e.*, particles, having dimensions in the micrometer or submicrometer range. *Note:* Microfinishing films resemble sandpaper, but have much smaller abrasive or polishing particles. They are used commercially to shape and/or polish machined parts. They are also used to finish the endfaces of certain types of optical connectors. [After FAA]

**microinstruction:** An instruction that controls data flow and instruction-execution sequencing in a processor at a more fundamental level than machine instructions. *Note:* A series of microinstructions is necessary to perform an individual machine instruction.

**micro-mainframe link:** A physical or logical connection established between a remote microprocessor and mainframe host computer for the express purpose of uploading, downloading, or viewing interactive data and databases on-line in real time. *Note:* A micro-mainframe link usually requires terminal emulation software on the microcomputer.

**microprocessor:** A central processing unit implemented on a single chip.

**microprogram:** A sequence of microinstructions that are in special storage where they can be dynamically accessed to perform various functions.

**microwave (mw):** *Loosely,* an electromagnetic wave having a wavelength from 300 mm to 10 mm (1 GHz to 30 GHz). *Note:* Microwaves exhibit many of the properties usually associated with waves in the optical regime, *e.g.*, they are easily concentrated into a beam.

**Mie scattering:** Scattering of an electromagnetic wave by particles or refractive index inhomogeneities of a size on the order of the wavelength of interest.

**mileage:** In telecommunications, a specified distance used in tariff calculations, *i.e.*, toll charge calculations. *Note:* Mileage is locally defined and often refers to airline distance rather than actual communication system route miles.

**military common emergency frequency:** A frequency that (a) is used by all military units that are equipped to operate at that frequency or in the band in which that frequency lies and (b) is also used internationally by survival-craft stations and survival-craft equipment. [From Weik '89]

**millimeter wave:** *Loosely,* an electromagnetic wave having a wavelength from 1 mm to 0.1 mm (300 GHz to 3000 GHz). *Note:* Millimeter waves exhibit many of the properties

usually associated with waves in the optical regime, *e.g.*, they are easily concentrated into a beam.

**MIME:** *Abbreviation for multipurpose Internet mail extensions.* A messaging standard that allows Internet users to exchange e-mail messages enhanced with graphics, video, and voice as attachments to the body of the text.

**mimicking:** [A] form of spoofing. [INFOSEC-99]

**minicomputer:** *See computer.*

**minimize:** A condition wherein normal message and telephone traffic is drastically reduced in order that messages connected with an actual or simulated emergency shall not be delayed. [JP1]

**minimum bend radius:** The radius below which an optical fiber or fiber-optic cable should not be bent. *Note 1:* The minimum bend radius is of particular importance in the handling of fiber-optic cables. It will vary with different cable designs. The manufacturer should specify the minimum radius to which the cable may safely be bent during installation, and for the long term. The former is somewhat shorter than the latter. *Note 2:* The minimum bend radius is in general also a function of tensile stresses, *e.g.*, during installation, while being bent around a sheave while the fiber or cable is under tension. *Note 3:* If no minimum bend radius is specified, one is usually safe in assuming a minimum long-term low-stress radius not less than 15 times the cable diameter.

**minimum discernable signal (MDS):** *See threshold.*

**minimum-dispersion slope:** *See zero-dispersion slope.*

**minimum-dispersion wavelength:** *Synonym zero-dispersion wavelength.*

**minimum-dispersion window:** **1.** The window of an optical fiber at which material dispersion is very small. *Note 1:* In silica-based fibers, the minimum-dispersion window occurs at a wavelength of approximately 1.3  $\mu\text{m}$ . *Note 2:* The minimum-dispersion window may be shifted toward the minimum-loss window, *i.e.*, 1.55  $\mu\text{m}$ , by the addition of dopants during manufacture. [After FAA] **2.** In a single-mode fiber, the window or, in the case of doubly or quadruply clad fibers, windows, at which material and waveguide dispersion cancel one another, resulting in extremely wide bandwidth, *i.e.*, extremely low dispersion, over a very narrow range of wavelengths. [After FAA] *Synonym zero dispersion window.*

**minimum-loss window:** Of an optical fiber, the transmission window at which the attenuation coefficient is at or near the theoretical (quantum-limited) minimum. *Note 1:* If the losses from various mechanisms are plotted on a single graph as a function of wavelength, the minimum-loss window occurs in the vicinity of the wavelength at which the Rayleigh-scattering attenuation curve and the infrared-phonon-absorption curve intersect. *Note 2:* For silica-based fibers, the minimum-loss window occurs at approximately 1.55  $\mu\text{m}$ . [After FAA]

**minimum picture interval:** The minimum time between the television pictures that have been selected for encoding. *Note:* ITU-T Recommendation H.221 cites the following values for picture interval: 1/29.97, 2/29.97, 3/29.97, and 4/29.97 seconds per picture.

**minutes-of-use:** A unit of measurement expressed as either holding time or conversation time. [47 CFR Pt.36-A]

**minutes-of-use-kilometers:** The product of (a) the number of minutes-of-use-and (b) the average route kilometers of circuits involved. [47 CFR Pt.36-A]

**MIP:** *Abbreviation for medium interface point.*

**mirroring:** **1.** Of a network server, the maintenance of an identical copy of its files in (a) another network server, or (b) a redundant drive in the same server chassis. *Note:* Mirroring can be used as a rudimentary backup system for the original files, but is more often used to spread out the access load for popular sites, *e.g.*, Web sites, by offering users several different locations from which identical files can be accessed. **2.** Of a computer, the maintenance of an identical copy of its files in (a) another computer, or (b) another drive in the same computer chassis.

**MIS:** *Abbreviation for management information system.*

**misalignment loss:** *See angular misalignment loss, gap loss, lateral offset loss.*

**misdelivered block:** A block received by a user other than the one intended by the message source.

**misdelivered frame:** A frame transferred from a source user to a destination user other than the intended destination user. It is considered inconsequential whether the information is correct or incorrect in content. [T1.615-1992]

**mission bit stream:** *Synonym payload.*

**mistracking:** In ADPCM (adaptive differential pulse code modulation), the condition in which the internal state variables of the encoder and the decoder are not the same. [T1.310-1991]

**mixer:** **1.** A nonlinear analog circuit or device that accepts as its input two different frequencies (signals) and presents at its output (a) a signal equal in frequency to the sum of the frequencies of the input signals, (b) a signal equal in frequency to the difference between the frequencies of the input signals, and (c) if they are not filtered out, (c) the original input frequencies. *Note:* A nonlinear mixer may be used for amplitude modulation (AM) of rf carriers. *See heterodyne.* **2.** A linear analog circuit or device that accepts as its input two or more different signals (*e.g.*, from audio channels), adds them algebraically, and presents the sum at its output. *Note:* For example, a linear mixer of audio signals may be used to combine signals from several microphones for purposes of recording on a common audio track.

**mixing:** *See heterodyne, mixer.*

**MJU:** *Abbreviation for multipoint junction unit.* Equipment used by the service provider to perform the bridging functions for multipoint service. [T1.Rpt39-1995]

**MLP(multilevel precedence) compatibility mode:** An ANSI T1.224 operation mode that uses the MLP Channel to transfer data. ANSI T1.224 data sent on the MLP channel is broadcast to all other ANSI T1.224 capable terminals. [After T1.800.08-1995]

**MLPP:** *Abbreviation for multilevel precedence and preemption.*

**MM patch bay:** A patching facility designed for patching and monitoring of digital data circuits at rates exceeding 3 Mb/s.

**mobile Earth station:** **1.** An Earth station in the mobile-satellite service intended to be used while in motion or during halts at unspecified points. [NTIA] [RR] **2.** An Earth station intended to be used while in motion or during halts at unspecified points. [47CFR]

**mobile-satellite service:** A radiocommunication service:

- between mobile earth stations and one or more space stations, or between space stations used by this service; or
- between mobile earth stations by means of one or more space stations. This service may also include feeder links necessary for its operation. [NTIA] [RR] [47CFR]

**mobile service:** A radiocommunication service between mobile and land stations, or between mobile stations. [NTIA] [RR] [47CFR]

**mobile services switching center (MSC):** In an automatic cellular mobile system, the interface between the radio system and the public switched telephone network. *Note:* The MSC performs all signaling functions that are necessary to establish calls to and from mobile stations.

**mobile station: 1.** A station in the mobile service intended to be used while in motion or during halts at unspecified points. [NTIA] [RR] [47CFR] **2.** One or more transmitters that are capable of operation while in motion. [47CFR]

**mobile station international ISDN number:** A dialable number and, in the context of this document, a 10-digit NANP (North American Numbering Plan) directory number assigned to address a wireless service subscriber. [T1.708-1998]

**modal dispersion:** *Incorrect synonym for multimode distortion.*

**modal distortion:** *Synonym multimode distortion.*

**modal distribution:** In an optical waveguide operating at a given wavelength, the number of modes supported, and their propagation time differences.

**modal loss:** In an open waveguide, such as an optical fiber, a loss of energy on the part of an electromagnetic wave due to obstacles outside the waveguide, abrupt changes in direction of the waveguide, or other anomalies, that cause changes in the propagation mode of the wave in the waveguide.

**modal noise:** Noise generated in an optical fiber system by the combination of mode-dependent optical losses and fluctuation in the distribution of optical energy among the guided modes or in the relative phases of the guided modes. *Synonym speckle noise.*

**mode: 1.** In a waveguide or cavity, one of the various possible patterns of propagating or standing electromagnetic fields. *Note 1:* Each mode is characterized by frequency, polarization, electric field strength, and magnetic field strength. *Note 2:* The electromagnetic field pattern of a mode depends on the frequency, refractive indices or dielectric constants, and waveguide or cavity geometry. **2.** Any electromagnetic field distribution that satisfies Maxwell's equations and the applicable boundary conditions. **3.** In data communications, a protocol used to transfer data from switch to switch or from switch to terminal. **4.** In statistics, the value associated with the highest peak in a probability density function.

**mode coupling:** In an electromagnetic waveguide, the exchange of power among modes. *Note:* In a multimode optical fiber, mode coupling reaches statistical equilibrium, *i.e.*, equilibrium mode distribution, after the equilibrium length has been traversed.

**mode field diameter (MFD):** An expression of distribution of the irradiance, *i.e.*, the optical power, across the end face of a single-mode fiber. *Note:* For a Gaussian power distribution in a single-mode optical fiber, the mode field diameter is that at which the electric and magnetic field strengths are reduced to 1/e of their maximum values, *i.e.*, the diameter at which power is reduced to 1/e<sup>2</sup> of the maximum power, because the power is proportional to the square of the field strength.

**mode filter:** A device used to select, reject, or attenuate a certain mode or modes.

**mode [identification friend or foe]:** The number or letter referring to the specific pulse spacing of the signals transmitted by an interrogator. [JP1]

**modem:** *Acronym for modulator/demodulator.* **1.** In general, a device that both modulates and demodulates signals. **2.** In computer communications, a device used for converting digital signals into, and recovering them from, quasi-analog signals suitable for transmission over analog communications channels. *Note:* Many additional functions may be added to a modem to provide for customer service and control features. *Synonym signal conversion equipment.* **3.** In FDM carrier systems, a device that converts the voice band to, and recovers it from, the first level of frequency translation.

**mode mixer:** *Synonym mode scrambler.*

**modem patch:** A method of electrically interconnecting circuits by using back-to-back modems.

**mode of operation:** [A] description of the conditions under which an information system (IS) operates based on the sensitivity of information processed and the clearance levels, formal access approvals, and need-to-know of its users. Four modes of operation are authorized for processing or transmitting information: dedicated mode, system-high mode, compartmented/ partitioned mode, and multilevel mode. [INFOSEC-99]

**mode partition noise:** In an optical communications link, phase jitter of the signal caused by the combined effects of mode hopping in the optical source and intramodal distortion in the fiber. *Note:* Mode hopping causes random wavelength changes which in turn affect the group velocity, *i.e.*, the propagation time. Over a long length of fiber, the cumulative effect is to create jitter, *i.e.*, mode partition noise. The variation of group velocity creates the mode partition noise.

**moderated conference:** An electronic conference in which participants exchange computer messages via a moderator who may accept, modify, or reject them. [2382-pt.35]

**moderator:** In computer conferencing, a person who receives the prospective messages from conference attendees and may accept, modify, or reject them. [2382-pt.35] *Synonym conference controller.*

**mode scrambler: 1.** A device for inducing mode coupling in an optical fiber. **2.** A device composed of one or more optical fibers in which strong mode coupling occurs. *Note:* Mode scramblers are used to provide a modal distribution that is independent of the optical source, for purposes of laboratory or field measurements or tests. *Synonym mode mixer.*

**mode stripper:** *See cladding mode stripper.*

**mode volume:** The number of bound modes that an optical fiber is capable of supporting. *Note:* The mode volume  $M$  is approximately given by  $V^2/2$  and  $(V^2/2)[g/(g+2)]$  respectively for step-index and power-law profile fibers, where  $g$  is the profile parameter, and  $V$  is the normalized frequency greater than 5.

**modification detection:** *Synonym manipulation detection.*

**modification detection code:** *Synonym manipulation detection code.*

**Modification of Final Judgment (MFJ):** The 1982 antitrust suit settlement agreement ("*Consent Decree*") entered into by the United States Department of Justice and the American Telephone and Telegraph Company (AT&T) that, after modification and upon approval of the United States District Court for the District of Columbia, required the divestiture of the Bell Operating Companies from AT&T.

**modified AMI code:** *Abbreviation for modified alternate mark inversion code.* A T-carrier AMI line code in which bipolar violations may be deliberately inserted to maintain system synchronization. *Note 1:* The clock rate of an incoming T-carrier signal is extracted from its bipolar line code. T-carrier was originally developed for voice applications. When voice signals are digitized for transmission via T-carrier, there is no problem in maintaining system synchronization, because of the nature of the digitized signals. However, when used for the transmission of digital data, the conventional AMI line code may fail to have sufficient marks, *i.e.*, "1's," to permit recovery of the incoming clock, and synchronization is lost. This happens when there are too many consecutive zeros in the user data being transported. To prevent loss of synchronization when a long string of zeros is present in the user data, deliberate bipolar violations are inserted into the line code, to create a sufficient number of marks to maintain synchronization. The receive terminal equipment recognizes the bipolar violations and removes from the user data the marks attributable to the bipolar violations. *Note 2:* The exact pattern of bipolar violations that is transmitted in any given case depends on the line rate and the polarity of the last valid mark in the user data prior to the unacceptably long string of zeros. *Note 3:* The number of consecutive zeros that can be tolerated in user data depends on the data rate, *i.e.*, the level of the line code in the T-carrier hierarchy. The North American T1 line code (1.544 Mb/s) does not use bipolar violations. The European T1 line code (2.048 Mb/s) may use bipolar violations when 8 or more consecutive zeros are present. This line code is called *bipolar with eight-zero substitution (B8ZS)*. (In all levels of the European T-carrier hierarchy, the patterns of bipolar violations that are used differ from those used in the North American hierarchy.) At the North American T2 rate (6.312 Mb/s), bipolar violations are inserted if 6 or more consecutive zeros occur. This line code is called *bipolar with six-zero substitution (B6ZS)*. At the North American T3 rate (44.736 Mb/s), bipolar violations are inserted if 3 or more consecutive zeros occur. This line code is called *"bipolar with three-zero substitution" (B3ZS)*.

**modular:** Pertaining to the design concept in which interchangeable units are used to create a functional end product.

**modular jack:** A device that conforms to the *Code of Federal Regulations*, Title 47, part 68, which defines the size and configuration of all units that are permitted for connection to the public exchange facilities.

**modulation:** The process, or result of the process, of varying a characteristic of a carrier, in accordance with an information-bearing signal.

**modulation factor:** In amplitude modulation, the ratio of the peak variation actually used, to the maximum design variation in a given type of modulation. *Note:* In conventional amplitude modulation, the maximum design variation is considered that for which the instantaneous amplitude of the modulated signal reaches zero. When zero is reached, the modulation is considered 100%.

**modulation index:** In angle modulation, the ratio of the frequency deviation of the modulated signal to the frequency of a sinusoidal modulating signal. *Note:* The modulation index is numerically equal to the phase deviation in radians.

**modulation rate:** **1.** The rate at which a carrier is varied to represent the information in a digital signal. *Note:* Modulation rate and information transfer rate are not necessarily the same. **2.** For modulated digital signals, the reciprocal of the unit interval of the modulated signal, measured in seconds.

**modulation suppression:** In the reception of an amplitude-modulated signal, an apparent reduction in the depth of modulation of a wanted signal, caused by the presence, at the detector, of a stronger unwanted signal.

**modulator:** A device that imposes a signal on a carrier.

**modulator-demodulator (modem):** *See* modem.

**module:** **1.** An interchangeable subassembly that constitutes part of, *i.e.*, is integrated into, a larger device or system. **2.** In computer programming, a program unit that is discrete and identifiable with respect to compiling, combining with other modules, and loading.

**modulo-2 addition:** Binary addition with no carry. [After X9.8]

**monitor:** **1.** Software or hardware that is used to scrutinize and to display, record, supervise, control, or verify the operations of a system. *Note:* Possible uses of monitors are to indicate significant departures from the norm, or to determine levels of utilization of particular functional units. **2.** A device used for the real-time temporary display of computer output data. *Note:* Monitors usually use cathode-ray-tube or liquid-crystal technology. *Synonyms* CRT, video display terminal, video display unit, visual display unit.

**monitor black level:** Relative to video, the luminance displayed on a monitor by a signal at reference black level. [After SMPTE]

**monitoring:** **1.** The act of listening, carrying out surveillance on, and/or recording the emissions of one's own or allied forces for the purposes of maintaining and improving procedural standards and security, or for reference, as applicable. [JP 1-02] **2.** The act of listening, carrying out surveillance on, and/or recording of enemy emissions for intelligence purposes. [JP 1-02] **3.** The act of detecting the presence of radiation and the measurement thereof with radiation measuring instruments. [JP 1-02] *Synonym* radiological monitoring.

**monitor jack:** A jack used to access communications circuits to observe signal conditions without interrupting the services.

**monitor key:** A key used to access communications circuits to observe signal conditions without interrupting the services.

**monitor window:** An interval during which an entity performs the monitoring function at the direction of a service control function. [T1.667-1999]

**monochromatic:** In optics, pertaining to a single wavelength of electromagnetic radiation or to a single color. *Note:* In practice, optical radiation is never perfectly monochromatic, *i.e.*, it never consists of only one wavelength. It always has a finite spectral width, albeit narrow.

**monochromator:** In optics, an instrument for isolating narrow portions of the spectrum.

**monomode optical fiber:** *Synonym* single-mode optical fiber.

**more (M) bit:** A bit used to indicate that more packets in sequence are to be expected by the terminating endpoint. [T1.509-1995] *Note:* The M bit is set to 1 for all packets except for the last packet of a burst, which is set to 0. It is used to indicate that more packets in sequence are to be expected by the terminating endpoint. This allows the terminating endpoint to recover from packet loss. [T1.312-1991]

**mosquito noise:** In a video display, distortion sometimes seen around the edges of moving objects, and characterized by moving artifacts around edges and/or by blotchy noise patterns superimposed over the objects, resembling a mosquito flying around a person's head and shoulders.

**most significant bit:** In a binary code, the bit or bit position that is assigned to, or represents, the largest quantity or increment that can be represented by the code.

**motion compensation:** Interframe coding that (a) is used to compress motion of video images and (b) uses an algorithm to examine a sequence of image frames to measure the difference from frame to frame in order to send motion vector information.

**motion-related artifacts:** Distortion of motion video potentially observable by the viewer. In some instances, the distortion becomes more observable with increased motion. The distortion may appear as smearing, block distortion, jerkiness, or other impairments. [T1.801.02-1996]

**motion response degradation:** The deterioration of motion video quality, resulting in a loss of perceived spatiotemporal resolution.

**motion video:** In video systems, temporally varying visual imagery intended to communicate or to convey movement or change.

**mouse:** A hand-held computer input device that generates signals that increment, *i.e.*, slew, the position of a cursor on a video display. *Note:* A mouse is placed on a flat surface and moved manually in the direction in which it is desired to move the cursor. A mouse has momentary switches ("buttons") that may be finger-operated to trigger an event after the cursor is positioned correctly.

**MP3:** A standard wave file format (with a ".wav" file extension) for digitally encoded and compresses music files (similar to the format used for CD music files). *Note:* MP3 files can be stored or downloaded from the Web or other media and played on suitable players.

**M-patch bay:** A patching facility designed for patching and monitoring digital data circuits at data signaling rates from 1 Mb/s (megabits per second) to 3 Mb/s.

**.mpe:** The computer file-name extension that identifies a Motion Picture Experts Group (MPEG) video file. *See* **M-PEG**. [Bahorsky]

**M-PEG:** **1.** *Abbreviation for Motion Picture Experts Group.* **2.** In digital television signal recording or transmission, the designator that identifies a certain coding algorithm having several levels and profiles, the most sophisticated of which are used for HDTV (high-definition television) applications. *Note:* M-PEG-2 video coding has been developed for use with satellite TV applications, including the required decoders ("set-top boxes"). **3.** The designator that identifies an international standard for compression of TV signals, which standard is used in conjunction with desktop computers for video presentations or clips. **4.** Pertaining to files (with file-name extensions ".mpg" or ".mpeg") that are compressed using the MPEG standard. [Bahorsky] *Also written* **MPEG**.

**.mpg:** *See* **M-PEG**.

**.mps:** *See* **M-PEG**.

**.mpv:** A computer file name extension that identifies a Motion Picture Experts Group (MPEG) video file. *See* **M-PEG**. [Bahorsky]

**m-sequence:** *See* **n-sequence**.

**MTA:** *Abbreviation for message transfer agent.*

**MTBF:** *Abbreviation for mean time between failures.*

**MTBO:** *Abbreviation for mean time between outages.*

**MTSR:** *Abbreviation for mean time to service restoral.*

**MTTR:** *Abbreviation for mean time to repair.*

**MTU:** *Abbreviation for maintenance termination (or terminating) unit.* A device that provides a termination function and a testable signature. [T1.Rpt39-1995]

**mudbox:** Equipment that is sufficiently rugged to withstand adverse environments. *Note:* A mudbox is expected to operate unsheltered on the ground.

**MUF:** *Abbreviation for maximum usable frequency.*

**mu-law ( $\mu$ -law):** *See* **mu-law ( $\mu$ -law) algorithm**.

**mu-law ( $\mu$ -law) algorithm:** A standard analog signal compression algorithm, used in digital communications systems of the North American digital hierarchy, to optimize, *i.e.*, modify, the dynamic range of an analog signal prior to digitizing. *Note:* The wide dynamic range of speech does not lend itself well to efficient linear digital encoding. Mu-law encoding effectively reduces the dynamic range of the signal, thereby increasing the coding efficiency and resulting in a signal-to-distortion ratio that is greater than that obtained by linear encoding for a given number of bits.

**muldem:** *Acronym for multiplexer/ demultiplexer.*

**multiaddress calling:** A service feature that permits a user to designate more than one addressee for the same data. *Note:* Multiaddress calling may be performed sequentially or simultaneously.

**multicarrier modulation (MCM):** A technique of transmitting data by dividing the data into several interleaved bit streams and using these to modulate several carriers. *Note:* MCM is a form of frequency-division multiplexing.

**multicast:** **1.** In a network, a technique that allows data, including packet form, to be simultaneously transmitted to a selected set of destinations. *Note:* Some networks, such as Ethernet, support multicast by allowing a network interface to belong to one or more multicast groups. **2.** To transmit identical data simultaneously to a selected set of destinations in a network, usually without obtaining acknowledgement of receipt of the transmission.

**multicast address:** A routing address that (a) is used to address simultaneously all the computers in a group and (b) usually identifies a group of computers that share a common protocol, as opposed to a group of computers that share a common network. *Note:* Multicast address also applies to radio communications. *Synonym (in Internet protocol)* **class d address**.

**multicast backbone (Mbone):** *See* **Mbone**.

**multi-center exchange:** An exchange area in which are located two or more local central office buildings or wire centers. [47 CFR Pt.36-A]

**multichannel:** Pertaining to communications, usually full-duplex communications, on more than one channel. *Note:* Multichannel transmission may be accomplished by time-division multiplexing, frequency-division multiplexing, phase-division multiplexing, or space diversity.

**multicoupler:** In radio communications, a device for connecting several receivers or transmitters to one antenna in such a way that the equipment impedances are properly matched to the antenna impedance.

**multidestination mode (MD):** A DCME- (direct-circuit, multiplication equipment) operational mode where trunk channel traffic is interpolated over a pool of available bearer channels regardless of destination within the multidestination network. [T1.309-1990]

**multi-element dipole antenna:** An antenna consisting of an arrangement of multiple dipole antennas. *Note:* Various directivity patterns may be obtained by varying the arrangement of the dipoles and the way they are driven.

**multifiber cable:** A fiber-optic cable having two or more fibers, each of which is capable of serving as an independent optical transmission channel. [After FAA]



**multifiber cable assembly:** See cable assembly.

**multifiber joint:** An optical splice or connector designed to mate two multifiber cables, providing simultaneous optical alignment of all individual optical fibers.

**multiframe:** In PCM systems, a set of consecutive frames in which the position of each frame can be identified by reference to a multiframe alignment signal. *Note:* The multiframe alignment signal does not necessarily occur, in whole or in part, in each multiframe.

**multifrequency pulsing:** *Synonym* multifrequency signaling. See dual-tone multifrequency signaling.

**multifrequency signaling:** *Synonym* dual-tone multifrequency signaling.

**multi-homed host:** A computer that is connected to more than one physical data link; these data links may or may not be attached to the same network. [Bahorsky]

**multilayer filter:** See interference filter.

**multilevel device:** In cryptosystems, a functional unit that can simultaneously process data of two or more security levels without risk of compromising computer security. [2382-pt.8]

**multilevel mode:** [An] Information systems (IS) mode of operation wherein all the following statements are satisfied concerning the users who have direct or indirect access to the system, its peripherals, remote terminals, or remote hosts: (a) some users do not have a valid security clearance for all the information processed in the IS; (b) all users have the proper security clearance and appropriate formal access approval for that information to which they have access; and (c) all users have a valid need-to-know only for information to which they have access. [INFOSEC-99]

**multilevel modulation:** See *n*-ary code.

**multilevel precedence and preemption (MLPP):** In military communications, a priority scheme (a) for assigning one of several precedence levels to specific calls or messages so that the system handles them in a predetermined order and time frame, (b) for gaining controlled access to network resources in which calls and messages can be preempted only by higher priority calls and messages, (c) that is recognized only within a predefined domain, and (d) in which the precedence level of a call outside the predefined domain is usually not recognized.

**multilevel security (MLS):** [The] concept of processing information with different classifications and categories that simultaneously permits access by users with different security clearances and denies access to users who lack authorization. [INFOSEC-99]

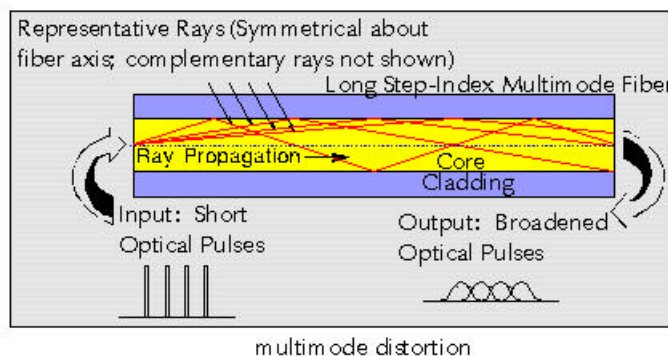
**multilink operation:** In packet-switched networks, the simultaneous use of multiple links for the transmission of different segments of the same message unit. *Note:* Use of multilink operation is intended to increase the effective rate of message transmission. Multilink operation requires special procedures for multiplexing/demultiplexing control.

**multimedia:** Pertaining to the processing and integrated presentation of information in more than one form, e.g., video, voice, music, or data.

**multimedia communication system:** A system that handles more than one media stream in a synchronized way from the user's point of view. The system may allow interconnection of multiple parties, multiple connections, and the addition or deletion of resources and users within a single communication session. [T1.801.04-1997]

**multimode dispersion:** *Incorrect synonym for multimode distortion.*

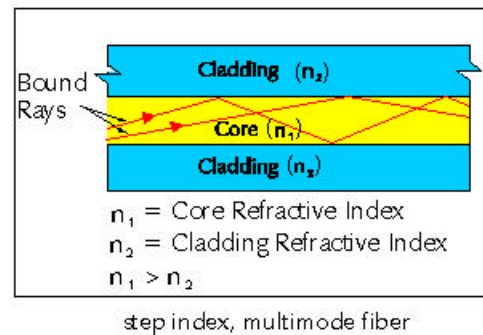
**multimode distortion:** A distortion mechanism, occurring in multimode fibers, in which the signal is spread in time because the velocity of propagation of the optical signal is not the same for all modes. *Note 1:* In the ray-optics analogy, multimode distortion in a step-index optical fiber may be compared to multipath propagation of a radio signal. The direct signal is distorted by the arrival of the reflected signal a short time later. In a step-index optical fiber, rays taking more direct paths through the fiber core, i.e., those which undergo the fewest reflections at the core-cladding boundary, will traverse the length of the fiber sooner than those rays which undergo more reflections. This results in distortion of the signal. *Note 2:* Multimode distortion limits the bandwidth of multimode fibers. For example, a typical step-index fiber with a 50- $\mu$ m core would be limited to approximately 20 MHz for a one-kilometer length, i.e., a bandwidth of 20 MHz $\cdot$ km. *Note 3:* Multimode distortion may be considerably reduced, but never completely eliminated, by the use of a core having a graded refractive index. The bandwidth of a typical off-the-shelf graded-index multimode fiber, having a 50- $\mu$ m core, may approach 1 GHz $\cdot$ km or more. Multimode graded-index fibers having bandwidths approaching 3 GHz $\cdot$ km have been produced. *Note 4:* Because of its similarity to dispersion in its effect on the optical signal, multimode distortion is sometimes incorrectly referred to as "intermodal dispersion," "modal dispersion," or "multimode dispersion." Such usage is incorrect because multimode distortion is not a truly dispersive effect. Dispersion is a wavelength-dependant phenomenon, whereas multimode distortion may occur at a single wavelength. [After FAA] *Synonyms* intermodal delay distortion, intermodal distortion, modal distortion.



**multimode group delay:** *Synonym* differential mode delay.

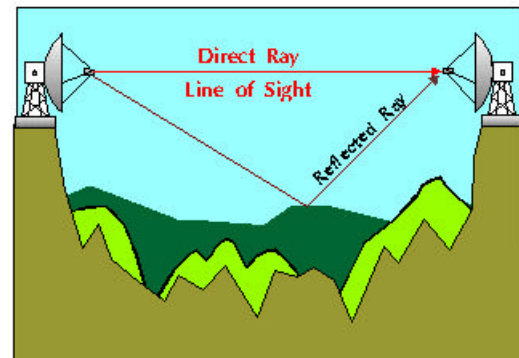
**multimode optical fiber:** An optical fiber that supports the propagation of more than one bound mode. *Note:* A multimode optical fiber may be either a graded-index (GI) fiber or a step-index (SI) fiber.





**multiparty line:** *Synonym party line.*

**multipath:** The propagation phenomenon that results in radio signals' reaching the receiving antenna by two or more paths. *Note 1:* Causes of multipath include atmospheric ducting, ionospheric reflection and refraction, and reflection from terrestrial objects, such as mountains and buildings. *Note 2:* The effects of multipath include constructive and destructive interference, and phase shifting of the signal. *Note 3:* In facsimile and television transmission, multipath causes jitter and ghosting.



multipath

**multiple:** A system of wiring so arranged that a circuit, a line, or a group of lines is accessible at a number of points. *Synonym multipoint.*

**multiple access:** **1.** The connection of a user to two or more switching centers by separate access lines using a single message routing indicator or telephone number. **2.** In satellite communications, the capability of a communications satellite to function as a portion of a communications link between more than one pair of satellite terminals concurrently. *Note:* The three types of multiple access presently used with communications satellites are code-division, frequency-division, and time-division multiple access. **3.** In computer networking, a scheme that allows temporary access to the network by individual users, on a demand basis, for the purpose of transmitting information. *Note:* Examples of multiple access are carrier sense multiple access with collision avoidance (CSMA/CA) and carrier sense multiple access with collision detection (CSMA/CD).

**multiple association control function (MACF):** Represents the rules and regulations governing the coordination of set of peer-to-peer communications within an application entity invocation (AEI). [T1.667-1999]

**multiple call:** *Synonym conference call.*

**multiple data message format (MDMF):** A series of data words specifying message type, message length, parameter message(s), and error detection information. The parameter message consists of one or more parameters. Each parameter is a series of data words specifying parameter type, parameter length, and parameter data. [T1.401-1998]

**multiple frequency-shift keying (MFSK):** Frequency-shift keying (FSK) in which multiple codes are used in the transmission of digital signals. *Note:* In MFSK, the coding schemes use multiple frequencies that are transmitted concurrently or sequentially.

**multiple homing:** **1.** In telephone systems, the connection of a terminal facility so that it can be served by one or several switching centers. *Note:* Multiple homing may use a single directory number. **2.** In telephone systems, the connection of a terminal facility to more than one switching center by separate access lines. *Note:* Separate directory numbers are applicable to each switching center accessed.

**multiple media:** Transmission media using more than one type of transmission path (*e.g.*, optical fiber, radio, and copper wire) to deliver information.

**multiple-spot scanning:** In facsimile systems, scanning performed simultaneously by two or more scanning spots, each one analyzing its fraction of the total scanned area of the object.

**multiple terminal address registration:** A feature that enables the UPT user to simultaneously register multiple terminal addresses for incoming and/or outgoing UPT calls. [T1.701-1994]

**multiplex (MUX):** *See multiplexing.*

**multiplex aggregate bit rate:** In a time-division multiplexer, the bit rate that is equal to the sum of (a) the input channel data signaling rates available to the user and (b) the rate of the overhead bits required.

**multiplex baseband:** **1.** In frequency-division multiplexing, the frequency band occupied by the aggregate of the signals in the line interconnecting the multiplexing and radio or line equipment. **2.** In frequency division multiplexed carrier systems, at the input to any stage of frequency translation, the frequency band occupied. *Note:* For example, the output of a group multiplexer consists of a band of frequencies from 60 kHz to 108 kHz. This is the group-level baseband that results from combining 12 voice-frequency input channels, having a bandwidth of 4 kHz each, including guard bands. In turn, 5 groups are multiplexed into a super group having a baseband of 312 kHz to 552 kHz. This baseband, however, does not represent a group-level baseband. Ten super groups are in turn multiplexed into one master group, the output of which is a baseband that may be used to modulate a microwave-frequency carrier.

**multiplexer (MUX):** A device that combines multiple inputs into an aggregate signal to be transported via a single transmission channel. *Synonym* **multiplexing equipment.**

**multiplexer/demultiplexer (muldem):** A device that combines the functions of multiplexing and demultiplexing of digital signals. *Note:* The term *muldem* should not be confused with *modem* .

**multiplex hierarchy:** In frequency-division multiplexing, the rank of frequency bands occupied:

12 channels	group
5 groups (60 channels)	super group
5 super groups (300 channels)	master group (CCITT--now, ITU-T)
10 super groups (600 channels)	master group (U.S. standard)
6 U.S. master groups (3600 channels)	jumbo group

**multiplexing (MUXing):** The combining of two or more information channels onto a common transmission medium. *Note:* In electrical communications, the two basic forms of multiplexing are time-division multiplexing (TDM) and frequency-division multiplexing (FDM). In optical communications, the analog of FDM is referred to as wavelength-division multiplexing (WDM).

**multiplexing equipment:** *Synonym* **multiplexer.**

**multiplex link encryption:** Encryption in which a single cryptographic device is used to encrypt all of the data in a multiplexed link.

**multipoint:** *Synonym* **multiple.**

**multipoint access:** Access in which more than one terminal is supported by a single network termination.

**multipoint circuit:** A circuit that interconnects three or more separate points.

**multipoint configuration:** A network configuration where there are more than two access points. [T1.620-1991]

**multipoint connection:** A connection with more than two endpoints. [T1.629-1999]

**multipoint control unit (MCU):** A multipoint device, by means of which two or more audiovisual terminals may intercommunicate in a conference call. *Note:* A "principal MCU" has been assigned a superior controlling function in a call where two or more MCUs in that call are termed "satellite MCUs". The physical realization of an MCU may be such that two or more independent conferences may be set up within the same unit; logically, however, there is no relationship between these conferences; the text of this definition refers to an MCU only as a logical entity pertinent to the particular call of concern. [T1.800.06-1995]

**multipoint distribution service: (MDS) 1.** A one-way domestic public radio service rendered on microwave frequencies from a fixed station transmitting (usually in an omnidirectional pattern) to multiple receiving facilities located at fixed points. [47CFR] **2.** A domestic public radio service rendered on microwave frequencies from one or more fixed stations transmitting to multiple receiving facilities located at fixed points. MDS also may encompass transmissions from response stations to response station hubs or associated fixed stations. [47CFR]

**multipoint grounding system:** Equipment bonded together and also bonded to the facility grounding system at the point nearest the equipment.

**multipoint link:** A data communications link that interconnects three or more terminals.

**multipoint repeater:** In digital networking, an active device, having multiple input/output (I/O) ports, in which a signal introduced at the input of any port appears at the output of every port. *Note 1:* A multipoint repeater usually performs regenerative functions, *i.e.* , it reshapes the digital signals. *Note 2:* Depending on the application, a multipoint repeater may be designed not to repeat a signal back to the port from which it originated.

**multiprocessing: 1.** Simultaneous processing by two or more processors acting in concert. **2.** The simultaneous execution of two or more computer programs or sequences of instructions by a single processor.

**multiprocessor:** A computer that has two or more processors that have common access to a main storage.

**multiprogramming:** A mode of operation that provides for the interleaved execution of two or more computer programs by a single processor.

**multipulse test signal:** A test signal consisting of a white flag, a 2T pulse, and modulated pulses. The modulating frequencies of the pulses correspond to the frequency packets of the multiburst portion of the combination test signal (with the exception of 0.5 MHz), superimposed upon standard synchronizing and blanking signals. [T1.502-1988]

**multipurpose Internet mail extension:** *See* **MIME.**

**multi-satellite link:** A radio link between a transmitting Earth station and a receiving Earth station through two or more satellites, without any intermediate Earth station. A multi-satellite link comprises one uplink, one or more satellite-to-satellite links, and one downlink. [NTIA] [RR]

**multistreaming technology:** *See* **streaming.**

**multitasking:** The concurrent performance or interleaved execution of two or more tasks. *Synonym* **concurrent operation.**

**multi-threaded:** A characteristic of a sequence or group of messages that allows several messages to be sent by one party to the same message recipient without waiting for a response to each message. [After X9.15]

**Musical Instrument Digital Interface (MIDI):** An electronic standard for encoding and transmitting digitized musical information between musical instruments and computers. [Bahorsky]

**mutually synchronized network:** A network that has a synchronizing arrangement in which each clock in the network exerts a degree of control on all others.

**mutual suspicion: 1.** The relationship between interacting entities in which neither entity relies upon the other entity to function correctly or securely with respect to some property. [2382-pt.8] **2.** [The] condition in which two IS's need to rely upon each other to perform a service, yet neither trusts the other to properly protect shared data. [INFOSEC-99]

**mutual synchronization:** Synchronization in which the frequency of the clock at a particular node is controlled by a weighted average of the timing on all signals received from neighboring nodes.

**MUX:** Abbreviation for **multiplex, multiplexer**. See **multiplexing**.

**mw:** Abbreviation for **microwave**.

**mx record:** Abbreviation for **mail exchange record**.

**NA:** Abbreviation for **numerical aperture**.

**nailed-up circuit:** *Deprecated term*. See **dedicated circuit, permanent virtual circuit**.

**NAK:** Acronym for **negative-acknowledge character**.

**NAK attack:** In communications security systems, a security penetration technique that makes use of the negative-acknowledge transmission-control character and capitalizes on a potential weakness in a system that handles asynchronous transmission interruption in such a manner that the system is in an unprotected state against unauthorized access during certain periods. [From Weik '89]

**naming authority:** With respect to Internet addressing, an entity responsible for the allocation of names. *Note:* Such naming is typically hierarchical, so that the authority to allocate domain names is restricted to a particular level within a domain, such as ".com", ".net", or ".gov".

**narrative traffic:** Traffic consisting of plain or encrypted messages written in a natural language and transmitted in accordance with standard formats and procedures. *Note:* Examples of narrative traffic include (a) messages that are placed on paper tape and transmitted via a teletypewriter (TTY), and on reception, are converted back to a printed page on another teletypewriter or teleprinter and (b) messages printed on a sheet of paper, transmitted via optical character recognition (OCR) equipment, and on reception, converted back to a printed page on a printer.

**narrowband modem:** A modem whose modulated output signal has an essential frequency spectrum that is limited to that which can be wholly contained within, and faithfully transmitted through, a voice channel with a nominal 4-kHz bandwidth. *Note:* High frequency (HF) modems are limited to operation over a voice channel with a nominal 3-kHz bandwidth.

**narrowband radio voice frequency (NBRVF):** In narrowband radio, the nominal 3-kHz bandwidth allocated for single channel radio that provides a transmission path for analog and quasi-analog signals.

**narrowband signal:** Any analog signal or analog representation of a digital signal whose essential spectral content is limited to that which can be contained within a voice channel of nominal 4-kHz bandwidth. *Note:* Narrowband radio uses a voice channel with a nominal 3-kHz bandwidth.

**n-ary code:** A code that has *n* significant conditions, where *n* is a positive integer greater than 1. *Note 1:* The integer substituted for *n* indicates the specific number of significant conditions, *i.e.*, quantization states, in the code. For example, an 8-ary code has eight significant conditions and can convey three bits per code symbol. *Note 2:* A prefix that indicates an integer, *e.g.*, "bi," "tern," or "quater," may be used in lieu of a numeral, to produce "binary," "ternary," or "quaternary" (2, 3, and 4 states respectively).

**n-ary signaling:** See **n-ary code**.

**NATA:** Abbreviation for **North American Telecommunications Association**.

**National Communications System (NCS):** **1.** The organization established by Section 1(a) of Executive Order No. 12472 to assist the President, the National Security Council, the Director of the Office of Science and Technology Policy, and the Director of the Office of Management and Budget, in the discharge of their national security emergency preparedness telecommunications functions. The NCS consists of both the telecommunications assets of the entities represented on the NCS Committee of Principals and an administrative structure consisting of the Executive Agent, the NCS Committee of Principals, and the Manager. **2.** The telecommunications system that results from the technical and operational integration of the separate telecommunications systems of the several executive branch departments and agencies having a significant telecommunications capability. [JP 1-02]

**National Coordinating Center (NCC) for Telecommunications:** The joint telecommunications industry/Federal Government operation established by the National Communications System to assist in the initiation, coordination, restoration, and reconstitution of National Security or Emergency Preparedness (NS/EP) telecommunications services or facilities.

**National Electric Code® (NEC):** A standard that governs the use of electrical wire, cable, and fixtures, and electrical and optical communications cable installed in buildings. *Note:* The NEC was developed by the NEC Committee of the American National Standards Institute (ANSI), was sponsored by the National Fire Protection Association (NFPA), and is identified by the description ANSI/NFPA 70-XXXX, the last four digits representing the year of the NEC revision.

**National Information Infrastructure (NII):** A proposed, advanced, seamless web of public and private communications networks, interactive services, interoperable hardware and software, computers, databases, and consumer electronics to put vast amounts of information at users' fingertips. *Note:* NII includes more than just the physical facilities (more than the cameras, scanners, keyboards, telephones, fax machines, computers, switches, compact disks, video and audio tape, cable, wire, satellites, optical fiber transmission lines, microwave nets, switches, televisions, monitors, and printers) used to transmit, store, process, and display voice, data, and images; it encompasses a wide range of interactive functions, user-tailored services, and multimedia databases that are interconnected in a technology-neutral manner that will favor no one industry over any other. *Synonym* **information superhighway**.

**national number:** The number identifying a calling user line within an area designated by a country code. [T1.104-1991]

**national prefix:** A digit or combination of digits to be dialed by a calling subscriber, making a call to a subscriber in his own country but outside his own numbering area. It provides access to the automatic outgoing trunk equipment. [CCITT E.160] [T1.Rpt30-1994]

**national security information (NSI):** Information that has been determined, pursuant to Executive Order 12958 or any predecessor order, to require protection against unauthorized disclosure. [INFOSEC-99]

**national security system:** Any telecommunications or information system operated by the United States Government, the function, operation, or use of which: (a) involves intelligence activities; (b) involves cryptologic activities related to national security; (c) involves command and control of military forces; (d) involves equipment that is an integral part of a weapon or weapon system; or (e) is critical to the direct fulfillment of military or intelligence missions and does not include a system that is to be used for routine administrative and business applications (including payroll, finance, logistics, and personnel management applications). *40 U.S.C. Section 1452, Information Technology Management Reform Act of 1996.* [INFOSEC-99]

**National Security or Emergency Preparedness telecommunications:** See **NS/EP telecommunications**.

**National Television Standards Committee standard:** See **NTSC standard**.

**natural frequency:** Of an antenna, the lowest frequency at which the antenna resonates without the addition of any inductance or capacitance.

**nautical mile (nmi):** A unit of distance used in navigation and based on the length of one minute of arc taken along a great circle. *Note 1:* Because the Earth is not a perfect sphere, various values have been assigned to the nautical mile. The value 1852 meters (6076.1 ft.) has been adopted internationally. *Note 2:* The nautical mile is frequently confused with the geographical mile, which is equal to 1 min of arc on the Earth's equator (6087.15 ft.).

**navigate:** To move around (a) within a series of Web pages, or (b) among different Web pages, by following hyperlinked paths within each document. *Synonyms browsing, surfing [slang]*.

**navigation assistant:** *Synonym droid.*

**navigator:** *Synonym droid.*

**NBH:** *Abbreviation for network busy hour. See busy hour.*

**NBRVF:** *Abbreviation for narrowband radio voice frequency.*

**NCC:** *Abbreviation for National Coordinating Center for Telecommunications.*

**NC code:** *Abbreviation for network channel (NC) code.* A code used to identify both switched and nonswitched channel services. Included in this code set are customer options associated with individual channel services, or feature groups and other switched services. [T1.223-1991]

**NCI code:** *Abbreviation for network channel interface code.* An encoded representation used to identify 5 interface elements located at a point of termination (POT) at central office or customer location. The interface elements are: total conductors, protocol, impedance, protocol options, and transmission level points. [T1.223-1991]

**NC (no circuit):** A call disposition category for a call attempt that does not find an available outgoing trunk. [T1.209-1998]

**NCS:** *Abbreviation for National Communications System, net control station.*

**NDUB (network-determined user busy):** A condition of an interface, as determined by the network, based on the network's capability to terminate another call to that interface. The interface is said to be NDUB if any of the following conditions exist: (a) if the maximum number of information channels available has been reached and the network does not support the offering of additional calls beyond this number; (b) if the limit of additional offering had been reached; (c) if the maximum number of total calls supported for User B has been reached. [T1.620-1991]

**near absolute immunity:** A central office or similar facility's ability to maintain continuity of operations without any operationally significant interruption of service from either hardware or software failures in the presence of one or more HEMP (high-altitude electromagnetic pulse) events. [T1.320-1994]

**near-end crosstalk:** Crosstalk that is propagated in a disturbed channel in the direction opposite to the direction of propagation of a signal in the disturbing channel. *Note:* The terminals of the disturbed channel, at which the near-end crosstalk is present, and the energized terminal of the disturbing channel, are usually near each other.

**near field:** *Synonym near-field region.*

**near-field diffraction pattern:** The diffraction pattern of an electromagnetic wave, which pattern is observed close to a source or aperture, as distinguished from a far-field diffraction pattern. *Note:* The pattern in the output plane is called the near-field radiation pattern. *Synonym Fresnel diffraction pattern.*

**near-field region: 1.** The close-in region of an antenna wherein the angular field distribution is dependent upon distance from the antenna. *Synonyms near field, near zone. 2.* In optical fiber communications, the region close to a source or aperture. *Note:* The diffraction pattern in this region typically differs significantly from that observed at infinity and varies with distance from the source.

**near-field scanning:** A technique for measuring the refractive-index profile of an optical fiber by using an extended source to illuminate an endface and measuring the point-by-point radiance at the exit face.

**near real time: 1.** Pertaining to the delay introduced, by automated data processing, between the occurrence of an event and the use of the processed data, *e.g.*, for display or feedback and control purposes. *Note 1:* For example, a near-real-time display depicts an event or situation as it existed at the current time less the processing time. *Note 2:* The distinction between near real time and real time is somewhat nebulous and must be defined for the situation at hand. **2.** Pertaining to the timeliness of data or information which has been delayed by the time required for electronic communication and automatic data processing. This implies that there are no significant delays. [JP1]

**near-vertical-incidence skywave:** In radio propagation, a wave that is reflected from the ionosphere at a nearly vertical angle and that is used in short-range communications to reduce the area of the skip zone and thereby improve reception beyond the limits of the ground wave.

**near zone:** *Synonym near-field region.*

**NEC:** *Abbreviation for National Electric Code®.*

**necessary bandwidth: 1.** For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions. [NTIA] [RR] *Note:* Emissions useful for the adequate functioning of the receiving equipment, *e.g.*, the emission corresponding to the carrier of reduced carrier systems, must be included in the necessary bandwidth. (*See Annex J of NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management for formulas used to calculate necessary bandwidth.*) **2.** The calculated spectral width of an emission. Calculations are made using procedures set forth in part 2 of this chapter [of 47CFR]. The bandwidth so calculated is considered to be the minimum necessary to convey information at the desired rate with the desired accuracy. [47CFR]

**need to know: 1.** The legitimate requirement of a person or organization to know, access, or possess sensitive or classified information that is critical to the performance of an authorized, assigned mission. **2.** The necessity for access to, or knowledge or possession of, specific information required to carry out official duties. [INFOSEC-99]

**negation circuit:** *Deprecated synonym for inverter.*

**negative-acknowledge character (NAK):** A transmission control character sent by a station as a negative response to the station with which the connection has been set up. *Note 1:* In binary synchronous communication protocol, the NAK is used to indicate that an error was detected in the previously received block and that the receiver is ready to accept retransmission of that block. *Note 2:* In multipoint systems, the NAK is used as the not-ready reply to a poll.

**negative feedback:** *See feedback.*

**negative justification:** *Synonym de-stuffing.*

**negative pulse stuffing:** *Synonym de-stuffing.*

***n*-entity**: An active element in the *n*-th layer of the Open Systems Interconnection--Reference Model (OSI-RM) that (a) interacts directly with elements, *i.e.*, entities, of the layer immediately above or below the *n*-th layer, (b) is defined by a unique set of rules, *i.e.*, syntax, and information formats, including data and control formats, and (c) performs a defined set of functions. *Note 1*: The *n* refers to any one of the 7 layers of the OSI-RM. *Note 2*: In an existing layered open system, the *n* may refer to any given layer in the system. *Note 3*: Layers are conventionally numbered from the lowest, *i.e.*, the physical layer, to the highest, so that the *n* + 1 layer is above the *n*-th layer and the *n* - 1 layer is below.

**NEP**: *Abbreviation for noise equivalent power.*

**neper (Np)**: A unit used to express ratios, such as gain, loss, and relative values. *Note 1*: The neper is analogous to the decibel, except that the Napierian base 2.718281828... is used in computing the ratio in nepers. *Note 2*: The value in nepers, *Np*, is given by  $Np = \ln(x_1/x_2)$ , where  $x_1$  and  $x_2$  are the values of interest, and  $\ln$  is the natural logarithm, *i.e.*, logarithm to the base e. *Note 3*: One neper (Np) = 8.686 dB, where  $8.686 = 20/(\ln 10)$ . *Note 4*: The neper is often used to express voltage and current ratios, whereas the decibel is usually used to express power ratios. *Note 5*: Like the dB, the Np is a dimensionless unit. *Note 6*: The ITU recognizes both units.

**nested command menu**: A command menu within another command menu. *See* **command menu**.

**net**: *Synonym communications net.*

**net browser**: *Abbreviation for network browser.*

**net control station (NCS)**: **1.** A radio station that performs net control functions, such as controlling traffic and enforcing operational discipline. [From Weik '89] **2.** [A] terminal in a secure telecommunications net responsible for distributing key in electronic form to the members of the net. [NIS]

**net gain**: The overall gain of a transmission circuit. *Note 1*: Net gain is measured by applying a test signal at an appropriate power level (*see* *Note 5*) at the input port of a circuit and measuring the power delivered at the output port. The net gain in dB is calculated by taking 10 times the logarithm of the ratio of the output power to the input power. *Note 2*: The net gain expressed in dB may be positive or negative. *Note 3*: If the net gain expressed in dB is negative, it is also called the "net loss." *Note 4*: If the net gain is expressed as a ratio, and the ratio is less than unity, a net loss is indicated. *Note 5*: The test signal must be chosen so that its power level is within the usual operating range of the circuit being tested.

**netiquette**: [*Slang*] A contraction of **network etiquette**. The written or unwritten rules of etiquette that govern online interaction between users on the Internet. *Note*: Some typical rules are a ban on profane or offensive language, a requirement to respect other users, and a ban on floods of unsolicited advertisements. Netiquette rules may be enforced by a moderator or may be self-policed by other users.

**net loss**: The overall loss of a transmission circuit.

**net loss variation**: The maximum change in net loss occurring in a specified portion of a communication system during a specified period.

**net operation**: The operation of an organization of stations capable of direct communication on a common channel or frequency. *Note*: Net operations (a) allow participants to conduct ordered conferences among participants who usually have common information needs or related functions to perform, (b) are characterized by adherence to standard formats and procedures, and (c) are responsive to a common supervisory station, called the "net control station," which permits access to the net and maintains net operational discipline.

**net radio interface (NRI)**: An interface between a single-channel radio station (usually in a radio net) and switched communications systems.

**NETS**: *Abbreviation for Nationwide Emergency Telecommunications Service. See* **Government Emergency Telecommunications Service**.

**network**: **1.** An interconnection of three or more communicating entities. **2.** An interconnection of usually passive electronic components that performs a specific function (which is usually limited in scope), *e.g.*, to simulate a transmission line or to perform a mathematical function such as integration or differentiation. *Note*: A network may be part of a larger circuit.

**network access point (NAP)**: A physical entity that provides network access for users. It contains the call-control agent function and may include the call-control function. [T1.667-1999]

**network address**: The signaling point code, containing for U.S. national networks, the network identification, network cluster, and network cluster member fields (24 bits). [T1.110-1987]

**network administration**: A group of network management functions that (a) provide support services, (b) ensure that the network is used efficiently, and (c) ensure prescribed service-quality objectives are met. *Note*: Network administration may include activities such as network address assignment, assignment of routing protocols and routing table configuration, and directory service configuration.

**network architecture**: **1.** The design principles, physical configuration, functional organization, operational procedures, and data formats used as the bases for the design, construction, modification, and operation of a communications network. **2.** The structure of an existing communications network, including the physical configuration, facilities, operational structure, operational procedures, and the data formats in use.

**network availability**: The probability a network can perform its required functions. [T1.Rpt24-1993]

**network browser**: A computer program for browsing hyperlinked documents (especially on the Web). *Note 1*: A network browser formats and displays information so obtained in a form useful to the viewer. *Note 2*: A network browser may function in a graphical mode or in a text-only mode.

**network busy hour (NBH)**: *See* **busy hour**.

**network cluster**: The field in the U.S. signaling point code structure that identifies groups of signaling points and individual STPs (signaling transfer points) of a signaling network. [T1.110-1987]

**network computer**: **1.** *Synonym thin client.* **2.** Any computer connected to a network.

**network connectivity**: The topological description of a network that specifies, in terms of circuit termination locations and quantities, the interconnection of the transmission nodes.

**network control program (NCP)**: In a switch or network node, software designed to store and forward frames between nodes. *Note*: An NCP may be used in local area networks or larger networks.

**network data**: Data that are specific to the functionality of the network. [T1.667-1999]

**network element function block**: A functional block that communicates with a telecommunications management network (TMN) for the purpose of being monitored, or controlled, or both. [T1.210-1993]

**network element location (NE location)**: A building (such as a central office) or nonbuilding location housing NEs. Communication within an NE location may be accomplished with minimal attention to such factors as noise, lightning protection, or the cost of bandwidth; communication outside an NE location uses suitable modems and uses conventional



communications services or an EOC (embedded operations channel). [T1.204-1992]

**network element (NE):** In integrated services digital networks, a piece of telecommunications equipment that provides support or services to the user.

**network engineering:** **1.** In telephony, the discipline concerned with (a) determining internetworking service requirements for switched networks, and (b) developing and implementing hardware and software to meet them. **2.** In computer science, the discipline of hardware and software engineering to accomplish the design goals of a computer network. **3.** In radio communications, the discipline concerned with developing network topologies.

**network etiquette (netiquette):** *See netiquette.*

**network facility:** The connection between the radio port controller and the PCS (personal communications services) switching center. [T1.Rpt34-1994]

**network failure:** A complete or partial failure of a component or components of a network because of malfunction or natural or human-caused disasters. Partial failures include degradation (and graceful degradation). [T1.Rpt24-1993]

**network failure triple:** A combination of the network's unservability (U), duration (D), and extent (E) parameters that exceeds a threshold. [After T1.Rpt24-1993]

**network file system (NFS):** *See NFS.*

**network identification:** The field in the U.S. signaling point code structure that identifies signaling networks. [T1.110-1987]

**network indicator (NI):** Information within the service information octet of the message signal unit that permits discrimination between national and international messages. [T1.226-1992]

**network information center (NIC):** *See NIC.*

**network integrity:** *See network survivability.*

**network interface:** **1.** The point of interconnection between a user terminal and a private or public network. **2.** The point of interconnection between the public switched network and a privately owned terminal. *Note: Code of Federal Regulations, Title 47, part 68, stipulates the interface parameters.* **3.** The point of interconnection between one network and another network. **4.** The point of demarcation between the carrier's facilities and the customer installation, which establishes the technical interface and division of operational responsibility. In this definition, the term "customer" refers to the end-user. [T1.501-1988]

**network interface card (NIC):** *See NIC.*

**network interface device (NID):** **1.** A device that performs interface functions, such as code conversion, protocol conversion, and buffering, required for communications to and from a network. **2.** A device used primarily within a local area network (LAN) to allow a number of independent devices, with varying protocols, to communicate with each other. *Note 1: An NID converts each device protocol into a common transmission protocol. Note 2: The transmission protocol may be chosen to accommodate directly a number of the devices used within the network without the need for protocol conversion for those devices by the NID. Synonym network interface unit.*

**network interface unit (NIU):** *Synonym network interface device.*

**network interworking:** Cooperation among networks in the processing, management, and creation of services that span multiple networks. [After T1.667-1999]

**network inward dialing (NID):** *Synonym direct inward dialing.*

**network-launched application:** In a computer networking environment, an application (program) that is centrally stored, *e.g.*, on a server, and copies of which may be accessed on demand by a client and used temporarily (*i.e.*, for a single session) by the client (*e.g.*, a desktop computer). *Note: Multiple clients may make simultaneous use of a given network-launched application.*

**Network Layer:** *See Open Systems Interconnection--Reference Model.*

**network layer relay:** A function within the network layer by means of which one correspondent network entity forwards data to another correspondent network entity. [T1.204-1992]

**network loss:** Loss added to the network to control echo. [T1.508-1998]

**network management:** The execution of the set of functions required for controlling, planning, allocating, deploying, coordinating, and monitoring the resources of a telecommunications network, including performing functions such as initial network planning, frequency allocation, predetermined traffic routing to support load balancing, cryptographic key distribution authorization, configuration management, fault management, security management, performance management, and accounting management. *Note: Network management does not include user terminal equipment.*

**network manager:** In network management, the entity that initiates requests for management information from managed systems or receives spontaneous management-related notifications from managed systems.

**network node (NN):** A grouping of one or more network elements (at one or more sites) which provides network related functions, and is administered as a single entity. A single site may contain more than one network node. For the purpose of this glossary, a network node is considered synonymous with a network element, and is usually at a single site. This restriction simplifies the definition of the network node interface (NNI) and INI, which would not apply between network elements. [T1.640-1996]

**network number:** An identification number, within a computer network or set of interconnected networks, that uniquely identifies a computer. *Note: Under the Internet protocol system, the network number forms a part of the IP address of each computer in the network. [2382-pt.35]*

**network operating system (NOS):** Software that (a) controls a network and its message (*e.g.*, packet) traffic, and queues, (b) controls access by multiple users to network resources such as files, and (c) provides for certain administrative functions, including security. *Note 1: A network operating system is most frequently used with local area networks and wide area networks, but could also have application to larger network systems. Note 2: The upper 5 layers of the OSI--Reference Model provide the foundation upon which many network operating systems are based.*

**network operations center (NOC):** A centralized organization responsible for the operation and maintenance of its network. [2382-pt.35]

**network operator:** The operator responsible for the development, provision and maintenance of real-time networking services and for operating the corresponding networks. [After T1.667-1999]

**network outpulsing state:** A call state in which the network transmits the caller's emergency service ID (CESID) to the public service answering point (PSAP) customer installation (CI). [T1.414-1998]



**network outward dialing (NOD):** *Synonym direct outward dialing.*

**network performance:** The qualitative level at which a network fulfills its function. [After T1.Rpt24-1993]

**network provided number (NPN):** An ISDN number, supplied by the calling user's or the redirecting user's network, which is associated with the calling user or the redirecting user. It is possible that the NPN may have the same value as the user provided number (UPN) especially in cases where delivery of two calling party numbers is supported. The NPN may also be accompanied by a subaddress. [T1.625-1993]

**network provider:** The organization that maintains and operates the network components required for intelligent network (IN) functionality. A network provider may also take more than one role, *e.g.*, also acting as service provider. [T1.667-1999]

**network reliability:** *See network survivability.*

**network restoration:** Automatic or manual methods to return a network to its normal function in response to a network failure. [T1.Rpt24-1993]

**network section:** The network components that provide a virtual connection between two circuit sections. A network section may be either an access network section or a transit network section. [T1.504-1989]

**network security:** Protection of networks and their services from unauthorized modification, destruction, or disclosure. It provides assurance the network performs its critical functions correctly and there are no harmful side-effects. [INFOSEC-99]

**network security architecture:** [A] subset of network architecture specifically addressing security-relevant issues. [INFOSEC-99]

**network service part:** The combination of the MTP (message transfer part) and the SCCP (signaling connection control part). [T1.110-1987]

**network side:** The side of the network interface or the network functions as seen from the interface. [T1.601-1988]

**network site:** **1.** A collection of functional units that provide network services and that belong to one management domain and are considered as a whole. [2382-pt.35] **2.** A specific location that houses telecommunications equipment entities and/or facility terminations at that location, or a specific location that houses administrative operations. A location is usually designated as a network site when it houses one or more network applications. [T1.253-1999]

**network surveillance:** A process concerned with surveillance of the network as a whole. It includes activities for coordination and assigning priorities to maintenance actions. The information necessary to support this process comes from alarms, measurements, and indicators of operational (including congestion) status. [T1.226-1992]

**network survivability:** The (a) ability of a network to maintain or restore an acceptable level of performance during network failures by applying various restoration techniques, and (b) mitigation or prevention of service outages from network failures by applying preventive techniques. [T1.Rpt24-1993]

**network survivability model:** The analytical processes for estimating how well network services will be affected and restored with transparencies to the users as a result of a failure.

**network terminal number (NTN):** In the ITU-T International X.121 format, the sets of digits that comprise the complete address of the data terminal end point. *Note:* For an NTN that is not part of a national integrated numbering format, the NTN is the 10 digits of the ITU-T X.25 14-digit address that follow the Data Network Identification Code (DNIC). When part of a national integrated numbering format, the NTN is the 11 digits of the ITU-T X.25 14-digit address that follow the DNIC.

**network terminating interface (NTI):** *Synonym for demarcation point.*

**network termination:** Network equipment that provides functions necessary for network operation of ISDN access protocols. *Note:* Network termination provides functions essential for transmission services.

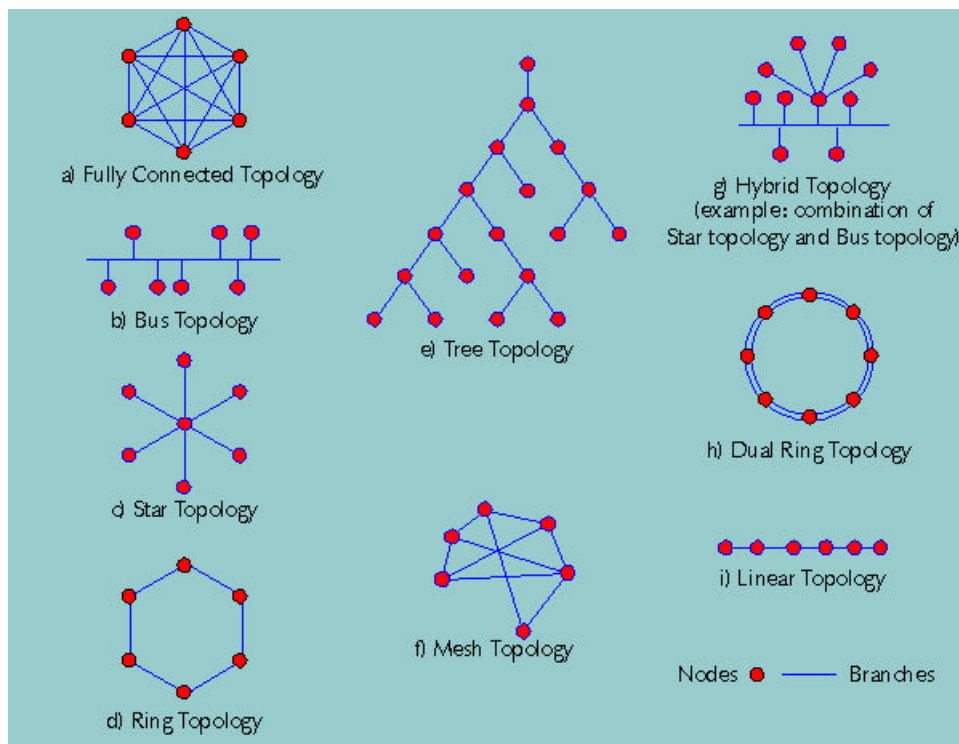
**network termination 1 (NT1):** In Integrated Services Digital Networks (ISDN), a functional grouping of customer-premises equipment that includes functions that may be regarded as belonging to OSI Layer 1, *i.e.*, functions associated with ISDN electrical and physical terminations on the user premises. *Note:* The NT1 forms a boundary to the network and may be controlled by the provider of the ISDN services.

**network termination 2 (NT2):** In Integrated Services Digital Networks (ISDN), an intelligent device that may include functionality for OSI Layers 1 through 3 (dependent on individual systems requirements).

**network topology:** The specific physical, *i.e.*, real, or logical, *i.e.*, virtual, arrangement of the elements of a network. *Note 1:* Two networks have the same topology if the connection configuration is the same, although the networks may differ in physical interconnections, distances between nodes, transmission rates, and/or signal types. *Note 2:* The common types of network topology are illustrated [*refer to the figure on this page*] and defined in alphabetical order below:

- **bus topology:** A network topology in which all nodes, *i.e.*, stations, are connected together by a single bus.
- **fully connected topology:** A network topology in which there is a direct path (branch) between any two nodes. *Note:* In a fully connected network with  $n$  nodes, there are  $n(n-1)/2$  direct paths, *i.e.*, branches. *Synonym fully connected mesh network.*
- **hybrid topology:** A combination of any two or more network topologies. *Note 1:* Instances can occur where two basic network topologies, when connected together, can still retain the basic network character, and therefore not be a hybrid network. For example, a tree network connected to a tree network is still a tree network. Therefore, a hybrid network accrues only when two basic networks are connected and the resulting network topology fails to meet one of the basic topology definitions. For example, two star networks connected together exhibit hybrid network topologies. *Note 2:* A hybrid topology always accrues when two different basic network topologies are connected.
- **linear topology:** *See bus topology.*
- **mesh topology:** A network topology in which there are at least two nodes with two or more paths between them.
- **ring topology:** A network topology in which every node has exactly two branches connected to it.
- **star topology:** A network topology in which peripheral nodes are connected to a central node, which rebroadcasts all transmissions received from any peripheral node to all peripheral nodes on the network, including the originating node. *Note 1:* All peripheral nodes may thus communicate with all others by transmitting to, and receiving from, the central node only. *Note 2:* The failure of a transmission line, *i.e.*, channel, linking any peripheral node to the central node will result in the isolation of that peripheral node from all others. *Note 3:* If the star central node is passive, the originating node must be able to tolerate the reception of an echo of its own transmission, delayed by the two-way transmission time, *i.e.*, to and from the central node, plus any delay generated in the central node. An active star network has an active central node that usually has the means to prevent echo-related problems.
- **tree topology:** A network topology that, from a purely topologic viewpoint, resembles an interconnection of star networks in that individual peripheral nodes are required to

transmit to and receive from one other node only, toward a central node, and are not required to act as repeaters or regenerators. *Note 1:* The function of the central node may be distributed. *Note 2:* As in the conventional star network, individual nodes may thus still be isolated from the network by a single-point failure of a transmission path to the node. *Note 3:* A single-point failure of a transmission path within a distributed node will result in partitioning two or more stations from the rest of the network.



**network trusted computing base (NTCB):** [The] totality of protection mechanisms within a network, including hardware, firmware, and software, the combination of which is responsible for enforcing a security policy. [INFOSEC-99]

**network utility:** An internetwork administrative signaling mechanism in the call control procedure between packet switching public data networks.

**network weaving:** **1.** In computer security, a penetration technique in which different communication networks are used to gain access to a data processing system to avoid detection and trace-back. [After 2382-pt.8] **2.** [A] penetration technique in which different communication networks are linked to access an information system (IS) to avoid detection and trace-back. [INFOSEC-99]

**neutral:** **1.** In ac power distribution, the conductor that (a) is intentionally grounded on the supply side of the service disconnect and (b) provides a current return path for ac power currents. **2.** In three-phase ac "Y," *i.e.*, wye, power distribution, the low-potential fourth wire that conducts only that current required to achieve electrical balance, *i.e.*, to provide a return path for any current imbalance among the three phases.

**neutral direct-current telegraph system:** A telegraph system in which (a) current flows during marking intervals and no current flows during spacing intervals for the transmission of signals over a line, and (b) the direction of current flow is immaterial. *Synonyms* **single-current system, single-current transmission system, single-Morse system.**

**neutral ground:** An intentional ground applied to the neutral conductor or neutral point of a circuit, transformer, machine, apparatus, or system.

**neutral operation:** A method of teletypewriter operation in which marking signals are formed by current pulses of one polarity, either positive or negative, and spacing signals are formed by reducing the current to zero or nearly zero.

**neutral relay:** A relay in which the direction of movement of the armature does not depend upon the direction of the current in the circuit controlling the armature.

**new customer premises equipment:** All customer premises equipment not in service or in the inventory of a regulated telephone utility as of December 31, 1982.

**news client:** *Synonym* **newsreader.**

**newsfeed:** Information distributed by a computer, *e.g.*, one operated by an Internet service provider that maintains current articles within selected groups.

**newsgroup:** *Synonym* **forum.**

**newsreader:** A local software application (client program) that provides access by means of which a user may view one or more forums or newsgroups from one or more news servers. *Note:* Most newsreaders format and display information from the server in a form suitable to the user. *Synonym* **news client.** [After 2382-pt.35]

**news server:** A server on a network that stores, organizes, and distributes messages for selected newsgroups. [2382-pt.35]

**NF:** *Abbreviation for* **noise figure.**

**NFS:** *Abbreviation for* **network file system.** **1.** A file system that is distributed over a computer network. **2.** A file system, on a single computer, that contains the low-level networking files for an entire network. [2382-pt.35]

**n-function:** A defined action performed by an *n*-entity. *Note:* An *n*-function may be (a) a single action, *i.e.*, a primitive function, or (b) a set of actions.

**950 + WXXX:** A carrier access code for obtaining switched access to interchange carriers where (a) the calling customer accesses the IC and passes the address information, if any, in two distinct operations; (b) the calling customer usually uses in-band signals to pass the address, if any, to the IC; and (c) the EC does not repeat the address information. *Note:*

The X digits in WXXX are the carrier identification code for the IC, and W is 0 or 1.

**nibble:** Part of a byte, usually half of a byte. [*Obsolete*]

**NIC: 1.** *Abbreviation for network interface card.* A network interface device (NID) in the form of a circuit card that is installed in an expansion slot of a computer to provide network access. *Note:* Examples of NICs are cards that interface a computer with an Ethernet LAN and cards that interface a computer with an FDDI ring network. **2.** *Abbreviation for network information center.* An entity that provides information management, technical support, and administrative services to users of a given network. *Note:* NICs can form a hierarchy. A specific NIC, designated at the "Internetwork information center" or "InterNIC," has been the authority that assigns the network numbers to the subnetworks that it connects to the Internet. [2382-pt.35]

**NID:** *Acronym for network interface device, network inward dialing.*

**NII:** *Abbreviation for National Information Infrastructure.*

**nine-hundred (900) service:** A telephone service via which the caller may access information on a charge-per-call or charge-per-time basis.

**NIU:** *Abbreviation for network interface unit. See network interface device.*

**Nmap:** A security-violating, network-scanning tool that can scan a network using a variety of protocols, can operate in stealth mode, and can automatically identify remote operating systems.

**nmi:** *Abbreviation for nautical mile.*

**NNTP:** *Abbreviation for network news transfer protocol.* An application protocol that provides the means to transfer files for computer conferences. [After 2382-pt.35]

**no circuit double prime (NC&quot;):** An SIT (special information tone) classification for call attempts that fail to find an available long distance service provider outgoing trunk. [T1.207-1998]

**no circuit (NC):** A call-disposition category for a call attempt that does not find an available outgoing trunk. [T1.207-1998]

**no circuit prime (NC')**: An SIT (special information tone) classification for call attempts that fail to find an available Local Service Provider outgoing trunk. [T1.207-1998]

**NOD:** *Acronym for network outward dialing.*

**nodal clock:** The principal clock or alternate clock located at a particular node that provides the timing reference for all major functions at that node.

**nodal point:** *Synonym node.*

**node: 1.** In network topology, a terminal of any branch of a network or an interconnection common to two or more branches of a network. *Synonyms junction point, nodal point.* **2.** In a switched network, one of the switches forming the network backbone. *Note:* A node may also include patching and control facilities. **3.** A technical control facility (TCF). **4.** A point in a standing or stationary wave at which the amplitude is a minimum. *In this sense, synonym null.*

**noise: 1.** An undesired disturbance within the frequency band of interest; the summation of unwanted or disturbing energy introduced into a communications system from man-made and natural sources. **2.** A disturbance that affects a signal and that may distort the information carried by the signal. **3.** Random variations of one or more characteristics of any entity such as voltage, current, or data. **4.** A random signal of known statistical properties of amplitude, distribution, and spectral density. **5.** *Loosely,* any disturbance tending to interfere with the normal operation of a device or system.

**noise current: 1.** Interfering and unwanted electrical currents in a device or system. **2.** In optical communications, the rms component of the optical detector output electrical current with no incoming signal present.

**noise equivalent power (NEP):** At a given data-signaling rate or modulation frequency, operating wavelength, and effective noise bandwidth, the radiant power that produces a signal-to-noise ratio of unity at the output of a given optical detector. *Note 1:* Some manufacturers and authors define NEP as the minimum detectable power per square root bandwidth. When defined this way, NEP has the units of watts per (hertz)<sup>1/2</sup>. Therefore, the term is a misnomer, because the units of power are watts. *Note 2:* Some manufacturers define NEP as the radiant power that produces a signal-to-dark-current noise ratio of unity. The NEP measurement is valid only if the dark-current noise dominates the noise level.

**noise factor:** *Synonym noise figure.*

**noise field:** An indication of the level of background noise that the terminating end-point may play out in the absence of packets. [T1.312-1991]

**noise figure (NF):** Of an active device, over the bandwidth of interest, the contribution by the device itself to thermal noise at its output. The noise figure is usually expressed in decibels (dB), and is with respect to thermal noise power at the system impedance, at a standard noise temperature (usually 20<sup>0</sup> C, 293 K) over the bandwidth of interest. It is determined by (a) measuring (determining) the ratio, usually expressed in dB, of the thermal noise power at the output, to that at the input, and (b) subtracting from that result, the gain, in dB, of the system. Typical noise figures range from 0.5 dB for very low noise devices, to 4 to 8 dB. In some systems, *e.g.*, heterodyne systems, total output noise power includes noise from other than thermal sources, such as spurious contributions from image-frequency transformation, but noise from these sources is not considered in determining the noise figure. In this example, the noise figure is determined only with respect to that noise that appears in the output via the principal frequency transformation of the system, and excludes noise that appears via the image frequency transformation. *Synonym noise factor.*

**noise level:** The noise power, usually relative to a reference. *Note:* Noise level is usually measured in dB for relative power or picowatts for absolute power. A suffix is added to denote a particular reference base or specific qualities of the measurement. Examples of noise-level measurement units are dBa, dBa(F1A), dBa(HA1), dBa0, dBm, dBm(psoph), dBm0, dBm0P, dBm, dBmC, dBm(f<sub>1</sub>-f<sub>2</sub>), dBm(144-line), pW, pWp, and pWp0.

**noise power: 1.** The power generated by a random electromagnetic process. **2.** Interfering and unwanted power in an electrical device or system. **3.** In the acceptance testing of radio transmitters, the mean power supplied to the antenna transmission line by a radio transmitter when loaded with noise having a Gaussian amplitude-vs.-frequency distribution.

**noise power density:** The noise power in a bandwidth of 1 Hz, *i.e.*, the noise power per hertz at a point in a noise spectrum. *Note:* The noise-power density of the internal noise that is contributed by a receiving system to an incoming signal is expressed as the product of Boltzmann's constant, k, and the equivalent noise temperature, T<sub>n</sub>. Thus, the noise-power density is often expressed simply as kT. *Synonym kT.* [From Weik '89]

**noise suppression: 1.** Reduction of the noise power level in electrical circuits. **2.** The process of automatically reducing the noise output of a receiver during periods when no carrier is being received.

**noise temperature:** At a pair of terminals, the temperature of a passive system having an available noise power per unit bandwidth at a specified frequency equal to that of the actual

terminals of a network. *Note:* The noise temperature of a simple resistor is the actual temperature of that resistor. The noise temperature of a diode may be many times the actual temperature of the diode.

**noise voltage:** **1.** Interfering and unwanted voltage in an electronic device or system. **2.** In optical communications, the rms component of the optical detector output electrical voltage with no incoming signal present.

**noise weighting:** A specific amplitude-vs.-frequency characteristic that permits a measuring set to give numerical readings that approximate the interfering effects to any listener using a particular class of telephone instrument. *Note 1:* Noise weighting measurements are made in lines terminated either by the measuring set or the class of instrument. *Note 2:* The most widely used noise weightings were established by agencies concerned with public telephone service, and are based on characteristics of specific commercial telephone instruments, representing successive stages of technological development. The coding of commercial apparatus appears in the nomenclature of certain weightings. The same weighting nomenclature and units are used in military versions of commercial noise measuring sets.

**noise window:** A notch, *i.e.*, a dip, in the noise frequency spectrum characteristic of a device, such as a transmitter, receiver, channel, or amplifier, from external sources or internal sources. *Note:* The noise window is usually represented as a band of lower amplitude noise in a wider band of higher amplitude noise. [From Weik '89]

**noisy black:** **1.** In facsimile or display systems, such as television, a nonuniformity in the black area of the image, *i.e.*, document or picture, caused by the presence of noise in the received signal. **2.** A signal or signal level that is supposed to represent a black area on the object, but has a noise content sufficient to cause the creation of noticeable white spots on the display surface or record medium.

**noisy white:** **1.** In facsimile or display systems, such as television, a nonuniformity in the white area of the image, *i.e.*, document or picture, caused by the presence of noise in the received signal. **2.** A signal or signal level that is supposed to represent a white area on the object, but has a noise content sufficient to cause the creation of noticeable black spots on the display surface or record medium.

**no-lone zone:** [An] Area, room, or space that, when staffed, must be occupied by two or more appropriately cleared individuals who remain within sight of each other. [INFOSEC-99]

**nominal bandwidth:** The widest band of frequencies, inclusive of guard bands, assigned to a channel. *Note:* Nominal bandwidth should not be confused with the terms "necessary bandwidth," "occupied bandwidth," or "rf bandwidth."

**nominal bit stuffing rate:** The rate at which stuffing bits are inserted when both the input and output bit rates are at their nominal values.

**nominal linewidth:** In facsimile systems, the average separation between centers of adjacent scanning or recording lines.

**nonassociated common-channel signaling:** A form of common-channel signaling where the signaling channel serves one or more trunk groups, at least one of which terminates at a point other than the signal transfer point at which the signaling channel terminates.

**nonassociated mode of signaling:** The signaling mode in which messages involving two (nonadjacent) signaling points are communicated between them over two or more signaling links in tandem passing through one or more signaling transfer points other than those which are the origin and destination of the messages. [T1.226-1992]

**nonblocking switch:** A switch that has enough paths across it that an originated call can always reach an available line without encountering a busy condition.

**non-call associated signaling (NCAS):** Signaling that is independent of an end-to-end bearer connection, including support for the functions of registration, authentication, and validation.

**nonce:** In cryptography, a time-variant parameter, such as a counter or a time stamp, that is used in key management protocols to prevent message replay and other types of attacks. [After X9.42]

**noncentralized operation:** Operation that uses a control discipline for multipoint data communication links in which transmission may be between tributary stations or between the control station and tributary stations.

**noncircularity:** *Synonym* ovality.

**noncooperative remote rekeying:** *Synonym* automatic remote rekeying.

**noncritical technical load:** Of the total technical load at a facility during normal operation, the part that is not required for synchronous operation.

**nonerasable storage:** *Synonym* read-only memory.

**non-fixed access:** In personal communications service (PCS), terminal access to a network in which there is no set relationship between a terminal and the access interface. *Note:* The access interface and the terminal each has its own separate "identifiers." The terminal may be moved from one access interface to another while maintaining the terminal's unique identity. [After T1.244-1995]

**nonlinear distortion:** Distortion caused by a deviation from a linear relationship between specified input and output parameters of a system or component.

**nonlinear scattering:** Direct conversion of a photon from one wavelength to one or more other wavelengths. *Note 1:* In an optical fiber, nonlinear scattering is usually not important below the threshold irradiance for stimulated nonlinear scattering. *Note 2:* Examples of nonlinear scattering are Raman and Brillouin scattering.

**nonloaded twisted pair:** A twisted pair that has no intentionally added inductance.

**nonoperational load:** Administrative, support, and housing power requirements. *Synonym* utility load.

**non-repeated video frame (active frame):** *See* active video frame identification.

**nonrepudiation:** **1.** The capability, in security systems, that guarantees that a message or data can be proven to have originated from a specific person. **2.** Assurance the sender of data is provided with proof of delivery and the recipient is provided with proof of the sender's identity, so neither can later deny having processed the data. [INFOSEC-99]

**nonresonant antenna:** *Synonym* aperiodic antenna.

**non-return-to-zero (NRZ):** A code in which "1s" are represented by one significant condition and "0s" are represented by another, with no neutral or rest condition, such as a zero amplitude in amplitude modulation (AM), zero phase shift in phase-shift keying (PSK), or mid-frequency in frequency-shift keying (FSK). *Note:* For a given data signaling rate, *i.e.*, bit rate, the NRZ code requires only one-half the bandwidth required by the Manchester code.

**non-return-to-zero change-on-ones (NRZI):** A code in which "1s" are represented by a change in a significant condition and "0s" are represented by no change.

**non-return-to-zero mark (NRZ-M):** A binary encoding scheme in which a signal parameter, such as electric current or voltage, undergoes a change in a significant condition or level every time that a "one" occurs, but when a "zero" occurs, it remains the same, *i.e.*, no transition occurs. *Note 1:* The transitions could also occur only when "zeros" occur and not when "ones" occur. If the significant condition transition occurs on each "zero," the encoding scheme is called "non-return-to-zero space" (NRZ-S). *Note 2:* NRZ-M and NRZ-S signals are technically interchangeable; *i.e.*, one is the logical "NOT" (inverse) of the other. It is necessary for the receiver to have prior knowledge of which scheme is being used. Without such knowledge, it is impossible for the receiver to interpret the data stream correctly; *i.e.*, its output may be the correct data stream or the logical inverse of the correct data stream. [From Weik '89] *Synonyms* **conditioned baseband representation, differentially encoded baseband, non-return-to-zero one.**

**non-return-to-zero one (NRZ-1):** *Synonym* **non-return-to-zero mark.**

**non-return-to-zero space (NRZ-S):** A binary encoding scheme in which a signal parameter, such as electric current or voltage, undergoes a change in a significant condition or level every time that a "zero" occurs, but when a "one" occurs, it remains the same, *i.e.*, no transition occurs. *Note 1:* The transitions could also occur only when "ones" occur and not when "zeros" occur. If the significant condition transition occurs on each "one," the encoding scheme is called "non-return to zero mark" (NRZ-M). *Note 2:* NRZ-S and NRZ-M signals are technically interchangeable; *i.e.*, one is the logical "NOT" (inverse) of the other. It is necessary for the receiver to have prior knowledge of which scheme is being used. Without such knowledge, it is impossible for the receiver to interpret the data stream correctly; *i.e.*, its output may be the correct data stream or the logical inverse of the correct data stream. [From Weik '89] *Synonym* **non-return-to-zero.**

**nonsecret encryption:** *Synonym* **public key cryptography.**

**nonshifted fiber:** *Synonym* **dispersion-unshifted fiber.**

**nonsynchronous data transmission channel:** A data transmission channel in which separate timing information is not transferred between the data terminal equipment (DTE) and the data circuit terminating equipment (DCE).

**nonsynchronous network:** *Synonym* **asynchronous network.**

**nonsynchronous system:** *See* **asynchronous transmission.**

**nonsynchronous transmission:** *See* **asynchronous transmission.**

**nontechnical load:** Of the total operational load at a facility during normal operation, the part used for support purposes, such as general lighting, heating, air-conditioning, and ventilating equipment.

**non-transparent loopback:** A loopback in which the signal transmitted beyond the loopback point (the forward signal) when the loopback is activated, is not the same as the received signal at the loopback point. The forward signal may be a defined signal or unspecified. [T1.216-1998]

**nontransparent mode:** A mode of operating a data transmission system in which control characters are treated and interpreted as such, rather than simply as data or text bits in a bit. [From Weik '89]

**normal/alarm (N/A) state bit:** A bit used in signaling packets to transfer information on alarm status across a permanent virtual circuit in the direction of transmission from the channelized side to the packetized side. The N/A bit set to 0 indicates normal operation. The N/A bit set to 1 indicates the existence of an alarm on the channelized access facility or error condition on the permanent virtual circuit. [T1.312-1991]

**normalized frequency ( $V$ ): 1.** In an optical fiber, a dimensionless quantity,  $V$ , given by

$$V = \frac{2\pi a}{\lambda} \sqrt{n_1^2 - n_2^2},$$

where  $a$  is the core radius,  $\lambda$  is the wavelength in vacuum,  $n_1$  is the maximum refractive index of the core, and  $n_2$  is the refractive index of the homogeneous cladding. *Note 1:* In multimode operation of an optical fiber having a power-law refractive index profile, the approximate number of bound modes, *i.e.*, the mode volume, is given by

$$\frac{V^2}{2} \left( \frac{g}{g+2} \right),$$

where  $V$  is the normalized frequency greater than 5 and  $g$  is the profile parameter. *Note 2:* For a step index fiber, the mode volume is given by  $V^2/2$ . For single-mode operation,  $V < 2.405$ . *Synonym*  **$V$  number. 2.** The ratio between an actual frequency and a reference value. **3.** The ratio between an actual frequency and its nominal value.

**normal mode (application layer):** The mode of ACSE (association control service element) operation that results in the transfer of ACSE semantics, using the presentation service. [T1.208-1989]

**normal mode (presentation layer):** The mode of operation of the Presentation Layer, which provides the full facilities of the presentation service. [T1.208-1989]

**normal resolution still image:** A still image transmitted in the ANSI T1.314 video stream encoded to the same resolution as the previous motion video (*i.e.*, QCIF—quarter common intermediate format). *Note:* This mode uses a bit 2 "document camera indicator." [T1.800.08-1995]

**normal routing:** The routing of a given signaling traffic stream under normal conditions (in the absence of failures). [T1.226-1992]

**NORM state:** A state that exists on a permanent virtual circuit connection when there are no alarm conditions on either the originating or terminating endpoints. The absence of alarms must be satisfied on both the channelized side and the packetized side. During the NORM state, signaling packets have their normal alarm (N/A) bit set to 0. [T1.312-1991]

**North American Number Plan (NANP):** A plan for the allocation of unique 10-digit address numbers. The numbers consists of a 3-digit area (numbering plan area) code, a 3-digit office code, and a 4-digit line number. The plan also extends to format variations (*e.g.*, 3-digit and 7-digit address), prefixes (*e.g.*, 1, 0, 01, and 011), and special code applications (*e.g.*, service access codes). [T1.104-1988]

**notarization:** A method of changing a key-enciphering key so as to confirm the identities of the originator and the ultimate recipient. [After X9.8]

**notch:** In a relatively wide band of frequencies, not necessarily of uniform amplitude, a narrow band of frequencies having relatively low amplitudes.



**notched filter:** *Synonym band-stop filter.*

**notched noise:** Noise from which a narrow band of frequencies has been removed. *Note:* Notched noise is usually used for testing devices or circuits.

**not-ready condition:** At the data terminal equipment/data circuit-terminating equipment (DTE/DCE) interface, a steady-state condition that indicates that the DCE is not ready to accept a call-request signal or that the DTE is not ready to accept an incoming call.

**Np:** *Abbreviation for neper.*

**NPA:** *Abbreviation for numbering plan area.*

**NRI:** *Abbreviation for net radio interface.*

**NRZ:** *Abbreviation for non-return-to-zero.*

**NRZ-M:** *Synonym non-return-to-zero mark.*

**NS/EP telecommunications:** *Abbreviation for National Security or Emergency Preparedness telecommunications.* Telecommunications services that are used to maintain a state of readiness or to respond to and manage any event or crisis (local, national, or international) that causes or could cause injury or harm to the population, damage to or loss of property, or degrade or threaten the national security or emergency preparedness posture of the United States.

***n*-sequence:** A pseudorandom binary sequence of *n* bits that (a) is the output of a linear shift register and (b) has the property that, if the shift register is set to any nonzero state and then cycled, a pseudorandom binary sequence of a maximum of  $n = 2^m - 1$  bits will be generated, where *m* is the number of stages, *i.e.*, the number of bit positions in the register, before the shift register returns to its original state and the *n*-bit output sequence repeats. *Note:* The register may be used to control the sequence of frequencies for a frequency-hopping spread spectrum transmission system.

**NSFnet:** The high-speed national network that superseded ARPA Net as the framework of the Internet. *Note:* NSFnet was created under the auspices of the National Science Foundation. [After Bahorsky]

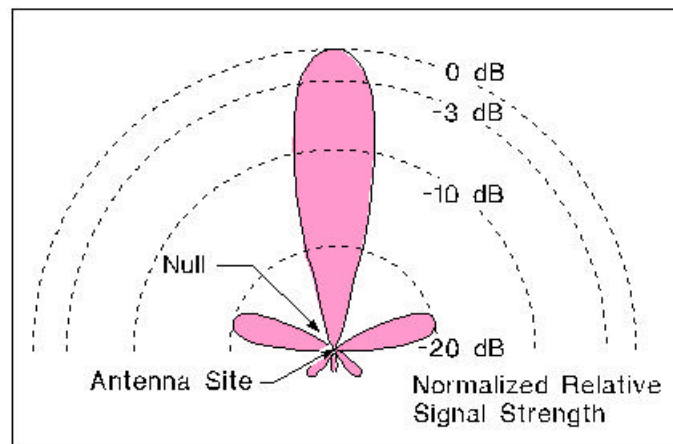
**NTI:** *Abbreviation for network terminating interface.*

**NTN:** *Abbreviation for network terminal number.*

**NTSC standard:** *Abbreviation for National Television Standards Committee standard.* The North American standard (525-line interlaced raster-scanned video) for the generation, transmission, and reception of television signals. *Note 1:* In the NTSC standard, picture information is transmitted in vestigial-sideband AM and sound information is transmitted in FM. *Note 2:* In addition to North America, the NTSC standard is used in Central America, a number of South American countries, and some Asian countries, including Japan.

**nuclear hardness: 1.** An expression of the extent to which the performance of a system, facility, or device is expected to degrade in a given nuclear environment. **2.** The physical attributes of a system or component that will allow survival in an environment that includes nuclear radiation and electromagnetic impulses (EMI). *Note 1:* Nuclear hardness may be expressed in terms of either susceptibility or vulnerability. *Note 2:* The extent of expected performance degradation (*e.g.*, outage time, data lost, and equipment damage) must be defined or specified. The environment (*e.g.*, radiation levels, overpressure, peak velocities, energy absorbed, and electrical stress) must be defined or specified. **3.** The physical attributes of a system or component that will allow a defined degree of survivability in a given environment created by a nuclear weapon. *Note:* Nuclear hardness is determined for specified or actual quantified environmental conditions and physical parameters, such as peak radiation levels, overpressure, velocities, energy absorbed, and electrical stress. It is achieved through design specifications and is verified by test and analysis techniques.

**null: 1.** In an antenna radiation pattern, a zone in which the effective radiated power is at a minimum relative to the maximum effective radiated power of the main beam. *Note 1:* A null often has a narrow directivity angle compared to that of the main beam. Thus, the null is useful for several purposes, such as radio navigation and suppression of interfering signals in a given direction. *Note 2:* Because there is reciprocity between the transmitting and receiving characteristics of an antenna, there will be corresponding nulls for both the transmitting and receiving functions. **2.** A dummy letter, letter symbol, or code group inserted in an encrypted message to delay or prevent its solution, or to complete encrypted groups for transmission or transmission security purposes. [NIS] **3.** In database management systems, a special value assigned to a row or a column indicating either unknown values or inapplicable usage. **4.** *Synonym node.*



null

**null character (NUL):** In transmission systems, a control character (a) that is used to accomplish media-fill stuffing or a time-fill stuffing in storage device or in a data transmission line and (b) that may be inserted and removed from a series of characters without affecting the meaning of the series. *Note:* The null character may affect the control of equipment or the format of messages. [From Weik '89]

**numbering plan area (NPA):** A defined geographic area identified by a unique three-digit code used in the North American Number Plan Area. [T1.207-1998] [T1.209-1998] *Note 1:* *Defined geographic area* could mean the entire area encompassed by the North American Numbering Plan Area (for 800, 888, 877 codes, *etc.*). *Note 2:* By virtue of the overlay



concept deployed in some states, there may be two (or more) NPAs assigned to the same *defined geographic area*.

**numerical aperture (NA): 1.** The sine of the vertex angle of the largest cone of meridional rays that can enter or leave an optical system or element, multiplied by the refractive index of the medium in which the vertex of the cone is located. *Note:* The NA is generally measured with respect to an object or image point and will vary as that point is moved. **2.** For an optical fiber in which the refractive index decreases monotonically from  $n_1$  on the axis to  $n_2$  in the cladding, an expression of the extent of the fiber's ability to accept, in its

bound modes, non-normal incident rays, given by  $NA = (n_1^2 - n_2^2)^{1/2}$ . *Note:* In multimode fibers, the term *equilibrium numerical aperture* is sometimes used. This refers to the numerical aperture with respect to the extreme exit angle of a ray emerging from a fiber in which equilibrium mode distribution has been established. **3. Loosely,** the sine of the radiation or acceptance angle of an optical fiber, multiplied by the refractive index of the material in contact with the exit or entrance face. *Note:* This usage is approximate and imprecise, but is often encountered.

**numerical aperture loss:** A loss of optical power that occurs at a splice or a pair of mated connectors when the numerical aperture of the "transmitting" fiber exceeds that of the "receiving" fiber, even if the cores are precisely the same diameter and are perfectly aligned. [FAA] *Note 1:* The higher numerical aperture of the transmitting fiber means that it emits a larger cone of light than the receiving fiber is capable of accepting, resulting in a coupling loss. [FAA] *Note 2:* In the opposite case of numerical aperture mismatch, where the transmitting fiber has the lower numerical aperture, no numerical aperture loss occurs, because the receiving fiber is capable of accepting light from any bound mode of the transmitting fiber. [After FAA]

**n-unit code:** A code in which the signals or groups of digits that represent coded items, such as characters, have the same number of signal elements or digits, namely  $n$  elements or digits, where  $n$  may be any positive integer. *Note:* An example of an  $n$ -unit code is the 7-unit code (8-unit with parity) ASCII code. Each character is represented by a pattern of 7 binary digits. The units may also be characters or other special signs. [From Weik '89]

**n-user:** In the ISO Open Systems Interconnection--Reference Model (OSI--RM), an  $n+1$  entity that uses the services of the  $n$ -layer, and below, to communicate with another  $n+1$  entity. *Note:* If  $n$  identifies a specific or a reference level, the  $n+1$  layer is the layer above the  $n$  layer and the  $n-1$  layer is the layer below the  $n$  layer. Thus, the  $n+2$  layer is two layers above the  $n$  layer.

**NVIS:** *Abbreviation for near-vertical-incidence skywave.*

**NXX code:** In the North American direct distance dialing numbering plan, a central office code of three digits that designates a particular central office or a given 10,000-line unit of subscriber lines; "N" is any number from 2 to 9, and "X" is any number from 0 to 9.

**Nyquist interval:** The maximum time interval between equally spaced samples of a signal that will enable the signal waveform to be completely determined. *Note 1:* The Nyquist interval is equal to the reciprocal of twice the highest frequency component of the sampled signal. *Note 2:* In practice, when analog signals are sampled for the purpose of digital transmission or other processing, the sampling rate must be more frequent than that defined by Nyquist's theorem, because of quantization error introduced by the digitizing process. The required sampling rate is determined by the accuracy of the digitizing process.

**Nyquist rate:** The reciprocal of the Nyquist interval, *i.e.*, the minimum theoretical sampling rate that fully describes a given signal, *i.e.*, enables its faithful reconstruction from the samples. *Note:* The actual sampling rate required to reconstruct the original signal will be somewhat higher than the Nyquist rate, because of quantization errors introduced by the sampling process.

**Nyquist's theorem:** A theorem, developed by H. Nyquist, which states that an analog signal waveform may be uniquely reconstructed, without error, from samples taken at equal time intervals. The sampling rate must be equal to, or greater than, twice the highest frequency component in the analog signal. *Synonym* **sampling theorem.**

**object: 1.** In image processing, a sub-region of an image that is perceived as a single entity. *Note:* An image can contain more than one object. **2.** In facsimile systems, the image, the likeness of which is to be transmitted. **3.** [A] Passive entity containing or receiving information. Access to an object implies access to the information it contains. [INFOSEC-99]

**object oriented: 1.** Pertaining to, or characteristic of, a computer program consisting of (a) many relatively small, simple programs (subroutines), and (b) one monitor program, the function of which is to coordinate the exchange of data among the subroutines. *Note:* Subroutines designed under this concept may be stored in object libraries, and used by other computer programmers with similar functional requirements. **2.** Pertaining to, or characteristic of, data to be processed by object-oriented programs. *Note 1:* Each data object in an object-oriented program may have multiple attributes associated with it. For example, if a data object were defined as a person, several appropriate attributes might be the person's birth date, social security number, and eye color. *Note 2:* The data and its attributes are considered as one object as they pass between subroutines. *Note 3:* Objects with similar attributes are considered as a particular class of objects. For example, "people" would be one class of objects and "automobiles" could be another, because the objects in the "automobiles" class are likely to have a completely different set of attributes associated with them.

**object persistence:** In a video display, distortion wherein the entirety of some object (or objects) that appeared in a previous frame (and that should no longer appear) remain in the current frame and in subsequent frames as a faded image or as an outline.

**object retention:** In a video display, distortion in which a fragment of an object that appeared in a previous frame (and should no longer appear) remains in the current and subsequent video frames.

**object reuse:** Reassignment and re-use of a storage medium containing one or more objects after ensuring no residual data remains on the storage medium. [INFOSEC-99]

**obsolete:** In cryptography, pertaining to the state of a key that must no longer be used either to transmit information from the originator or to process received secure information. [After X9.17]

**obsolete date:** In encryption, the date and time when a key becomes obsolete. [After X9.17]

**OC:** *Abbreviation for optical carrier.* The nomenclature for the line rate of the optical transmission signal. [T1.106-1988]

**OCC:** *Abbreviation for other common carrier.*

**occupancy:** For equipment, such as a circuit or a switch, the ratio of the actual time in use to the available time during a 1-hour period. *Note 1:* Occupancy is usually expressed in percent. *Note 2:* Occupancy may be plotted versus time of day. *Synonym* **usage.**

**occupied bandwidth: 1.** The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage  $B/2$  of the total mean power of a given emission. Unless otherwise specified by the CCIR for the appropriate class of emission, the value of  $B/2$  should be taken as 0.5%. [NTIA] [RR] *Note 1:* The percentage of the total power outside the occupied bandwidth is represented by  $B$ . *Note 2:* In some cases, *e.g.*, multichannel frequency-division multiplexing systems, use of the 0.5% limits may lead to certain difficulties in the practical application of the definition of occupied and necessary bandwidth; in such cases, a different percentage may prove useful. **2.** The frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission. [47CFR]

**oceanographic data interrogating station:** A station in the maritime mobile service the emissions of which are used to initiate, modify or terminate functions of equipment directly associated with an oceanographic data station, including the station itself. [NTIA]

**oceanographic data station:** A station in the maritime mobile service located on a ship, buoy, or other sensor platform the emissions of which are used for transmission of

oceanographic data. [NTIA]

**OCR:** *Abbreviation for optical character reader, optical character recognition.*

**octet:** A byte of eight binary digits usually operated upon as an entity.

**octet alignment:** The configuration of a field composed of an integral number of octets. *Note:* If the field is not divisible by eight, bits (usually zeros) are added to either the first octet (left justification) or the last octet (right justification).

**OD:** *Abbreviation for optical density.*

**odd-even check:** *Synonym parity check.*

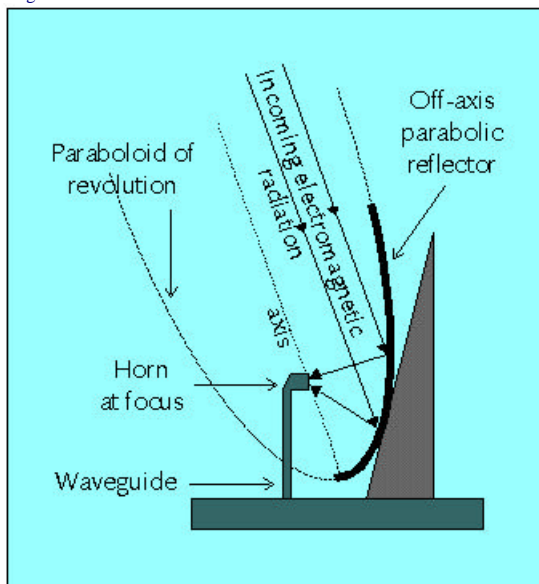
**odd parity:** *See parity, parity check.*

**OFC:** *Abbreviation for optical fiber, conductive. Note:* OFC is the designation given by the National Fire Protection Association (NFPA) to interior fiber-optic cables which contain at least one electrically conductive, non-current-carrying component, such as a metallic strength member or vapor barrier, and which are not certified for use in plenum or riser applications. [After FAA]

**OFCP:** *Abbreviation for optical fiber, conductive, plenum. Note:* OFCP is the designation given by the National Fire Protection Association (NFPA) to interior fiber-optic cables which contain at least one electrically conductive, non-current-carrying component such as a metallic strength member or vapor barrier, and which are certified for use in plenum applications. [After FAA]

**OFRC:** *Abbreviation for optical fiber, conductive, riser. Note:* OFRC is the designation given by the National Fire Protection Association (NFPA) to interior fiber-optic cables which contain at least one electrically conductive, non-current-carrying component such as a metallic strength member or vapor barrier, and which are certified for use in riser applications. [After FAA]

**off-axis optical system:** An optical system in which the optical axis of the aperture is not coincident with the mechanical center of the aperture. *Note:* The principal applications of off-axis optical systems are to avoid obstruction of the primary aperture by secondary optical elements, instrument packages, or sensors, and to provide ready access to instrument packages or sensors at the focus. The engineering tradeoff of an off-axis optical system is an increase in image aberrations.



off-axis optical system used as a microwave antenna system

**offered load:** The total load submitted to a trunk group. This value may be corrected for retrials during the engineering process. [T1.Rpt 11-1991]

**off-hook:** **1.** In telephony, the condition that exists when an operational telephone instrument or other user instrument is in use, *i.e.*, during dialing or communicating. *Note:* Off-hook originally referred to the condition that prevailed when the separate earpiece, *i.e.*, receiver, was removed from its switchhook, which extended from a vertical post that also supported the microphone, and which connected the instrument to the line when not depressed by the weight of the receiver. **2.** One of two possible signaling states, such as tone or no tone and ground connection versus battery connection. *Note:* If off-hook pertains to one state, on-hook pertains to the other. **3.** The active state, *i.e.*, closed loop, of a subscriber or PBX user loop. **4.** An operating state of a communications link in which data transmission is enabled either for (a) voice or data communications or (b) network signaling.

**off-hook service:** *Synonym hotline.*

**off-hook signal:** In telephony, of a circuit, a signal indicating seizure, request for service, or a busy condition.

**office classification:** Prior to divestiture, numbers that were assigned to offices according to their hierarchical function in the U.S. public switched telephone network. *Note 1:* The following class numbers are used:

- **Class 1:** Regional Center (RC)
- **Class 2:** Sectional Center (SC)
- **Class 3:** Primary Center (PC)
- **Class 4:** Toll Center (TC) [Only if operators are present; otherwise Toll Point (TP)]

- **Class 5:** End Office (EO) [Local central office]

*Note 2:* Any one center handles traffic from one center to two or more centers lower in the hierarchy. Since divestiture, these designations have become less firm.

**off line: 1.** In computer technology, the state or condition of a device or equipment that is not under the direct control of another device. **2.** In computer technology, the status of a device that is disconnected from service.

**off-line: 1.** Pertaining to the operation of a functional unit when not under the direct control of the system with which it is associated. *Note 1:* Off-line units are not available for immediate use on demand by the system. *Note 2:* Off-line units may be independently operated. **2.** Pertaining to equipment that is disconnected from a system, is not in operation, and usually has its main power source disconnected or turned off.

**off-line cryptosystem:** [A] cryptosystem in which encryption and decryption are performed independently of the transmission and reception functions. [INFOSEC-99]

**off-line recovery:** The process of recovering nonprotected message traffic by use of an off-line processor or central processing unit.

**off-line storage:** Storage that is not under the control of a processing unit.

**off-net calling:** The process by which telephone calls that originate or pass through private switching systems in transmission networks are extended to stations in a public switched telephone system.

**off-premises extension (OPX):** An extension telephone, PBX station, or key system station located on property that is not contiguous with that on which the main telephone, PBX, or key system is located.

**offset:** In encryption, the process of applying Exclusive-OR logic to a target value and a known count. [After X9.17]

**offset encryption:** The process of encryption by using a key that has been offset. [After X9.28]

**offset track:** In information assurance, a track written at a nonstandard position on a diskette, as part of a method of copy protection. [2382-pt.8]

**off-the-air: 1.** In radio communications systems, pertaining to a station that is completely shut down, *i.e.*, that is not transmitting any signal, not even an unmodulated carrier. **2.** In a radio station, pertaining to a particular source of modulation, such as a specific microphone, that is disconnected, *i.e.*, is no longer capable of modulating the carrier. *Note:* The carrier may continue unmodulated or it may be modulated by another signal source.

**off-the-air monitoring: 1.** In radio net operations, the listening, by the net-control station, to the transmissions of stations in the net, particularly to check the quality of their transmissions. *Note:* Off-the-air monitoring is usually performed during periods when the net-control station is not transmitting. **2.** The listening, by a radio station, to its own transmissions by receiving the signal that has been transmitted by the transmitting antenna, to discover the quality of the signal being transmitted to other stations or being broadcast. *Note:* In off-the-air monitoring, the received signal must have traveled through the air a reasonable distance from the transmitting antenna and not be a signal that is tapped on its way to the transmitting antenna internal to the station or in the antenna transmission line, *i.e.*, the feeder. The monitoring distance should be such that direct inductive or capacitive coupling between the transmitting antenna and monitor antenna does not occur. [From Weik '89]

**off-the-shelf:** Pertaining to equipment already manufactured and available for delivery from stock.

**OFN:** *Abbreviation for optical fiber, nonconductive.* *Note:* OFN is the designation given by the National Fire Protection Association (NFPA) to interior fiber-optic cables which contain no electrically conductive component, and which are not certified for use in plenum or riser applications. [After FAA]

**OFNP:** *Abbreviation for optical fiber, nonconductive, plenum.* *Note:* OFNP is the designation given by the National Fire Protection Association (NFPA) to interior fiber-optic cables which contain no electrically conductive component, and which are certified for use in plenum applications. [After FAA]

**OFNR:** *Abbreviation for optical fiber, nonconductive, riser.* *Note:* OFNR is the designation given by the National Fire Protection Association (NFPA) to interior fiber-optic cables which contain no electrically conductive component, and which are certified for use in riser applications. [After FAA]

**oligarchically synchronized network:** A synchronized network in which the timing of all clocks is controlled by a selected few clocks.

**Omega:** A global radionavigation system that enables user with special receivers to obtain position information by measuring phase difference between precisely timed signals radiated by a network of eight transmitting stations deployed worldwide. *Note:* The transmitted signals time-share transmission on frequencies of 10.2, 11.05, 11.33, and 13.6 kHz. Since the transmissions are coordinated with UTC (USNO), they also provide time reference.

**omnidirectional antenna:** An antenna that has a radiation pattern that is nondirectional in azimuth. *Note:* The vertical radiation pattern may be of any shape.

**omnidirectional range station:** A radionavigation land station in the aeronautical radionavigation service providing direct indication of the bearing (omnbearing) of that station from an aircraft. [NTIA]

**ONA:** *Abbreviation for open network architecture.*

**on-board communication station:** A low-powered mobile station in the maritime mobile service intended for use for internal communications on board a ship, or between a ship and its lifeboats and liferafts during lifeboat drills or operations, or for communication within a group of vessels being towed or pushed, as well as for line handling and mooring instructions. [NTIA] [RR]

**144-line weighting:** In telephony, a noise weighting used in a noise measuring set to measure line noise as it would be perceived if the line were terminated with a No. 144-receiver, or a similar instrument. *Note:* The meter scale readings are in dBrn (144-line).

**144-receiver weighting:** In telephony, a noise weighting used in a noise measuring set to measure noise across the receiver of an instrument equipped with a No. 144-receiver. *Note:* The meter scale readings are in dBrn (144-receiver).

**one-part code:** Code in which plain text elements and their accompanying code groups are arranged in alphabetical, numerical, or other systematic order, so one listing serves for both encoding and decoding. One-part codes are normally small codes used to pass small volumes of low-sensitivity information. [INFOSEC-99]

**one-time cryptosystem:** Cryptosystem employing key used only once. [INFOSEC-99]

**one-time pad:** [A] manual one-time cryptosystem produced in pad form. [INFOSEC-99]

**one-way communication:** Communication in which information is always transferred in only one preassigned direction. *Note 1:* One-way communication is not necessarily constrained to one transmission path. *Note 2:* Examples of one-way communications systems include broadcast stations, one-way intercom systems, and wireline news services.

**one-way encryption:** *Synonym irreversible encryption.*

**one-way function:** A transfer function  $f$  which is relatively easy to compute, but for which, for a general value,  $y$ , within the selected range, it is computationally difficult to find a value  $x$  within the expected domain such that  $f(x) = y$ . There may be several values for  $y$ , for which finding  $x$  is not computationally difficult. [After X.509]

**one-way-only channel:** A channel capable of transmission in only one direction, which cannot be reversed. *Synonym unidirectional channel.*

**one-way operation:** *Synonym simplex operation.*

**one-way reversible operation:** *Synonym half-duplex operation.*

**one-way trunk:** A trunk between two switching centers, over which traffic may be originated from one preassigned location only. *Note 1:* The traffic may consist of two-way communications; the expression "one way" refers only to the origin of the demand for a connection. *Note 2:* At the originating end, the one-way trunk is known as an "outgoing trunk"; at the other end, it is known as an "incoming trunk".

**on-hook:** **1.** In telephony, the condition that exists when an operational telephone, or other user instrument, is not in use. *Note:* On-hook originally referred to the storage of an idle telephone receiver, *i.e.*, separate earpiece, on a hook that extended from a vertical post that supported the microphone also. The hook was mechanically connected to a switch that automatically disconnected the idle telephone from the network. **2.** One of two possible signaling states, such as tone or no tone, or ground connection versus battery connection. *Note:* If on-hook pertains to one state, off-hook pertains to the other. **3.** The idle state, *i.e.*, open loop, of a subscriber or PBX user loop. **4.** An operating state of a communications link in which data transmission is disabled and a high-impedance, *i.e.*, open, circuit is presented to the link by the end instrument(s). *Note:* During the on-hook condition, the link is responsive to ringing signals. *See on-hook state.*

**on-hook signal:** In telephony, of a circuit, a signal indicating a disconnect, unanswered call, or an idle condition.

**on-hook state:** A state in which the customer installation (CI) presents a high-resistance path at the network interface. [T1.Rpt37-1994]

**on line:** *See on-line. Alternate spellings: on-line, online. Note:* These alternate spellings are inconsistent with convention, but are widely used in computer technology.

**on-line:** **1.** Pertaining to the operation of a functional unit when under the direct control of the system with which it is associated. *Note 1:* On-line units are available for immediate use on demand by the system without human intervention. *Note 2:* On-line units may not be independently operated. **2.** Pertaining to equipment that is connected to a system, and is in operation. **3.** In computer technology, the state or condition of a device or equipment that is under the direct control of another device. **4.** In computer technology, the status of a device that is functional and ready for service. *Also spelled "on line" and "online."*

**online computer system:** A computer system that is a part of, or is embedded in, a larger entity, such as a communications system, and that interacts in real or near-real time with the entity and its users.

**on-line cryptosystem:** [A] cryptosystem in which encryption and decryption are performed in association with the transmitting and receiving functions. [INFOSEC-99]

**online shopping:** A process in which images or listings of goods and services are viewed remotely via electronic means, *e.g.*, a vendor's Web site, items are selected for purchase, and the transaction is completed electronically with a credit card or an established credit account. *Note:* Various encryption schemes may be, and usually are, used to reduce the risks of sending sensitive information, such as credit-card numbers, over the Internet or other telecommunications facility.

**online software upgrade:** In computer networking, a software modification or installation performed remotely from an originating site (*e.g.*, by authority of a network administrator) on a subject user's computer, by means of a special utility program that enables access to the subject computer whenever it is powered up and on line. *Note:* An online software upgrade may be performed (a) automatically, without the consent and, perhaps, without the knowledge of the user, (b) semi-automatically, in which case an application resident on the networked computer will, upon every bootup, automatically check the originating site and notify the user if an upgrade is available (if so, some kind of assenting action on the part of the user is necessary to retrieve it), or (c) manually, in which case the user must check the originating site periodically to determine whether an upgrade is available, and take some kind of assenting action to retrieve it.

**on-premises extension:** An extension telephone, PBX station, or key system station located on property that is contiguous with that on which the main telephone, PBX, or key system is located.

**on-premises wiring:** Customer-owned metallic or optical-fiber communications transmission lines, installed within or between buildings. *Note:* On-premises wiring may consist of horizontal wiring, vertical wiring, and backbone wiring, and may extend from the external network interface to the user work station areas. It includes the total communications wiring to transport current or future data, voice, LAN, and image information.

**on-screen button:** A pictorial representation of a pushbutton on a display screen, which functions as a binary control, for example, on/off. [T1.232-1996]

**on-the-air:** **1.** In radio communications systems, pertaining to a station that is transmitting a carrier, whether or not the carrier is modulated. **2.** In a radio station, pertaining to a particular source of modulation, such as a specific microphone, that is connected, *i.e.*, is capable of modulating the carrier.

**open circuit:** **1.** In communications, a circuit available for use. **2.** In electrical engineering, a circuit that contains an essentially infinite impedance. *Note:* An open circuit may be intentional, as in a switch, or may constitute a fault, as in a severed cable.

**open dual bus:** A dual bus in which the head-of-bus functions for both buses are at different locations.

**open network architecture (ONA):** In the context of the FCC's Computer Inquiry III, the overall design of a communication carrier's basic network facilities and services to permit all users of the basic network to interconnect to specific basic network functions and interfaces on an unbundled, equal-access basis. *Note:* The ONA concept consists of three integral components: (a) basic serving arrangements (BSAs), (b) basic service elements (BSEs), and (c) complementary network services.

**open-security environment:** **1.** In INFOSEC, an environment in which protection of data and resources from accidental or malicious acts is achieved through normal operational procedures. [After 2382-pt.8] **2.** [An] environment that does not provide sufficient assurance that applications and equipment are protected against the loss of confidentiality, integrity, or availability. [INFOSEC-99]

**open storage:** Storage of classified information within an accredited facility, but not in General Services Administration approved secure containers, while the facility is unoccupied by authorized personnel. [INFOSEC-99]

**open switching interval (OSI):** An interval when the dc voltage applied between the tip and ring conductors of a line is removed, hence temporarily suspending line supervision and transmission. [T1.401-1998]

**open system:** A system with characteristics that comply with specified, publicly maintained, readily available standards and that therefore can be connected to other systems that comply with these same standards.

**open systems architecture:** **1.** The layered hierarchical structure, configuration, or model of a communications or distributed data processing system that (a) enables system

description, design, development, installation, operation, improvement, and maintenance to be performed at a given layer or layers in the hierarchical structure, (b) allows each layer to provide a set of accessible functions that can be controlled and used by the functions in the layer above it, (c) enables each layer to be implemented without affecting the implementation of other layers, and (d) allows the alteration of system performance by the modification of one or more layers without altering the existing equipment, procedures, and protocols at the remaining layers. *Note 1:* Examples of independent alterations include (a) converting from wire to optical fibers at a physical layer without affecting the data-link layer or the network layer except to provide more traffic capacity, and (b) altering the operational protocols at the network level without altering the physical layer. *Note 2:* Open systems architecture may be implemented using the Open Systems Interconnection--Reference Model (OSI--RM) as a guide while designing the system to meet performance requirements. 2. Nonproprietary systems architecture.

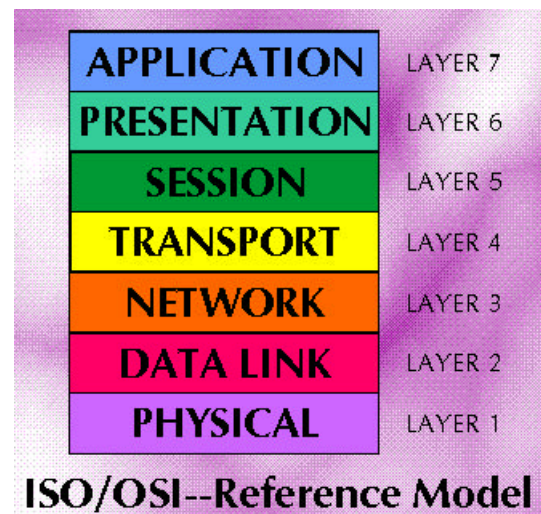
**Open Systems Interconnection (OSI):** Pertaining to the logical structure for communications networks standardized by the International Organization for Standardization (ISO). *Note:* Adherence to the standard enables any OSI-compliant system to communicate with any other OSI-compliant system for a meaningful exchange of information.

**Open Systems Interconnection (OSI)--Architecture:** Communications system architecture that adheres to the set of ISO standards relating to open systems architecture.

**Open Systems Interconnection (OSI)--Protocol Specification:** The lowest level of abstraction within the OSI standards scheme. *Note:* Each OSI--Protocol Specification operates at a single layer. Each defines the primitive operations and permissible responses required to exchange information between peer processes in communicating systems to carry out all or a subset of the services defined within the OSI--Service Definitions for that layer.

**Open Systems Interconnection--Reference Model (OSI--RM):** An abstract description of the digital communications between application processes running in distinct systems. The model employs a hierarchical structure of seven layers. Each layer performs value-added service at the request of the adjacent higher layer and, in turn, requests more basic services from the adjacent lower layer:

- **Physical Layer:** Layer 1. The lowest of seven hierarchical layers. The Physical layer performs services requested by the Data Link Layer. The major functions and services performed by the physical layer are: (a) establishment and termination of a connection to a communications medium; (b) participation in the process whereby the communication resources are effectively shared among multiple users, e.g., contention resolution and flow control; and, (c) conversion between the representation of digital data in user equipment and the corresponding signals transmitted over a communications channel.
- **Data Link Layer:** Layer 2. This layer responds to service requests from the Network Layer and issues service requests to the Physical Layer. The Data Link Layer provides the functional and procedural means to transfer data between network entities and to detect and possibly correct errors that may occur in the Physical Layer. *Note:* Examples of data link protocols are HDLC and ADCCP for point-to-point or packet-switched networks and LLC for local area networks.
- **Network Layer:** Layer 3. This layer responds to service requests from the Transport Layer and issues service requests to the Data Link Layer. The Network Layer provides the functional and procedural means of transferring variable length data sequences from a source to a destination via one or more networks while maintaining the quality of service requested by the Transport Layer. The Network Layer performs network routing, flow control, segmentation/desegmentation, and error control functions.
- **Transport Layer:** Layer 4. This layer responds to service requests from the Session Layer and issues service requests to the Network Layer. The purpose of the Transport Layer is to provide transparent transfer of data between end users, thus relieving the upper layers from any concern with providing reliable and cost-effective data transfer.
- **Session Layer:** Layer 5. This layer responds to service requests from the Presentation Layer and issues service requests to the Transport Layer. The Session Layer provides the mechanism for managing the dialogue between end-user application processes. It provides for either duplex or half-duplex operation and establishes checkpointing, adjournment, termination, and restart procedures.
- **Presentation Layer:** Layer 6. This layer responds to service requests from the Application Layer and issues service requests to the Session Layer. The Presentation Layer relieves the Application Layer of concern regarding syntactical differences in data representation within the end-user systems. *Note:* An example of a presentation service would be the conversion of an EBCDIC-coded text file to an ASCII-coded file.
- **Application Layer:** Layer 7, the highest layer. This layer interfaces directly to and performs common application services for the application processes; it also issues requests to the Presentation Layer. The common application services provide semantic conversion between associated application processes. *Note:* Examples of common application services of general interest include the virtual file, virtual terminal, and job transfer and manipulation protocols.



**Open Systems Interconnection (OSI)--Service Definitions:** The next lower level of abstraction below that of the OSI--Reference Model. The OSI--Service Definitions for each layer define the layer's abstract interface and the facilities provided to the user of the service independent of the mechanism used to accomplish the service.

**Open Systems Interconnection (OSI)--Systems Management:** In the Application Layer of the OSI--Reference Model (OSI--RM), the set of functions related to the management and status of various resources identified in all layers of the OSI--RM.

**open waveguide:** An all-dielectric waveguide in which electromagnetic waves are guided by a refractive index gradient so that the waves are confined to the guide by refraction or reflection from the outer surface of the guide or from surfaces within the guide. *Note 1:* In an open waveguide, the electromagnetic waves propagate, without radiation, within the waveguide, although evanescent waves coupled to internal waves may travel in the space immediately outside the waveguide. *Note 2:* Examples of open waveguides are (a) optical fibers and (b) planar waveguides in integrated optical circuits. [From Weik '89]



**open wire:** Conductors that are separately supported with insulators on poles or towers above the surface of the Earth. *Note 1:* Open wire conductors may be insulated or uninsulated. *Note 2:* Open wire may be used in both communication applications and power applications.

**operand:** An entity on which an operation is performed.

**operating system:** An integrated collection of routines that service the sequencing and processing of programs by a computer. *Note:* An operating system may provide many services, such as resource allocation, scheduling, input/output control, and data management. Although operating systems are predominantly software, partial or complete hardware implementations may be made in the form of firmware.

**operating system platform:** *Synonym platform.*

**operating time:** **1.** The time interval between the instant of occurrence of a specified input condition to a system and the instant of completion of a specified operation. **2.** In communications, computer, and information processing systems, the time interval between the instant a request for service is received from a user and the instant of final release of all facilities by the user or either of two users. **3.** In communications systems conference calls, the time interval between the instant a request for service is received from one of a group of concurrent users and the instant all but one of the users have released all facilities.

**operation:** **1.** The method, act, process, or effect of using a device or system. **2.** A well-defined action that, when applied to any permissible combination of known entities, produces a new entity, *e.g.*, the process of addition in arithmetic--in adding 5 and 3 to obtain 8, the numbers 5 and 3 are the operands, the number 8 is the result, and the plus sign is the operator indicating that the operation performed is addition. **3.** A program step, usually specified by a part of an instruction word, that is undertaken or executed by a computer. *Note:* Examples of operations include addition, multiplication, extraction, comparison, shift, transfer.

**operational data security:** Protection of data from either accidental or unauthorized intentional modification, destruction, or disclosure during input, processing, storage, transmission, or output operations. [INFOSEC-99]

**operational key:** Key intended for use over-the-air for protection of operational information or for the production or secure electrical transmission of key streams. [INFOSEC-99]

**operational load:** The total power requirements for communications facilities.

**operational service period:** **1.** A period during which a telecommunications service remains in an operational state. *Note:* The operational state must be defined in accordance with specified criteria. **2.** A performance measurement period, or succession of performance measurement periods, during which a telecommunications service remains in an operational service state. *Note:* An operational service period begins at the beginning of the performance measurement period in which the telecommunications service enters the operational service state, and ends at the beginning of the performance measurement period in which the telecommunications service leaves the operational service state.

**operational service state:** During any performance measurement period, a telecommunications service condition that existed when the calculated values of specified performance parameters were equal to or better than their associated outage thresholds.

**operations:** The term denoting the general classifications of services rendered to the public for which separate tariffs are filed, namely exchange, state toll and interstate toll. [47 CFR Pt.36-A]

**operations code:** Code composed largely of words and phrases suitable for general communications use. [INFOSEC-99]

**operations security:** [The] process denying to potential adversaries information about capabilities and/or intentions by identifying, controlling and protecting generally unclassified evidence of the planning and execution of sensitive activities. [NIS]

**operations security (OPSEC):** [The] Process denying information to potential adversaries about capabilities and/or intentions by identifying, controlling, and protecting unclassified generic activities. [INFOSEC-99]

**operations system:** A system that performs operations system functions (OSFs), that is, supports the processing of information related to operations, administration, maintenance, and provisioning for the telecommunications networks. *Note:* An operations system performs surveillance and testing functions to support customer access maintenance. [After T1.210-1989]

**operator service access point (OSAP):** The functional entity that provides access to an operator service from an exchange in the network. The operator service may be co-located with the exchange or located elsewhere. [T1.661-1997]

**operator service provider:** The company accepting the billing information, initiating the validation process, and recording the details of the call. [T1.230-1992]

**operator services:** A set of services including toll and assistance, listing services and intercept, associated with the originating connection network capability. [After T1.661-1997]

**operator system:** A stored program electronic system associated with one or more toll switching systems which provides centralized traffic service position functions for several local offices at one location. [47 CFR Pt.36-A]

**operator trunks:** A general term, ordinarily applied to trunks between manually operated switchboard positions and local dial central offices in the same wire center. [47 CFR Pt.36-A]

**OPSEC:** *Acronym for operations security.*

**optical amplifier:** *See fiber amplifier, optical repeater.*

**optical attenuator:** In optical communications, a device used to reduce the power level of an optical signal. *Note 1:* Optical attenuators used in fiber optic communications systems may use a variety of principles for their functioning. Those using the gap-loss principle are sensitive to the modal distribution ahead of the attenuator, and should be used at or near the transmitting end, or they may introduce less loss than intended. Optical attenuators using absorptive or reflective techniques avoid this problem. *Note 2:* The basic types of optical attenuators are fixed, step-wise variable, and continuously variable.

**optical axis:** **1.** Of a refractive or reflective optical element, the straight line that is coincident with the axis of symmetry of the surfaces. *Note:* The optical axis of a system is often coincident with its mechanical axis, but it need not be, *e.g.*, in the case of an off-axis parabolic reflector used to transmit signals to, or receive signals from, a geosynchronous satellite. **2.** In a lens element, the straight line which passes through the centers of curvature of the lens surfaces. [JP 1-02] **3.** In an optical system, the line formed by the coinciding principal axes of the series of optical elements. [JP 1-02] **4.** In an optical fiber, *synonym fiber axis* [which is the preferred term].

**optical beamsplitter:** *See beamsplitter.*

**optical cable:** *See fiber optic cable.*

**optical cable assembly:** *See cable assembly.*

**optical carrier level 1 (OC-1):** The optical signal that results from an optical conversion of an synchronous transport signal 1 (STS-1 signal). It is this signal that will form the basis of the interface. [T1.105-1988]

**optical cavity:** A region bounded by two or more mirrors that are aligned to provide multiple reflections of lightwaves. *Note:* The resonator in a laser is an optical cavity. *In this sense, synonym resonant cavity.*

**optical character reader (OCR):** A device used for optical character recognition.

**optical character recognition (OCR):** The machine identification of printed characters through use of light-sensitive devices.

**optical conductor:** *Deprecated synonym for optical fiber.*

**optical connector:** A demountable device for attaching a cabled or uncabled optical fiber to another, or to an active device such as a transmitter. *Note 1:* A connector is distinguished by the fact that it may be disconnected and reconnected, as opposed to a splice, which permanently joins two fibers. *Note 2:* Optical connectors are sometimes erroneously referred to as "couplers." Such usage is incorrect and is to be avoided. [After FAA]

**optical coupler:** *See directional coupler, star coupler, T-coupler.*

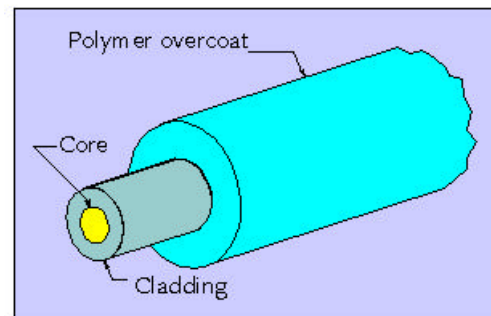
**optical density (OD):** For a given wavelength, an expression of the transmittance of an optical element. *Note 1:* Optical density is expressed by  $\log_{10}(1/T)$  where  $T$  is transmittance. *Note 2:* The higher the optical density, the lower the transmittance. *Note 3:* Optical density times 10 is equal to transmission loss expressed in decibels, *e.g.*, an optical density of 0.3 corresponds to a transmission loss of 3 dB.

**optical detector:** A transducer that generates an output signal when irradiated with optical energy.

**optical disk:** A flat, circular, plastic disk coated with material on which bits may be stored in the form of highly reflective areas and significantly less reflective areas, from which the stored data may be read when illuminated with a narrow-beam source, such as a laser diode. *Note:* The bits are stored sequentially on a continuous spiral track.

**optical dispersion:** *See dispersion.*

**optical fiber:** A filament of transparent dielectric material, usually glass or plastic, and usually circular in cross section, that guides light. *Note 1:* An optical fiber usually has a cylindrical core surrounded by, and in intimate contact with, a cladding of similar geometry. *Note 2:* The refractive index of the core must be slightly higher than that of the cladding for the light to be guided by the fiber. *Synonym lightguide.*



optical fiber

**optical fiber cable:** *See fiber optic cable.*

**optical fiber coating:** *See primary coating.*

**optical fiber, conductive:** *See OFC.*

**optical fiber, conductive, plenum:** *See OFCP.*

**optical fiber, conductive, riser:** *See OFCR.*

**optical fiber jacket:** *See sheath.*

**optical fiber link:** *See fiber optic link.*

**optical fiber, nonconductive:** *See OFN.*

**optical fiber, nonconductive, plenum:** *See OFNP.*

**optical fiber, nonconductive, riser:** *See OFNR.*

**optical fiber nuclear hardening:** Design allowances made to prevent or ameliorate the effects of gamma or high-energy neutron radiation or bombardment, that causes some optical fibers to darken, increase attenuation, or depart from normal operating parameters. *Note:* Light sources, such as LEDs and lasers, and photodetectors, also need to be hardened to prevent similar malfunctions. [From Weik '89]

**optical fiber transfer function:** *See transfer function.*

**optical fiber waveguide:** *See optical fiber.*

**optical filter:** In the optical regime, an element that selectively transmits or blocks a range of wavelengths, polarizations, *etc.*, or selectively displaces a beam, *e.g.*, by virtue of birefringence.

**optical heterodyning:** *See optical mixing.*

**optical interconnection:** In an integrated circuit or electronic module, the use of opto-electronic devices to make or facilitate connections, in lieu of a direct connection involving conducting or semiconducting materials.

**optical interface:** In a fiber optic communications link, a point at which an optical signal is passed from one equipment or medium to another without conversion to an electrical signal.

**optical isolator:** A device that uses a short optical transmission path to accomplish electrical isolation between elements of a circuit. *Note 1:* The optical path may be air or a dielectric waveguide. *Note 2:* The transmitting and receiving elements of an optical isolator may be contained within a single compact module, for mounting, *e.g.*, on a circuit board. *Synonym* **optoisolator**.

**optical junction:** Any physical interface in a fiber optic system. *Note:* Source to fiber, fiber to fiber, fiber to detector, beam to prism (or lens), fiber to lens, lens to fiber, are examples of optical junctions.

**optical line code:** Sequences of optical pulses suitably structured to permit information transfer over an optical link.

**optical line pair: 1.** In optical measurements or specifications, a pair of usually straight contiguous stripes of equal width and having a defined degree of contrast, and which are used as one means of defining or determining resolution. *Note 1:* Resolution may be expressed in terms of line pairs per unit distance, or line pairs per unit angle. *Note 2:* Optical "targets," consisting of many contiguous line pairs, are sometimes used to measure optical resolution. Such targets may have line pairs of high contrast, in which one stripe is "white," or highly reflective, at the wavelength(s) of interest, and the adjacent one, "black," or highly absorbent at the wavelength(s) of interest. Other such targets may have line pairs of lower contrast ("shades of gray"). Resolution may be specified or measured with respect to either or both kinds of target. **2.** In raster-scanned television technology, two adjacent scanning lines (traces).

**optical link:** An optical transmission channel, including any repeaters or regenerative repeaters, designed to connect two electronic or opto-electronic communications terminals. *Note:* An optical link is sometimes held to include the terminal optical transmitters and receivers, especially in the case of a communications link utilizing separate electronic terminals originally designed for metallic transmission, and retrofitted for optical transmission. [After FAA]

**optically active material:** A material that rotates the plane of polarization of light that passes through it.

**optical mixing:** Optical beating, *i.e.*, the mixing, *i.e.*, heterodyning, of two lightwaves (incoming signal and local oscillator) in a nonlinear device to produce a beat frequency low enough to be further processed by conventional electronic circuitry. *Note:* Optical mixing is the optical analog of heterodyne reception of radio signals. [After FAA] *Synonym* **optical heterodyning**.

**optical modulator:** Any device used to modify any characteristic of an optical signal (lightwave) for the purpose of conveying information.

**optical multiplexing:** *See* **wavelength-division multiplexing**.

**optical network unit (ONU):** A network element that is part of a fiber-in-the-loop system interfacing the customer analog access cables and the fiber facilities. [T1.508-1998]

**optical path length: 1.** In a medium of constant refractive index,  $n$ , the product of the geometric distance and the refractive index. **2.** In a medium of varying refractive index, the integral of  $n \delta s$ , where  $\delta s$  is an element of length along the path, and  $n$  is the local refractive index. *Note:* Optical path length is proportional to the phase shift that a lightwave undergoes along a path.

**optical path power penalty:** The extra optical power required to account for degradations due to reflections, intersymbol interference, and mode partition noise. [T1.646-1995]

**optical power:** *See* **radiant power**.

**optical power budget:** In a fiber-optic communication link, the allocation of available optical power (launched into a given fiber by a given source) among various loss-producing mechanisms such as launch coupling loss, fiber attenuation, splice losses, and connector losses, in order to ensure that adequate signal strength (optical power) is available at the receiver. *Note 1:* The optical power budget is usually specified or expressed in dB. *Note 2:* The amount of optical power launched into a given fiber by a given transmitter depends on the nature of its active optical source (LED or laser diode) and the type of fiber, including such parameters as core diameter and numerical aperture. Manufacturers sometimes specify an optical power budget only for a fiber that is optimum for their equipment--or specify only that their equipment will operate over a given distance, without mentioning the fiber characteristics. The user must first ascertain, from the manufacturer or by testing, (a) the transmission losses for the type of fiber to be used, (b) the required signal strength for a given level of performance. *Note 3:* In addition to transmission loss, including those of any splices and connectors, allowance should be made for at least several dB of optical power margin losses, to compensate for component aging and to allow for future splices in the event of a severed cable.

**optical power margin:** In an optical communications link, the difference between (a) the optical power that is launched by a given transmitter into the fiber, less transmission losses from all causes, and (b) the minimum optical power that is required by the receiver for a specified level of performance. *Note 1:* The optical power margin is usually expressed in dB. At least several dB of optical power margin should be included in the optical power budget. *Note 2:* The amount of optical power launched into a given fiber by a given transmitter depends on the nature of its active optical source (LED or laser diode) and the type of fiber, including such parameters as core diameter and numerical aperture.

**optical receiver:** A device that detects an optical signal, converts it to an electrical signal, and processes the electrical signal as required for further use.

**optical regenerator:** *See* **optical repeater**.

**optical repeater:** In an optical communication system, an optoelectronic device or module that receives an optical signal, amplifies it (or, in the case of a digital signal, reshapes, retimes, or otherwise reconstructs it), and retransmits it as an optical signal.

**optical return loss (ORL):** The ratio (in dB) of optical power arriving at the interface (P1) to the optical power reflected back from the same interface (P2). [T1.106-1988]

**optical section:** The part of the physical plant consisting of the fiber-optic cabling and connectors interconnected to provide the transport function between two adjacent repeater locations, between a repeater location and an adjacent terminal location, or between two adjacent terminal locations. The optical section extends between the point on the optical fiber just after the transmitter optical connector and the point on the optical fiber just before the receiver optical connector. [T1.106-1988]

**optical source: 1.** In optical communications, a device that converts an electrical signal into an optical signal. *Note:* The two most commonly used optical sources are light-emitting diodes (LEDs) and laser diodes. **2.** Test equipment that generates a stable optical signal for the purpose of making optical transmission loss measurements. [After FAA]

**optical spectrum:** By custom and practice, the electromagnetic spectrum between the wavelengths of the vacuum ultraviolet at 0.001  $\mu\text{m}$  and the far infrared at 100  $\mu\text{m}$ . *Note:* The term "optical spectrum" originally applied only to that region of the electromagnetic spectrum visible to the normal human eye, but is now considered to include all wavelengths between the shortest wavelengths of radio and the longest of x-rays. At this writing, no formal spectral limits are recognized nationally or internationally.

**optical splitter:** *See* **directional coupler**.

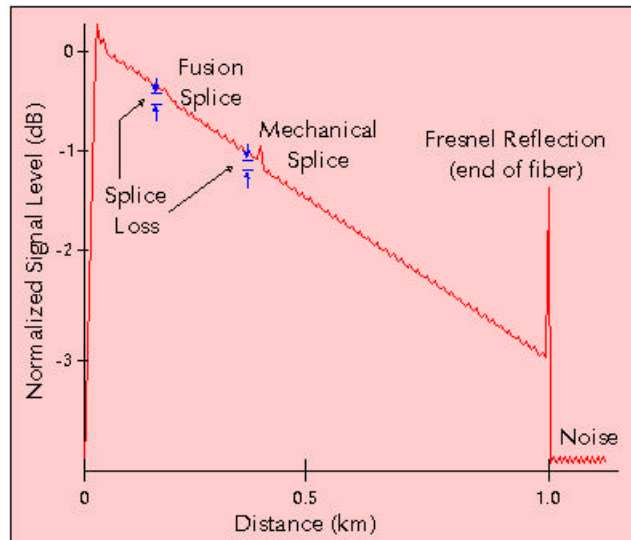
**optical switch:** A switch that enables signals in optical fibers or integrated optical circuits (IOCs) to be selectively switched from one circuit to another. *Note 1:* An optical switch

may operate by (a) mechanical means such as physically shifting an optical fiber to drive one or more alternative fibers, or (b) electro-optic effects, magneto-optic effects, or other methods. *Note 2:* Slow optical switches, such as those using moving fibers, may be used for alternate routing of an optical transmission path, e.g., routing around a fault. Fast optical switches, such as those using electro-optic or magneto-optic effects, may be used to perform logic operations.

**optical system power margin:** *See power margin.*

**optical thickness:** **1.** The product of the physical thickness of an isotropic optical element and its refractive index. **2.** Of an optical system, the total optical path length through all elements.

**optical time domain reflectometer (OTDR):** An opto-electronic instrument used to characterize an optical fiber. *Note 1:* An OTDR injects a series of optical pulses into the fiber under test. It also extracts, from the same end of the fiber, light that is scattered back and reflected back. The intensity of the return pulses is measured and integrated as a function of time, and is plotted as a function of fiber length. *Note 2:* An OTDR may be used for estimating the fiber's length and overall attenuation, including splice and mated-connector losses. It may also be used to locate faults, such as breaks.



representative OTDR trace

**optical transmittance:** *See transmittance.*

**optical transmitter:** A device that accepts an electrical signal as its input, processes this signal, and uses it to modulate an opto-electronic device, such as an LED or an injection laser diode, to produce an optical signal capable of being transmitted via an optical transmission medium.

**optical waveguide:** Any structure having the ability to guide optical energy. *Note:* Optical waveguides may be (a) thin-film deposits used in integrated optical circuits (IOCs) or (b) optical fibers.

**optimum traffic frequency:** *Synonym FOT.*

**optimum transmission frequency:** *Synonym FOT.*

**optimum working frequency:** *Synonym FOT.*

**optoelectronic:** *See opto-electronic.*

**opto-electronic:** Pertaining to any device that functions as an electrical-to-optical or optical-to-electrical transducer, or an instrument that uses such a device in its operation. *Note 1:* Photodiodes, LEDs, injection laser diodes, and integrated optical circuit (IOC) elements are examples of opto-electronic devices commonly used in optical fiber communications. *Note 2:* "Electro-optical" is often erroneously used as a synonym.

**optoisolator:** *Synonym optical isolator.*

**OPX:** *Abbreviation for off-premises extension.*

**orbit:** The path, relative to a specified frame of reference, described by the center of mass of a satellite or other object in space subjected primarily to natural forces, mainly the force of gravity. [NTIA] [RR]

**orbit determination:** The process of describing the past, present, or predicted position of a satellite in terms of orbital parameters. [JP 1-02]

**order of diversity:** The number of independently fading propagation paths or frequencies, or both, used in diversity reception.

**orderwire circuit:** A voice or data circuit used by technical control and maintenance personnel for coordination and control actions relative to activation, deactivation, change, rerouting, reporting, and maintenance of communication systems and services. *Synonyms engineering channel, engineering orderwire, service channel.*

**orderwire multiplex:** A multiplex carrier set specifically designed for the purpose of carrying orderwire traffic, as opposed to one designed for carrying mission traffic.

**ordinary ray:** *See birefringence.*

**organizer:** *See splice organizer.*

**originating connection:** The connection between the termination of a user-network interface and an operator service access point that is used for communication between the user and the operator service. [T1.661-1997]

**originating endpoint:** In a wideband packet node, the point that receives channelized traffic, packetizes it, and sends it into the wideband packet network. [T1.509-1995]

**originating line information (OLI):** Information indicating a toll class of service for the call. [T1.667-1999]

**originating line-side access:** The ability to dial the appropriate 7- or 10-digit test number from a subscriber line. [T1.207-2000]

**originating point code (OPC):** A part of the routing label in a signaling message that uniquely identifies the originating point of that signaling message in a signaling network. [T1.226-1992]

**originating trunk-side access:** The ability to dial the appropriate test line number with trunk access using the appropriate test equipment. [T1.207-2000]

**originating user:** The user that initiates a particular information transfer transaction. *Note:* The originating user may be either the source user or the destination user.

**origination network:** The signaling network that initiates a non-circuit-related message containing intermediate signaling network indication (ISNI) information; this network may send subsequent messages based on the received ISNI information. [T1.118-1992]

**originator:** *See* access originator, disengagement originator.

**originator-to-recipient speed of service:** *Synonym* speed of service.

**orthogonal multiplex:** A method of combining two or more digital signals that have mutually independent pulses, thus avoiding intersymbol interference.

**orthogonal sampling:** In digital video, a sampling where the luminance and the color-difference samples are generated from pixels arranged in common, continuous vertical and horizontal lines on a rectilinear grid that remains constant field/frame to field/frame. [After SMPTE]

**orthomode transducer:** A device forming part of an antenna feed and serving to combine or separate orthogonally polarized signals.

**oscillator:** An electronic circuit designed to produce an ideally stable alternating voltage or current.

**OSI:** *Abbreviation for Open Systems Interconnection.*

**OSI--RM:** *Abbreviation for Open Systems Interconnection--Reference Model.*

**OTAR:** *Abbreviation for over-the-air rekeying.*

**OTDR:** *Abbreviation for optical time domain reflectometer.*

**other common carrier (OCC):** A communications common carrier--usually an interexchange carrier--that offers communications services in competition with AT&T and/or the established U.S. telephone local exchange carriers.

**outage:** A telecommunications system service condition in which a user is completely deprived of service by the system. *Note:* For a particular system or a given situation, an outage may be a service condition that is below a defined system operational threshold, *i.e.*, below a threshold of acceptable performance. *See* outage threshold.

**outage duration:** That period of time between the onset of an outage and the restoration of service.

**outage probability:** The probability that an outage will occur within a specified time period.

**outage ratio:** The sum of all the outage durations divided by the time period of measurement.

**outage state:** *See* outage.

**outage threshold:** For a supported performance parameter of a system, the value that establishes the minimum performance level at which the system is considered to remain in an operational state. *Note:* A measured parameter value better than the outage threshold indicates that the system is in a system operational state.

**out call:** A universal personal telecommunications (UPT) call type that permits a UPT user to make calls from any terminal on any network, and have access to his/her subscribed services limited only by the serving and/or assisting network's capabilities. [T1.Rpt 41-1995]

**out-call registration:** A feature that enables the universal personal telecommunications (UPT) user to register for outgoing calls from the current terminal address to allow outgoing calls to be made from that terminal address. When registered, upon accessing the UPT facilities, all outgoing UPT calls can be made from that terminal address for the duration specified by the UPT user (duration may also be specified in terms of number of outgoing UPT calls), or until a specified de-registration time. Outgoing UPT calls will be charged to the UPT subscriber. Normally, the UPT user will not have to carry out any further authentication procedures in order to make outgoing calls. However, optionally, a simplified authentication procedure may be used. A UPT user may register for outgoing calls to several terminal addresses simultaneously, but at any time only one UPT user/number may be registered for outgoing calls at the same terminal address. The UPT user may also explicitly de-register outgoing calls. [T1.701-1994]

**outgoing access:** The ability of a user to originate data calls via an ISDN. [T1.615-1992]

**out-of-area:** An area not included in the subscribed service. An area may be defined in terms of a state/province, NPA, LATA, *etc.* [T1.207-1998]

**out-of-band emission:** Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emission. [NTIA] [RR]

**out-of-band notification:** In encryption, notification using a communication means other than the primary communication means. [After X9.49]

**out-of-band signaling:** **1.** Signaling that uses a portion of the channel bandwidth provided by the transmission medium, *e.g.*, the carrier channel, which portion is above the highest frequency used by, and is denied to, the speech or intelligence path by filters. *Note:* Out-of-band signaling results in a lowered high-frequency cutoff of the effective available bandwidth. **2.** Signaling via a different channel (either FDM or TDM) from that used for the primary information transfer.

**out-of-frame-alignment time:** The time during which frame alignment is effectively lost. *Note:* The out-of-frame-alignment time includes the time to detect loss of frame alignment and the alignment recovery time.

**outpulsing:** The process of transmitting address information over a trunk from one switching center or switchboard to another.

**output:** **1.** Information retrieved from a functional unit or from a network, usually after some processing. **2.** An output state, or sequence of states. **3.** Pertaining to a device, process, or channel involved in the production of data by a computer or by any of its components.



**output angle:** *Synonym radiation angle.*

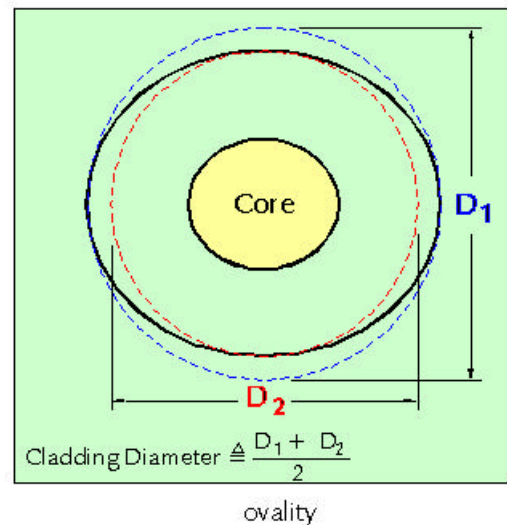
**output rating:** **1.** The expression of the stated power available at the output terminals of a transmitter when connected to the normal load or its equivalent. **2.** Under specified ambient conditions, the expression of the power that can be delivered by a device over a long period of time without overheating.

**outside plant:** **1.** In telephony, all cables, conduits, ducts, poles, towers, repeaters, repeater huts, and other equipment located between a demarcation point in a switching facility and a demarcation point in another switching facility or customer premises. *Note:* The demarcation point may be at a distribution frame, cable head, or microwave transmitter. **2.** In DOD communications, the portion of intrabase communications equipment between the main distribution frame (MDF) and a user end instrument or the terminal connection for a user instrument.

**out-slot signaling:** Signaling performed in digital time slots that are not within the channel time slot.

**outward dialing:** *See direct outward dialing.*

**ovality:** **1.** The attribute of an optical fiber, the cross section of the core or cladding of which deviates from a perfect circle. **2.** In an optical fiber, the degree of deviation, from perfect circularity, of the cross section of the core or cladding. *Note 1:* The cross sections of the core and cladding are assumed to first approximation to be elliptical. Quantitatively, the ovality of either the core or cladding is expressed as  $2(a-b)/(a+b)$ , where  $a$  is the length of the major axis and  $b$  is the length of the minor axis. The dimensionless quantity so obtained may be multiplied by 100 to express ovality as a percentage. *Note 2:* Alternatively, ovality of the core or cladding may be expressed or specified by a tolerance field consisting of two concentric circles, within which the cross section boundaries must lie. *Synonym noncircularity.*



**overflow:** **1.** The condition that prevails when the numerical aperture of an optical source, such as a laser, light-emitting diode, or optical fiber, exceeds that of the driven element, *e.g.*, optical fiber core. **2.** The condition that prevails when the beam diameter of an optical source, such as a laser, light-emitting diode, or optical fiber, exceeds that of the driven element, *e.g.*, optical fiber core. *Note:* In optical communications testing, overflow in both numerical aperture and mean diameter (core diameter or spot size) is usually required.

**overflow:** **1.** In telephony, the generation of potential traffic that exceeds the capacity of a communications system or subsystem. **2.** In telephony, a count of telephone call attempts made on groups of busy trunks or access lines. **3.** In telephony, traffic handled by overflow equipment. **4.** In telephony, traffic that exceeds the capacity of the switching equipment and is therefore lost. **5.** In telephony, on a particular route, excess traffic that is offered to another route, *i.e.*, an alternate route. **6.** In digital computing, *synonym for arithmetic overflow*. **7.** In digital communications, the condition that exists when the incoming data rate exceeds that which can be accommodated by a buffer, resulting in the loss of information.

**overhead bit:** Any bit other than a user information bit.

**overhead communications:** *See overhead bit.*

**overhead information:** Digital information transferred across the functional interface between a user and a telecommunications system, or between functional units within a telecommunications system, for the purpose of directing or controlling the transfer of user information or the detection and correction of errors. *Note:* Overhead information originated by the user is not considered to be system overhead information. Overhead information generated within the communications system and not delivered to the user is system overhead information. Thus, the user throughput is reduced by both overheads while system throughput is reduced only by system overhead.

**overlap pulsing:** An arrangement for exchange-carrier-to-interexchange carrier (EC-to-IC) outpulsing that allows seizure of the EC-to-IC trunk and initiation of outpulsing prior to completion of dialing by the calling customer. [T1.104-1988]

**overlay:** **1.** One of several segments of a computer program that, during execution, occupies the same area of main storage, one segment at a time. **2.** To use repeatedly the same areas of internal storage during different stages of the execution of a program.

**overlay cell:** A larger cell that physically overlays one or more smaller cells. For example, intra-building cells may be encompassed by a larger campus cell. [T1.244-1995]

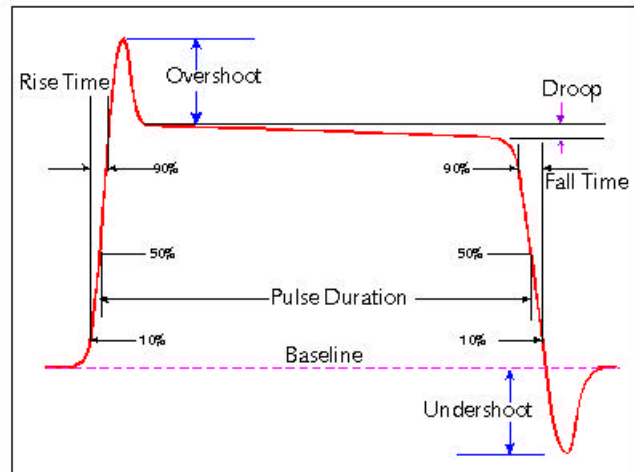
**overload:** A load, placed on a device or facility, that is greater than the device or facility is capable of handling, *i.e.*, capable of performing the functions for which it was designed. *Note:* Examples of overloads are (a) traffic on a communications system greater than the traffic capacity of the system, (b) for analog inputs, voltage levels above which an analog-to-digital converter cannot distinguish a change, and (c) in electrical circuits, an electrical current that will result in damage from overheating. [From Weik '89]

**overload point:** *Synonym load capacity.*

**overmodulation:** **1.** The condition that prevails when the instantaneous level of the modulating signal exceeds the value necessary to produce 100% modulation of the carrier. *Note 1:* Overmodulation results in spurious emissions by the modulated carrier, and distortion of the recovered modulating signal. *Note 2:* Overmodulation in the sense of this definition is almost always considered a fault condition. **2.** The condition that prevails when the mean level of the modulating signal is such that peaks in the modulating signal exceed the value necessary to produce 100% modulation of the carrier. *Note:* Overmodulation in the sense of this definition, if not excessive, is sometimes considered permissible.

**override: 1.** To preempt, manually or automatically, a prescribed procedure. *Note:* For example, one might manually override a prescribed course of action programmed to occur in the event of a fault. **2.** In telephony, the entering of or seizure of, a busy circuit, *i.e.*, an occupied circuit, by a party other than those using the circuit. *Note:* For example, an attendant might override a circuit after a busy verification, or a user with a higher precedence level might override a circuit.

**overshoot: 1.** In the transition of any parameter from one value to another, the transitory value of the parameter that exceeds the final value. *Note:* Overshoot occurs when the transition is from a lower value to a higher value. When the transition is from a higher value to a lower value, and the parameter takes a transitory value that is lower than the final value, the phenomenon is called *undershoot*. **2.** The increased amplitude of a portion of a nonsinusoidal waveform, *i.e.*, signal, at the output of a nonlinear circuit, *e.g.*, a realizable amplifier, caused by the characteristics of the circuit. *Note 1:* Overshoot causes distortion of the signal. *Note 2:* Overshoot may result from circuit design parameters that are intended to decrease the response time of the circuit. *Note 3:* The amount of overshoot in a given circuit is designed to minimize response time while maintaining distortion of the signal within acceptable limits. The absence or presence of overshoot, and if present, its magnitude, is a function of a circuit design parameter called *damping*. **3.** The result of an unusual atmospheric, *e.g.*, ionospheric, condition that causes microwave signals to be received where they are not intended.



representative pulse waveform

**overt channel:** [A] Communications path within a computer system or network designed for the authorized transfer of data. [INFOSEC-99]

**over-the-air key distribution:** Providing electronic key via over-the-air rekeying, over-the-air key transfer, or cooperative key generation. [INFOSEC-99]

**over-the-air key transfer:** Electronically distributing key without changing traffic encryption key used on the secured communications path over which the transfer is accomplished. [INFOSEC-99]

**over-the-air rekeying (OTAR):** Changing traffic encryption key or transmission security key in remote crypto -equipment by sending new key directly to the remote crypto-equipment over the communication path it secures. [INFOSEC-99]

**over-the-horizon radar:** A radar system that makes use of the atmospheric reflection and refraction phenomena to extend its range of detection beyond line of sight. Over-the-horizon radars may be either forward scatter or backscatter systems. [JP 1-02]

**overtone:** Of a sinusoidal wave, an integral multiple of the frequency, *i.e.*, the fundamental, of the wave, other than the fundamental itself. *Note 1:* The first overtone is twice the frequency of the fundamental, and thus corresponds to the second harmonic; the second overtone is three times the frequency of the fundamental, and thus corresponds to the third harmonic, *etc.* *Note 2:* Use of the term *overtone* is generally confined to acoustic waves, especially in applications related to music.

**overwrite procedure:** [The] Process of writing patterns of data on top of the data stored on a magnetic medium. [INFOSEC-99]

**PABX:** *Abbreviation for private automatic branch exchange. See PBX. Note:* Use of the term "PBX" is more common than "PABX," regardless of automation.

**packet:** In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. *Note:* The data, control signals, and possibly error control information, are arranged in a specific format.

**packet assembler/disassembler (PAD):** A functional unit that enables data terminal equipment (DTE) not equipped for packet switching to access a packet-switched network.

**packet entry event:** A packet layer reference event that corresponds to a packet entering a network section (from a circuit section) or a packet entering a DTE (from an access circuit section). [T1.504-1989]

**packet exit event:** A packet layer reference event that corresponds to a packet exiting a network section (to a circuit section) or a packet exiting a DTE (to an access circuit section). [T1.504-1989]

**packet filter:** A type of firewall in which each packet is examined and either allowed to pass through or is rejected, based on local security policy. [INFOSEC-99]

**packet format:** The structure of data, address, and control information in a packet. *Note:* The size and content of the various fields in a packet are defined by a set of rules that are used to assemble the packet.

**packet header:** A header consisting of octets 4 to 8 (inclusive) of the frame (flags excluded from the octet numbers). [After T1.509-1995]

**packet Internet proper:** *See ping.*

**packetization interval:** Defines the duration of the sampled speech of the access channel that has been collected, coded, and packetized. The packetization interval for voice is 16 ms. [T1.312-1991]

**packet layer reference event:** The event that occurs when a packet crossing a section boundary changes the state of the packet layer interface. [T1.504-1989]

**packet mode:** A mode of operating a communications network in which packet switching is used rather than message switching. [From Weik '89]

**packet-mode terminal:** Data terminal equipment (DTE) that can control, format, transmit, and receive packets.

**packet sniffer:** **1.** A dedicated device designed for the purpose of monitoring network traffic in order to recognize and decode certain packets of interest. **2.** A software package that enables a general-purpose computer to recognize and decode certain packets of interest. [After 2382-pt.35] *Note:* The packet sniffer is normally used by system administrators for network management and diagnostics, but is occasionally used by hackers for illicit purposes such as stealing a user's password or credit-card number. [2382-pt.35] **3.** In *INFOSEC*, *synonym sniffer*.

**packet stream:** A collection of logical links multiplexed together onto one physical channel between two endpoints of the wideband packet network. [T1.509-1995]

**packet-switched data transmission service:** A service that (a) provides for the transmission of data in the form of packets, (b) switches data at the packet level, and (c) may provide for the assembly and disassembly of data packets.

**packet switching:** The process of routing and transferring data by means of addressed packets so that a channel is occupied during the transmission of the packet only, and upon completion of the transmission the channel is made available for the transfer of other traffic.

**packet-switching network:** A switched network that transmits data in the form of packets.

**packet-switching node:** In a packet-switching network, a node that contains data switches and equipment for controlling, formatting, transmitting, routing, and receiving data packets. *Note:* In the Defense Data Network (DDN), a packet-switching node is usually configured to support up to thirty-two X.25 56-kb/s host connections, as many as six 56-kb/s interswitch trunk (IST) lines to other packet-switching nodes, and at least one Terminal Access Controller (TAC).

**packet transfer mode:** A method of information transfer, by means of packet transmission and packet switching, that permits dynamic sharing of network resources among many connections.

**pad:** A network, of fixed resistors, that attenuates signals by a fixed amount with negligible distortion. *Note:* The resistive network is called an *attenuator* if the resistance is adjustable.

**PAD:** *Acronym for packet assembler/disassembler.*

**padding:** **1.** In cryptography, a bit or a string of bits appended to a message either for filtering purposes or to cause the message to contain an even multiple of the number of bits required by the cryptographic algorithm. [After X9.23] **2.** One or more bits appended to a message in order to cause the message to contain the required number of bits or bytes. [T1.707-1998]

**padlocking:** The use of special techniques to protect data or software against unauthorized copying. [2382-pt.8]

**pager:** A small radio receiver designed to be carried by a person and to give an aural, visual, or tactile indication when activated by the reception of a radio signal containing its specific code. It may also reproduce sounds and/or display messages that were also transmitted. Some pagers also transmit a radio signal acknowledging that a message has been received. [47CFR] *Synonym [loosely] beeper.*

**paging:** A one-way communications service from a base station to mobile or fixed receivers that provide signaling or information transfer by such means as tone, tone-voice, tactile, optical readout, etc. [47CFR]

**paging and radiotelephone service:** See *PARS*.

**paging receiver:** See *pager*.

**paired cable:** A cable made up of one or more separately insulated twisted-wire pairs, none of which is arranged with another to form quads.

**paired disparity code:** A code in which some or all of the characters are represented by two sets of digits of opposite disparity that are used in sequence so as to minimize the total disparity of a longer sequence of digits. *Note 1:* An alternate mark inversion signal is an implementation of a paired disparity code. *Note 2:* The digits may be represented by disparate physical quantities, such as two different frequencies, phases, voltage levels, magnetic polarities, or electrical polarities, each one of the pair representing a 0 or a 1.

**pair-gain system:** A transmission system that uses concentrators or multiplexers so that fewer wire pairs may be used than would otherwise be required to provide service to a given number of subscribers.

**PAL:** *Acronym for phase alternation by line.* A television signal standard (625 lines, 50 Hz, 220 V primary power) used in the United Kingdom, much of the rest of western Europe, several South American countries, some Middle East and Asian countries, several African countries, Australia, New Zealand, and other Pacific island countries.

**PAL-M:** A modified version of the phase-alternation-by-line (PAL) television signal standard (525 lines, 50 Hz, 220 V primary power), used in Brazil.

**palm computer:** See *palm-top*.

**palm-top:** A small (pocket-size), hand-held computer, often including network-access software, personal-schedule software, and a basic word processor.

**PAM:** *Abbreviation for pulse-amplitude modulation.*

**PAMA:** *Abbreviation for pulse-address multiple access.*

**panning:** **1.** On the viewing screen of a display device, e.g., a computer monitor, horizontal shifting of the entire displayed image. *Note:* The panning direction is at a right angle with respect to the scrolling direction. **2.** In video technology, the use of a camera to scan a subject horizontally. **3.** In antenna systems, successively changing the azimuth of a beam of radio-frequency energy over the elements of a given horizontal region, or the corresponding process in reception.

**p / a r:** *Abbreviation for peak-to-average ratio.*

**parabolic antenna:** An antenna consisting of a parabolic reflector and a radiating or receiving element at or near its focus. *Note:* If the reflector is in the shape of a paraboloid of revolution, it is called a paraboloidal reflector; cylindrical paraboloids and off-axis paraboloids of revolution are also used.

**parabolic profile:** In an optical fiber, a power-law index profile with the profile parameter,  $g$ , equal to 2. *Synonym quadratic profile.*

**parallel computer:** A computer that has multiple arithmetic units or logic units that are used to accomplish parallel operations or parallel processing.

**parallel port:** A port through which two or more data bits are passed simultaneously, such as all the bits of an 8-bit byte, and that requires as many input channels as the number of bits that are to be handled simultaneously. [From Weik '89]

**parallel processing:** Pertaining to the concurrent or simultaneous execution of two or more processes in a single unit.

**parallel-to-serial conversion:** Conversion of a stream of multiple data elements, received simultaneously, into a stream of data elements transmitted in time sequence, *i.e.*, one at a time.

**parallel transmission:** **1.** The simultaneous transmission of the signal elements of a character or other data item. **2.** In digital communications, the simultaneous transmission of related signal elements over two or more separate paths. *Note:* Protocols for parallel transmission, such as those used for computer ports, have been standardized by ANSI.

**parametric amplifier (paramp):** An amplifier that (a) has a very low noise level, (b) has a main oscillator that is tuned to the received frequency, (c) has another pumping oscillator of a different frequency that periodically varies the parameters, *i.e.*, the capacitance or inductance, of the main oscillator circuit, and (d) enables amplification of the applied signal by making use of the energy from the pumping action. *Note:* Paramps with a variable-capacitance main-oscillator semiconductor diode are used in radar tracking and communications Earth stations, Earth satellite stations, and deep-space stations. The noise temperature of paramps cooled to the temperature of liquid helium, about 5 K, is in the range of 20 to 30 K. Paramp gains are about 40 dB. [From Weik '89]

**parasitic element:** Of an antenna, a directive element that is not connected to a radio transmitter or receiver either directly or via a feeder, but is coupled to the driven element only by the fields. *Synonym* passive element.

**parasitic emission:** In a communications system in which one or more electromagnetic sources are used, electromagnetic radiation--such as lightwaves, radio waves, microwaves, X-rays, or gamma rays from one or more of the sources--that is not harmonically related, *i.e.*, is not coherent, with the transmitted carrier. *Note:* Parasitic emissions are usually caused by undesired oscillations or energy-level transitions in the sources. [From Weik '89]

**paraxial ray:** In optical systems, a ray that is close to and nearly parallel with the optical axis.

**parity:** **1.** In binary-coded data, a condition that is maintained such that, in any permissible coded expression, the total number of 1s, or 0s, is always odd or always even. *Note 1:* Parity is used in error-detecting and error-correcting codes. *Note 2:* For example, in the ASCII code or in the International Telegraph Alphabet 5 (ITA-5) code as usually implemented, 7 bits are used to represent each character and 1 bit is used as a parity check bit. **2.** Bit(s) used to determine whether a block of data has been altered. [INFOSEC-99]

**parity bit:** An extra bit that can be added to a group of "0" bits and "1" bits to make the parity of the group odd or even. *Note:* The parity bit is discarded when the message is received. [After X9.19]

**parity check:** A test that determines whether the number of ones or zeros in an array of binary digits is odd or even. *Note:* Odd parity is standard for synchronous transmission and even parity for asynchronous transmission. *Synonym* odd-even check.

**parking party:** Representative of the served user who parks a call via "call park."

**par meter:** *Abbreviation for peak-to-average ratio meter.* A meter used to measure, calculate, and display the ratio of the peak power level to the time-averaged power level in a circuit, *i.e.*, the peak-to-average ratio (*p/a r*). *Note 1:* A par meter is used as a quick means to identify degraded telephone channels. *Note 2:* A par meter is very sensitive to envelope delay distortion. The par meter may also be used for idle channel noise, nonlinear distortion, and amplitude-distortion measurements. *Note 3:* The peak-to-average ratio can be determined for many signal parameters, such as voltage, current, power, frequency, and phase.

**PARS:** *Abbreviation for paging and radiotelephone service.* A radio service in which common carriers are authorized to offer and provide paging and radiotelephone service to the general public. This service was formerly titled Public Land Mobile Service. [47CFR 22.99]

**partial-dial condition:** A condition in which outpulsing has commenced, insufficient information has been received by the customer installation (CI) to process the call and no further outpulsing has been received from the network within a timed interval. [T1.405-1989]

**partitioned security mode:** [An] information-system (IS) security mode of operation wherein all personnel have the clearance, but not necessarily formal access approval and need-to-know, for all information handled by an IS. [INFOSEC-99]

**part 68:** The section of Title 47 of the *Code of Federal Regulations* governing (a) the direct connection of telecommunications equipment and customer premises wiring with the public switched telephone network and certain private line services, such as (1) foreign exchange lines at the customer premises end, (2) the station end of off-premises stations associated with PBX and Centrex® services, (3) trunk-to-station tie lines at the trunk end only, and (4) switched service network station lines, *i.e.*, common control switching arrangements; and (b) the direct connection of (1) all PBX and similar systems to private line services for tie trunk type interfaces, (2) off-premises station lines, and (3) automatic identified outward dialing and message registration. *Note:* Part 68 rules provide the technical and procedural standards under which direct electrical connection of customer-provided telephone equipment, systems, and protective apparatus may be made to the nationwide network without causing harm and without a requirement for protective circuit arrangements in the service-provider networks.

**party ID:** **1.** The served user's (or controller's) reference to a particular party within the context of a call. *Note 1:* Multiple parties may be associated with a given call, *e.g.*, a conference call. Moreover, there may be multiple connections associated with a single party, *e.g.*, a simultaneous voice and video call. *Note 2:* This service description assumes that there exists only one connection to a given party. **2.** In a teleconference, any participant. [T1.647-1995]

**party line:** In telephone systems, an arrangement in which two or more user end instruments, usually telephones, are connected to the same loop. *Note:* If selective ringing is not used, individual users may be alerted by different ringing signals, such as a different number of rings or a different combination of long and short rings. Party lines remain primarily in rural areas where loops are long. Privacy is limited and congestion often occurs. *Synonym* multiparty line.

**passband:** The portion of spectrum, between limiting frequencies (or, in the optical regime, limiting wavelengths), that is transmitted with minimum relative loss or maximum relative gain. *Note 1:* The limiting frequencies are defined as those at which the relative intensity or power decreases to a specified fraction of the maximum intensity or power. This decrease in power is often specified to be the half-power points, *i.e.*, 3 dB below the maximum power. *Note 2:* The difference between the limiting frequencies is called the bandwidth, and is expressed in hertz (in the optical regime, in nanometers or micrometers).

**passive device:** A device that does not require a source of energy for its operation. *Note:* Examples of passive devices are electrical resistors, electrical capacitors, diodes, optical fibers, cables, wires, glass lenses, and filters.

**passive element:** *Synonym* parasitic element.

**passive satellite:** **1.** In a satellite communications system, a satellite that only reflects signals from one Earth station to another, or from several Earth stations to several others. *Note:* Although the satellite acts passively by reflecting signals, it may contain active devices for station keeping. **2.** An Earth satellite intended to transmit radio communication signals by reflection. [47CFR]

**passive sensor:** A measuring instrument in the Earth exploration-satellite service or in the space research service by means of which information is obtained by reception of radio waves of natural origin. [NTIA] [RR]

**passive star:** *See* star coupler.

**passive station:** On a multipoint connection or a point-to-point connection using basic mode link control, any tributary station waiting to be polled or selected.

**passive threat:** Of a data or information processing system, a threat of disclosure of information without changing the state of the system. *Note:* An example of a passive threat is one that could result in the recovery of sensitive information through the unauthorized interception of a data transmission. [After 2382-pt.8]

**passphrase:** [A] sequence of characters, longer than the acceptable length of a password, that is transformed by a password system into a virtual password of acceptable length. [INFOSEC-99]

**password:** **1.** [A] Protected/private alphanumeric string used to authenticate an identity or to authorize access to data. [INFOSEC-99] **2.** In data communications, a word, character, or combination thereof, that permits access to otherwise inaccessible data, information, or facilities.

**password history:** With respect to a given information system (IS) asset, a log of expired passwords, used primarily for automatic comparison with proposed new passwords. A password history is used to ensure that proposed new passwords were not used in the recent past, if ever, in connection with the IS asset in question. A password history may be limited to only a prescribed number of expired passwords (the usual case) with any overflow (*i.e.*, the earliest) being discarded as new ones are added; or it may retain expired passwords only for a prescribed period of time; or both. A password history represents a tool that may be used to ensure that passwords are not repeated within a period of time that is deemed consistent with the sensitivity of the protected information system asset.

**password length equation:** An equation that determines an appropriate password length,  $M$ , which provides an acceptable probability,  $P$ , that a password will be guessed in its lifetime. *Note:* The password length is given by  $M = (\log S)/(\log N)$  where  $S$  is the size of the password space and  $N$  is the number of characters available. The password space is given by  $S = LR/P$ , where  $L$  is the maximum lifetime of a password and  $R$  is the number of guesses per unit of time.

**password length parameter:** A basic parameter affecting the password length needed to provide a given degree of security. *Note 1:* Password length parameters are related by the expression  $P = LR/S$ , where  $P$  is the probability that a password can be guessed in its lifetime,  $L$  is the maximum lifetime a password can be used to log in to a system,  $R$  is the number of guesses per unit of time, and  $S$  is the number of unique algorithm-generated passwords (the password space). *Note 2:* The degree of password security is determined by the probability that a password can be guessed in its lifetime.

**patch:** **1.** To connect circuits together temporarily. *Note:* In communications, patches may be made by means of a cord, *i.e.*, a cable, known as a "patch cord." In automated systems, patches may be made electronically. **2.** In a computer program, one or more statements inserted to circumvent a problem or to alter temporarily or permanently a usually limited aspect or characteristic of the functioning of the program, *e.g.*, to customize the program for a particular application or environment.

**patch and test facility (PTF):** A facility in which supporting functions, such as (a) quality control checking and testing of equipment, links, and circuits, (b) troubleshooting, (c) activating, changing, and deactivating of circuits, and (d) technical coordinating and reporting, are performed.

**patch bay:** An assembly of hardware so arranged that a number of circuits, usually of the same or similar type, appear on jacks for monitoring, interconnecting, and testing purposes. *Note 1:* Patch bays are used at many locations, such as technical control facilities, patch and test facilities, and at telephone exchanges. *Note 2:* Patch bays facilitate flexibility in the use, routing or restoration of a variety of circuit types, such as dc, VF, group, coaxial, equal-level, and digital data circuits.

**patch panel:** One segment of a patch bay.

**path:** **1.** In communications systems and network topologies, a route between any two points. [From Weik '89] **2.** In radio communications, the route that (a) lies between a transmitter and a receiver and (b) may consist of two or more concatenated links. *Note:* Examples of paths are line-of-sight paths and ionospheric paths. **3.** In a computer program, the logical sequence of instructions executed by a computer. **4.** In database management systems, a series of physical or logical connections between records or segments, usually requiring the use of pointers.

**path attenuation:** *Synonym path loss.*

**path clearance:** In microwave line-of-sight communications, the perpendicular distance from the radio-beam axis to obstructions such as trees, buildings, or terrain. *Note:* The required path clearance is usually expressed, for a particular  $k$ -factor, as some fraction of the first Fresnel zone radius.

**path intermodulation noise:** *See intermodulation noise.*

**path loss:** In a communication system, the attenuation undergone by an electromagnetic wave in transit between a transmitter and a receiver. *Note 1:* Path loss may be due to many effects such as free-space loss, refraction, reflection, aperture-medium coupling loss, and absorption. *Note 2:* Path loss is usually expressed in dB. *Synonym path attenuation.*

**path overhead (POH):** Overhead assigned to and transported with the payload until the payload is demultiplexed. It is used for functions that are necessary to transport the payload. [T1.105-1988]

**path profile:** A graphic representation of the physical features of a propagation path in the vertical plane containing both endpoints of the path, showing the surface of the Earth and including trees, buildings, and other features that may obstruct the radio signal. *Note:* Profiles are drawn either with an effective Earth radius simulated by a parabolic arc--in which case the ray paths are drawn as straight lines--or with a "flat Earth"--in which case the ray paths are drawn as parabolic arcs.

**path quality analysis:** In a communications path, an analysis that (a) includes the overall evaluation of the component quality measures, the individual link quality measures, and the aggregate path quality measures, and (b) is performed by evaluating communications parameters, such as bit error ratio, signal-plus-noise-plus-distortion to noise-plus-distortion ratio, and spectral distortion.

**path quality matrix:** A data bank that contains path-quality analyses used to support path selection and routing determination. *Note:* In adaptive radio automatic link establishment, path quality matrices contain path quality data for single-link and multilink paths.

**path survey:** The assembling of pertinent geographical and environmental data required to design a radio communication system.

**pattern recognition:** The identification of objects and images by their shapes, forms, outlines, color, surface texture, temperature, or other attribute, usually by automatic means. [From Weik '89]

**Pawsey stub:** A device for connecting an unbalanced coaxial feeder to a balanced antenna.

**PAX:** *Abbreviation for private automatic exchange. See PBX.*

**payload:** **1.** In a set of data, such as a data field, block, or stream, being processed or transported, the part that represents user information and user overhead information, and may include user-requested additional information, such as network management and accounting information. *Note:* The payload does not include system overhead information for the processing or transportation system. *Synonym mission bit stream.* **2.** The interface rate minus frame overhead. This is the act capability for information transfer provided for the next lower level of the hierarchy. [T1.107-1988] **3.** The 192 information bits of a DS1 frame. [T1.403-1989]

**payload loopback:** A signal used to command the far-end receiver to loop back the received payload. [T1.107-1988]



**payload module:** The portion of a payload that completely occupies one or more channels.

**payload overhead:** Bits that are assigned at the source and remain with the information payload until the payload reaches the sink and are used for functions associated with transporting the payload. [T1.107-1988]

**payload pointer:** The pointer that indicates the location of the beginning of the synchronous payload envelope. [T1.105-1988]

**PBER:** *Abbreviation for pseudo bit-error ratio.* In adaptive high-frequency (HF) radio, a bit error ratio derived by a majority decoder that processes redundant transmissions. *Note:* In adaptive HF radio automatic link establishment, PBER is determined by the extent of error correction, such as by using the fraction of non-unanimous votes in the 2-of-3 majority decoder.

**PBX:** *Abbreviation for private branch exchange.* **1.** A subscriber-owned telecommunications exchange that usually includes access to the public switched network. **2.** A switch that serves a selected group of users and that is subordinate to a switch at a higher level military establishment. **3.** A private telephone switchboard that provides on-premises dial service and may provide connections to local and trunked communications networks. *Note 1:* A PBX operates with only a manual switchboard; a private automatic exchange (PAX) does not have a switchboard, a private automatic branch exchange (PABX) may or may not have a switchboard. *Note 2:* Use of the term "PBX" is far more common than "PABX," regardless of automation.

**PBX tie trunk:** *See tie trunk.*

**PBX trunk:** *See trunk.*

**PC:** *Abbreviation for carrier power (of a radio transmitter).*

**PCB:** *Abbreviation for power circuit breaker.*

**PCM:** *Abbreviation for pulse-code modulation.*

**PCM multiplex equipment:** *See multiplexer.*

**PCS:** *Abbreviation for Personal Communications Service.* A set of capabilities that allows some combination of terminal mobility, personal mobility, and service profile management. *Note 1:* The flexibility offered by PCS can supplement existing telecommunications services, such as cellular radio, used for NS/EP missions. *Note 2:* PCS and UPT are sometimes mistakenly assumed to be the same service concept. UPT allows complete personal mobility across multiple networks and service providers. PCS may use UPT concepts to improve subscriber mobility in allowing roaming to different service providers, but UPT and PCS are not the same service concept.

**PCS application:** From a user-identity-module (UIM) perspective, the files, commands and data used to support PCS services. [T1.707-1998]

**PCS number:** A number that uniquely identifies a PCS user and is used to place or forward a call to that user. [T1.244-1995] *Synonyms* **personal number, UPT number.**

**PCS session:** That part of the card session dedicated to the PCS operation. [T1.707-1998]

**PCS switching center:** In personal communications service, a facility that (a) supports access-independent call control/service control, and connection control (switching) functions, and (b) is responsible for interconnection of access and network systems to support end-to-end services. *Note 1:* The PCS switching center represents a collection of one or more network elements. *Note 2:* The term "center" does not imply a physical location.

**PCS System:** In personal communications service, a collection of facilities that provides some combination of personal mobility, terminal mobility, and service profile management. *Note:* As used here, "facilities" includes hardware, software, and network components such as transmission facilities, switching facilities, signaling facilities, and databases.

**PDH:** *Acronym for plesiochronous digital hierarchy.* PDH refers to the DS1/DS2/DS3 family of signals which were developed as an asynchronously multiplexed hierarchy for transmission systems which are now more frequently encountered as payload in a SONET system. [T1.X1]

**PDM:** *Abbreviation for pulse-duration modulation.*

**PDN:** *Abbreviation for public data network.*

**PDS:** *Abbreviation for protected distribution system.*

**PDU:** *Abbreviation for protocol data unit.*

**PE:** *Abbreviation for phase-encoded. See phase-encoded recording.*

**peak busy hour:** *Synonym busy hour.*

**peak emission wavelength:** Of an optical emitter, the spectral line having the greatest power. *Synonym* **peak wavelength.**

**peak envelope power (of a radio transmitter) [PEP, pX, PX]:** The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions. [NTIA] [RR]

**peak limiting:** A process by which the absolute instantaneous value of a signal parameter is prevented from exceeding a specified value.

**peak power output:** The output power averaged over that cycle of an electromagnetic wave having the maximum peak value that can occur during transmission.

**peak signal level:** **1.** In a transmission path, the maximum instantaneous signal power, voltage, or current at any point. **2.** At a given point in a transmission path, the maximum instantaneous signal power, voltage, or current that occurs during a specified period.

**peak spectral emission:** *See peak emission wavelength.*

**peak-to-average ratio ( $p/a$  r):** The ratio of the instantaneous peak value, *i.e.*, maximum magnitude, of a signal parameter to its time-averaged value. *Note:* The peak-to-average ratio can be determined for many signal parameters, such as voltage, current, power, frequency, and phase.

**peak-to-peak value:** The absolute value of the difference between the maximum and the minimum magnitudes of a varying quantity.

**peak wavelength:** **1.** *Synonym peak emission wavelength.* **2.** Of an optical bandpass filter, the wavelength that suffers the lowest loss. [After FAA]

**pedestal:** **1.** Black level expressed as an offset in voltage or IRE units relative to blanking level. Conventionally, approximately 54 mV (7.5 IRE) in system M as defined by ANSI/EIA/TIA 250-C; conventionally zero in all other systems. [After SMPTE] **2.** See **blanking level**.

**peer entity:** In layered systems, entities in the same layer but in different systems (nodes) that must exchange information to achieve a common objective. [After T1.110-1987]

**peer-entity authentication:** The corroboration that a peer entity in an association is the one claimed. [T1.233-1993]

**peer group:** In Open Systems Interconnection (OSI)--Architecture, a group of functional units in a given layer of a network in which all the functions performed by the functional units extend throughout the system at the same layer. [From Weik '89]

**peer protocol:** A formal language used by peer entities to exchange user data. [T1.110-1987].

**peg count:** **1.** In communication systems, a count that is made of the number of times that an event or condition occurs. [From Weik '89] **2.** In telephone systems, the process that provides counts of the calls of different service classes that occur during intervals of such frequency as to reliably indicate the traffic load. [From Weik '89] **3.** A count of the attempts to seize, or a count of the actual seizures that occur, of various types of telephone trunks, access lines, switches, or other equipment. [From Weik '89]

**pel:** In a facsimile system, the smallest discrete scanning line sample containing only monochrome information, *i.e.*, not containing gray-scale information.

**penetration:** **1.** The intentional passage, through a building wall or partition, or an equipment enclosure or chassis, of a signal-bearing communications medium, *e.g.*, a cable, metallic or optical. **2.** Unintended access to the information within a communications or information-processing device via a metallic path intended for another purpose, *e.g.*, via the primary power connection. **3.** [The] unauthorized act of bypassing the security mechanisms of a system. [INFOSEC-99] **4.** The passage of an rf signal through a physical barrier, such as a partition, a wall, a building, or earth. **5.** Unauthorized access to a data processing system. [2382-pt.8]

**penetration testing:** Security testing in which evaluators attempt to circumvent the security features of a system based on their understanding of the system design and implementation. [INFOSEC-99]

**PEP:** *Deprecated abbreviation for peak envelope power.* Either "PX" or "pX" is now preferred. See **peak envelope power, power**.

**per-call key:** [A] unique traffic encryption key generated automatically by certain secure telecommunications systems to secure single voice or data transmissions. [INFOSEC-99]

**percentage modulation:** **1.** In angle modulation, the fraction of a specified reference modulation, expressed in percent. **2.** In amplitude modulation, the modulation factor expressed in percent. *Note:* Percentage modulation may also be expressed in dB below 100% modulation.

**percent break:** In pulsed telephone signaling (dialing), the ratio, expressed in percent, of (a) the open-circuit (break) time to (b) the sum of the open- and closed-circuit times of a single dial pulse cycle. *Note:* For example, at a pulse rate of 10 per second, the pulse period is 100 milliseconds. If, during each pulse period, the equipment generating the dial pulses (*e.g.*, a telephone set) presents an open circuit (high impedance) for 48 milliseconds, and a closed circuit (low impedance) for 52 milliseconds, the percent break is  $[(48 \text{ ms}/(48 \text{ ms} + 52 \text{ ms}))] = 0.48$ , or 48%.

**perfect forward secrecy:** In cryptography, of a key-establishment protocol, the condition in which the compromise of a session key or long-term private key after a given session does not cause the compromise of any earlier session.

**performance anomalies:** A discrepancy between actual and desired characteristics of an item. An anomaly may or may not affect the ability of an item to perform a required function. [T1.503-1996]

**performance management:** In network management, (a) a set of functions that evaluate and report the behavior of telecommunications equipment and the effectiveness of the network or network element and (b) a set of various subfunctions, such as gathering statistical information, maintaining and examining historical logs, determining system performance under natural and artificial conditions, and altering system modes of operation.

**performance measurement period:** The period during which performance parameters are measured. *Note:* A performance measurement period is determined by required confidence limits and may vary as a function of the observed parameter values. User time is divided into consecutive performance measurement periods to enable measurement of user information transfer reliability.

**performance parameter:** A quality, usually quantified by a numerical value, which quality characterizes a particular aspect, capability, or attribute of a system. *Note:* Examples of performance parameters are peg count and mean time between failures.

**performance primitives:** Basic error events or other performance-related occurrences that may be detected by monitoring a digital signal. [T1.503-1996]

**performance reliability:** The ability of an item to perform a required function under given conditions for a given time period. *Note 1:* It is generally assumed that the item is in a state to perform this required function at the beginning of the time interval. *Note 2:* The term *reliability* is used as a measure of reliability performance. [T1.226-1992]

**performance standard:** A statement of general criteria that define a desired result without specifying the techniques for achieving that result. *Synonym performance-based standard.* [After X9.19]

**periapsis:** In a satellite orbit, the point that is closest to the gravitational center of the system consisting of the primary body and the satellite. *Note:* In an orbit about the Earth, periapsis is called *perigee*. In an orbit about the Moon, periapsis is called *perilune*, and in an orbit about the Sun, it is called *perihelion*.

**perigee:** Of a satellite orbiting the Earth, the point in the orbit at which the gravitational centers of the satellite and Earth are closest to one another.

**perigee altitude:** See **altitude of the apogee or of the perigee**.

**periodic antenna:** An antenna that has an approximately constant input impedance over a narrow range of frequencies. *Note:* An example of a periodic antenna is a dipole array antenna. *Synonym resonant antenna.*

**period (of a satellite):** The time elapsing between two consecutive passages of a satellite through a characteristic point on its orbit. [NTIA] [RR]

**periods processing:** Processing of various levels of classified and unclassified information at distinctly different times. Under the concept of periods processing, the system must be purged of all information from one processing period before transitioning to the next. Under periods processing, the system must be purged of all information from one processing period before transitioning to the next when there are different users with differing authorizations. [INFOSEC-99]

**peripheral device:** See **peripheral equipment**.

**peripheral equipment:** In a data processing system, any equipment, distinct from the central processing unit, that may provide the system with additional capabilities. *Note:* Such equipment is often offline until needed for a specific purpose and may, in some cases, be shared among several users.

**peripheral node:** *Synonym endpoint node.*

**periscope antenna:** An antenna configuration in which the transmitting antenna is oriented to produce a vertical radiation pattern, and a flat or off-axis parabolic reflector, mounted above the transmitting antenna, is used to direct the beam in a horizontal path toward the receiving antenna. *Note:* A periscope antenna facilitates increased terrain clearance without long transmission lines, while permitting the active equipment to be located at or near ground level for ease of maintenance.

**permanent bond:** A bond not expected to require disassembly for operational or maintenance purposes.

**permanent signal (PS):** **1.** An extended off-hook condition not followed by dialing. **2.** A connect signal from the network that has not been followed by network outpulsing within a timed interval. [T1.405-1989]

**permanent storage:** A storage device in which stored data are nonerasable.

**permanent virtual circuit (PVC):** A virtual circuit used to establish a long-term connection between data terminal equipments (DTE). *Note 1:* In a PVC, the long-term association is identical to the data transfer phase of a virtual call. *Note 2:* Permanent virtual circuits eliminate the need for repeated call set-up and clearing. *Deprecated synonym nailed-up circuit.*

**permissible interference:** Observed or predicted interference which complies with quantitative interference and sharing criteria contained in these [Radio] Regulations or in CCIR Recommendations or in special agreements as provided for in these Regulations. [NTIA] [RR]

**permuter:** [A] device used in crypto-equipment to change the order in which the contents of a shift register are used in various nonlinear combining circuits. [INFOSEC-99]

**persistent data:** Information that endures beyond a single instance of use, *e.g.*, longer than one call attempt. [T1.667-1999]

**personal agent:** *Synonym droid. See bot.*

**personal authenticating information (PAI):** Information such as a secret password, a badge, or biometric data—or any combination of these—used to authenticate a user's identity. [After X9.26]

**Personal Communications Service:** *See PCS.*

**personal de-registration:** The process by which end users cancel a previous registration to a terminal. [T1.702-1995] [T1.Rpt34-1994]

**personal identification number:** *See PIN.*

**personal mobility:** In universal personal telecommunications (UPT), (a) the ability of a user to access telecommunication services at any UPT terminal on the basis of a personal identifier, and (b) the capability of the network to provide those services in accord with the user's service profile. *Note 1:* The personal mobility aspects of personal communications are based on the UPT number. *Note 2:* Personal mobility involves the network's capability to locate the terminal associated with the user for the purposes of addressing, routing, and charging the user for calls. *Note 3:* "Access" is intended to convey the concepts of both originating and terminating services. *Note 4:* Management of the service profile by the user is not part of personal mobility. [After T1.667-1999, T1.702-1995]

**personal mobility controller:** In UPT (universal personal telecommunications), a facility that provides the control logic for user authentication, service request validation, location management, alerting, user access to service profile, privacy, access registration, and call management. [After T1.Rpt34-1994]

**personal mobility management:** In PCS (personal communication service), the capability that (a) provides authentication of user identification and maintains user location information in the service profile, (b) controls the completion of calls based on user-specified incoming call management contained in the service profile, (c) provides translation between user identification and identification of the terminal currently associated with the user for the completion of calls to the user's current location, and (d) controls the services and features available to the user based on the user's subscription and in conjunction with user-specified terminal access configurations. [After T1.244-1995]

**personal number:** A number that uniquely identifies a PCS or UPT user (universal personal telecommunications service user) and is used to place, or forward, a call to that user. *Note:* Before the full implementation of UPT service, the use of the term UPT number may, in some contexts, be subject to misinterpretation. The personal number is a UPT number, and is the basis of the personal mobility aspects of PCS. The term is provided as an alternative term for use where appropriate to avoid such a misinterpretation. *Synonym PCS number.* [T1.Rpt34-1994]

**personal registration:** In universal personal telecommunications, the process of associating a UPT user with a specific terminal.

**personal station:** A light-weight, pocket-sized FPLMTS terminal (Future Public Land Mobile Telecommunication Systems terminal). [CCITT (ITU-T) Rec. F.115]

**personal terminal:** In personal communications service, a lightweight, small, portable terminal that provides the capability for the user to be either stationary or in motion while accessing and using telecommunication services. *Informal synonym brick.*

**PGP:** *Abbreviation for pretty good privacy.* A publicly available implementation of a public-key encryption system using no trusted third party. *Note:* PGP can be used to apply a digital signature to a message without actually encrypting the text of the message. This is normally used in public postings where the user wants all readers to be able to see the message text and also wants the reader to be able to confirm that the message is unaltered from its original form. Once a digital signature is created with PGP, it is impossible for anyone to modify either the message or the signature without the modification being detected by PGP. [2382-pt.35]

**phantom circuit:** A third circuit derived from two suitably arranged pairs of wires, called side circuits, with each pair of wires being a circuit in itself and at the same time acting as one conductor of the third circuit. *Note:* The side circuits are coupled to their respective drops by center-tapped transformers, usually called "repeat coils." The center taps are on the line side of the side circuits. Current from the phantom circuit is split evenly by the center taps. This cancels crosstalk from the phantom circuit to the side circuits. *Synonym [loosely] phantom facility.*

**phantom facility:** A transmission facility derived with repeating coils from two or more pairs of wires. [T1.238-1994/97] *Synonyms phantom circuit, phantom pair.* *Note:* The name "phantom" is derived from the fact that balanced, center-tapped transformers, called "repeat(ing)" coils in telephone parlance, can be used, *e.g.*, in conjunction with two twisted pairs, to create a third, electrically isolated transmission path ("phantom pair") by splitting the latter's electrical signal between the two twisted pairs (called "side circuits") in such a fashion as to cancel inductive interference from the phantom circuit to the side circuits, and vice versa.

**phantom group:** Three circuits that are derived from complexing two physical circuits to form a phantom circuit.

**phantom pair:** *Synonyms [loosely] phantom circuit, phantom facility.*

**phase:** **1.** Of a periodic, varying phenomenon, *e.g.*, an electrical signal or electromagnetic wave, any distinguishable instantaneous state of the phenomenon, referred to a fixed reference or another periodic varying phenomenon. *Note 1:* Phase, *i.e.*, *phase time* (frequently abbreviated simply to "phase" in informal usage), can be specified or expressed by time of occurrence relative to a specified reference. *Note 2:* The phase of a periodic phenomenon can also be expressed or specified by angular measure, with one period usually encompassing  $360^\circ/176; (2\pi \text{ radians})$ . *Note 3:* Phase may be represented (a) in polar coordinates by  $M \angle \theta$ , where  $M$  is the magnitude and  $\theta$  is the phase angle, and (b) in Cartesian

coordinates, *i.e.*, an Argand diagram, as  $(a + jb)$ , where  $a$  is a real component and  $b$  is an imaginary component such that  $\tan \theta = (b/a)$ , where  $\theta$  is the phase angle, and the magnitude,  $M$ , is  $(a^2 + b^2)^{1/2}$ . **2.** A distinguishable state of a phenomenon. **3.** That period of time during which a specified function occurs in a sequential list of functions.

**phase angle:** Of a periodic wave, the number of suitable units of angular measure between a point on the wave and a reference point. *Note 1:* The reference point may be a point on another periodic wave. The waves may be plotted on a suitable coordinate system, such as a Cartesian plot, with degrees or other angular measure usually plotted on the abscissa and amplitude on the ordinate. Usually, at least one full cycle of each wave is plotted, with  $360^\circ$  ( $2\pi$  radians) encompassing one full cycle. The reference points may be any significant instants on the waves, such as where they cross the abscissa axis. *Note 2:* The use of angular measure to define the relationship between a periodic wave and a reference point is derived from the projection of a rotating vector onto the real axis of an Argand diagram. *Note 3:* The value of the phase angle of a point on the wave is the point on the abscissa that corresponds to the point on the wave. *Note 4:* The phase angle of a vector may be written as  $M \angle \theta$ , where  $M$  is the magnitude of the vector and  $\theta$  is the phase angle relative to the specified reference.

**phase bandwidth:** Of a network or device, the width of the continuous frequency range over which the phase-vs.-frequency characteristic does not depart from linearity by more than a stated amount.

**phase coherence:** The state in which two signals maintain a fixed phase relationship with each other or with a third signal that can serve as a reference for each.

**phase coherent:** See **phase coherence**.

**phase constant:** The imaginary part of the axial propagation constant for a particular mode, usually expressed in radians per unit length.

**phased array:** A group of antennas in which the relative phases of the respective signals feeding the antennas are varied in such a way that the effective radiation pattern of the array is reinforced in a desired direction and suppressed in undesired directions. *Note 1:* The relative amplitudes of--and constructive and destructive interference effects among--the signals radiated by the individual antennas determine the effective radiation pattern of the array. *Note 2:* A phased array may be used to point a fixed radiation pattern, or to scan rapidly in azimuth or elevation.

**phase delay:** In the transmission of a single-frequency wave from one point to another, the delay of an arbitrary point in the wave that identifies its phase. *Note:* Phase delay may be expressed in any convenient unit, such as seconds, degrees, radians, or wavelengths.

**phase departure:** **1.** A phase deviation from a specified value. **2.** An unintentional deviation from the nominal phase value.

**phase detector:** A circuit or instrument that detects the difference in phase between corresponding points on two signals.

**phase deviation:** In phase modulation, the maximum difference between the instantaneous phase angle of the modulated wave and the phase angle of the unmodulated carrier. *Note:* For a sinusoidal modulating wave, the phase deviation, expressed in radians, is equal to the modulation index.

**phase diagram:** A graphic representation of the phase relationships between two or more waveforms. *Note:* A phase diagram may be represented as a vector diagram or as an amplitude-vs.-time diagram.

**phase difference:** The time interval or phase angle by which one wave leads or lags another. *Synonym phase offset.*

**phase distortion:** Distortion that occurs when (a) the phase-frequency characteristic is not linear over the frequency range of interest, *i.e.*, the phase shift introduced by a circuit or device is not directly proportional to frequency, or (b) the zero-frequency intercept of the phase-frequency characteristic is not 0 or an integral multiple of  $2\pi$  radians. *Synonym phase-frequency distortion.*

**phase-encoded (PE) recording:** Binary recording on magnetic media, such as magnetic disks, tapes, and cards, in which a "1" is represented by a magnetic flux reversal to the polarity of the interblock gap, and a "0" is represented by a magnetic flux reversal to the polarity opposite to that of the interblock gap when recording in the forward direction.

**phase equalizer:** See **delay equalizer**.

**phase flux reversal:** In phase-encoded recording, a magnetic flux reversal written at the nominal midpoint between successive "1" bits, or between successive "0" bits, to establish proper polarity.

**phase-frequency characteristic:** A Cartesian-coordinate plot of phase shift as the dependent variable, versus frequency as the independent variable. *Note:* The phase-frequency characteristic is linear if the phase shift introduced by a circuit or device is the same for all frequencies in the input signal.

**phase-frequency distortion:** *Synonym phase distortion.*

**phase hit:** See **hit**.

**phase instability:** The fluctuation of the phase of a wave, relative to a reference. *Note:* The fluctuation is often from unknown causes.

**phase interference fading:** The variation in signal amplitude produced by the interaction of two or more signal elements with different relative phases.

**phase inversion:** Introduction of a phase difference of  $180^\circ$ . *Note:* Phase inversion may occur with a random or periodic, symmetrical or non-symmetrical waveform, although it is usually produced by the inversion of a symmetrical periodic signal, resulting in a change in sign. A symmetrical periodic signal represented by  $f(t) = A e^{j\omega t}$ , after phase inversion, becomes  $f_1(t) = A e^{j(\omega t + \pi)}$ , where  $t$  is time,  $A$  is the magnitude of the vector,  $\omega$  is angular frequency ( $\omega = 2\pi f$ ), where  $f$  is the frequency and  $\pi \approx 3.1416$  and  $e \approx 2.7183$ . The algebraic sum of  $f(t)$  and  $f_1(t)$  will always be zero.

**phase jitter:** Rapid, repeated phase perturbations that result in the intermittent shortening or lengthening of signal elements. *Note 1:* Phase jitter may be random or cyclic. *Note 2:* The phase departure in phase jitter usually is smaller, but more rapid, than that of phase perturbation. Phase jitter may be expressed in degrees, radians, or seconds. Phase jitter is usually random. However, if cyclic, phase jitter may be expressed in hertz as well as in degrees, radians, or seconds.

**phase jump:** A sudden phase change in a signal.

**phase linearity:** Direct proportionality of phase shift to frequency over the frequency range of interest.

**phase-locked loop (PLL):** An electronic circuit that controls an oscillator so that it maintains a constant phase angle relative to a reference signal. *Note:* Phase-locked loops are widely used in space communications for coherent carrier tracking and threshold extension, bit synchronization, and symbol synchronization.

**phase measurement tolerance:** The maximum allowable difference between a phase measurement and the actual phase value.

**phase modulation (PM):** Angle modulation in which the phase angle of a carrier is caused to depart from its reference value by an amount proportional to the instantaneous value of the modulating signal.

**phase noise:** In an oscillator, rapid, short-term, random fluctuations in the phase of a wave, caused by time-domain instabilities. *Note:* Phase noise,  $\mathcal{L}(f)$  in decibels relative to carrier power (dBc) on a 1-Hz bandwidth, is given by  $\mathcal{L}(f) = 10\log[0.5(S\phi(f))]$  where  $S\phi(f)$  is the spectral density of phase fluctuations.

**phase nonlinearity:** Lack of direct proportionality of phase shift to frequency over the frequency range of interest.

**phase offset:** *Synonym phase difference.*

**phase perturbation:** Any shifting (often quite rapid), from whatever cause, in the phase of a signal. *Note 1:* The shifting in phase may appear to be random, cyclic, or both. *Note 2:* The phase departure in phase perturbation usually is larger, but less rapid, than that of phase jitter. *Note 3:* Phase perturbation may be expressed in degrees, with any cyclic component expressed in hertz.

**phase quadrature:** *See quadrature.*

**phase shift:** The change in phase of a periodic signal with respect to a reference.

**phase-shift keying (PSK):** **1.** In digital transmission, angle modulation in which the phase of the carrier is discretely varied in relation either to a reference phase or to the phase of the immediately preceding signal element, in accordance with data being transmitted. **2.** In a communications system, the representing of characters, such as bits or quaternary digits, by a shift in the phase of an electromagnetic carrier wave with respect to a reference, by an amount corresponding to the symbol being encoded. *Note 1:* For example, when encoding bits, the phase shift could be 0° for encoding a "0," and 180° for encoding a "1," or the phase shift could be -90° for "0" and +90° for a "1," thus making the representations for "0" and "1" a total of 180° apart. *Note 2:* In PSK systems designed so that the carrier can assume only two different phase angles, each change of phase carries one bit of information, *i.e.*, the bit rate equals the modulation rate. If the number of recognizable phase angles is increased to 4, then 2 bits of information can be encoded into each signal element; likewise, 8 phase angles can encode 3 bits in each signal element. *Synonyms* **biphase modulation, phase-shift signaling.**

**phase-shift signaling:** *Synonym phase-shift keying.*

**phase term:** In the propagation of an electromagnetic wave in a uniform waveguide, such as an optical fiber or metal waveguide, the parameter that indicates the phase change per unit distance of the wave at any point along the waveguide. [From Weik '89]

**phase transients:** Perturbations in phase of limited duration seen at synchronization interfaces. Typical duration is several time constants of the slave clock which produces them. [T1.105.09-1996]

**phase velocity:** The velocity of propagation of a uniform plane wave, given by (a) the product of the wavelength and the frequency divided by (b) the refractive index of the medium in which the wave is propagating. *Note 1:* In free space, the refractive index may be considered as unity. *Note 2:* In free space, the group velocity and the phase velocity are equal.

**phasing:** In facsimile transmission and reception, the process by which the start of the scanning line or lines is made to correspond to one edge of the object being scanned. *Note:* If there is no correspondence between the object being scanned and the scanning line or lines, distortion, often in the form of a split image, will occur in the received image.

**phon:** In acoustics, a unit of subjective loudness level equal to the sound pressure level in dB compared to that of an equally loud standard sound. *Note:* The accepted standard is a 1-kHz pure sine-wave tone or narrowband noise centered at 1 kHz. [From Weik '89]

**phone:** **1.** *Abbreviation for telephone, telephony.* **2.** *Loosely, the voice-operation mode in radio communications.*

**phonetic alphabet:** A list of standard words used to identify letters in a message transmitted by radio or telephone. The following are the authorized words, listed in order, for each letter in the alphabet: **A** lpha, **B** ravo, **C** harlie, **D** elta, **E** cho, **F** oxtrot, **G** olf, **H** otel, **I** ndia, **J** uliet, **K** ilo, **L** ima, **M** ike, **N** ovember, **O** scar, **P** apa, **Q** uebec, **R** omeo, **S** ierra, **T** angos, **U** niform, **V** ictor, **W** hiskey, **X** -ray, **Y** ankee, **Z** ulu. [JP 1-02]

**phonon:** A quantum of acoustic energy, the level of which is a function of the frequency of the acoustic wave. *Note:* Phonons in acoustics are analogous to photons in electromagnetics. The energy of a phonon is usually less than 0.1 eV (electron-volt) and thus is one or two orders of magnitude less than that of a photon. When photons and phonons interact in semiconductors used in communications systems, undesirable system behavior can occur. [From Weik '89]

**phonon absorption:** Absorption of light energy by its conversion to vibrational energy. *Note:* Phonon absorption determines the fundamental, *i.e.*, quantum limit of attenuation, *i.e.*, minimum attenuation, in silica-based glasses in the far infrared region. [After FAA]

**photoconductive effect:** In certain materials, the phenomenon that results in photoconductivity.

**photoconductivity:** In certain materials, the increase in electrical conductivity that results from increases in the number of free carriers generated when photons are absorbed. *Note:* The photons must have quantum energy sufficient to overcome the band-gap in the material in question.

**photocurrent:** The current that flows through a photosensitive device, such as a photodiode, as the result of exposure to radiant power. *Note 1:* The photocurrent may occur as a result of the photoelectric, photoemissive, or photovoltaic effect. *Note 2:* The photocurrent may be enhanced by internal gain caused by interaction among ions and photons under the influence of applied fields, such as occurs in an avalanche photodiode (APD).

**photodetector (PD):** A transducer capable of accepting an optical signal and producing an electrical signal containing the same information as in the optical signal. [2196] *Note:* The two main types of semiconductor photodetectors are the photodiode (PD) and the avalanche photodiode (APD).

**photodiode:** A semiconductor diode that produces, as a result of the absorption of photons, (a) a photovoltage or (b) free carriers that support the conduction of photocurrent. *Note:* Photodiodes are used for the detection of optical communication signals and for the conversion of optical power to electrical power.

**photoelectric effect:** In certain materials, the changes in the electrical characteristics caused by photon absorption.

**photon:** A discrete packet, *i.e.*, quantum, of electromagnetic energy. *Note:* The energy of a photon is  $h\eta$ , where  $h$  is Planck's constant and  $\eta$  is the frequency of the electromagnetic wave.

**photonic:** Referring to or using opto-electronic, electro-optic, or magneto-optic phenomena. *Note:* Photonic devices include a wide variety of active devices that are used in countless applications in the fields of optical detection and imaging, optical communications systems, direct optical-to-electrical power generation, *etc.* For example, photonic devices include, but are not limited to: light-emitting diodes (LEDs), injection laser diodes (ILDs), avalanche photodiodes (APDs), liquid crystal displays (LCDs), charge-coupled devices (CCDs), cathode-ray tubes (CRTs), Kerr cells, Pockels cells, photovoltaic cells, *etc.*



**photonic computer:** A variety of computer in which the electronic circuits (which process data serially) are replaced by faster and more powerful photonic circuits (which can perform parallel processing).

**photonics:** The science of generating and harnessing light as well as other forms of radiant energy whose quantum unit is the photon.

**photonic switching:** The use of photonic devices rather than electronic devices to make or break connections within integrated circuits.

**photon noise:** In an optical communication link, noise attributable to the statistical nature of optical quanta. [FAA] *See* **quantum noise**.

**photosensitive recording:** Facsimile recording by the exposure of a photosensitive surface to a signal-controlled light beam or spot.

**photovoltaic effect:** The production, as a result of the absorption of photons, of a voltage difference across a pn junction. *Note:* The voltage difference is caused by the internal drift of holes and electrons.

**physical frame:** *See* **frame**.

**Physical Layer: 1.** *See* **Open Systems Interconnection--Reference Model. 2.** The layer (layer 1) that provides transparent transmission of a bit stream over a circuit built from some physical communications medium. [T1.110-1987]

**physical optics:** The branch of optics that treats light propagation as a wave phenomenon rather than a ray phenomenon, as in geometric optics.

**physical plane:** The plane in the intelligent network conceptual model containing elements and their interfaces that implement functional entities. [T1.667-1999]

**physical security:** *See* **communications security**.

**physical signaling sublayer (PLS):** In a local area network (LAN) or a metropolitan area network (MAN) using open systems interconnection (OSI) architecture, the portion of the physical layer that (a) interfaces with the medium access control sublayer, (b) performs character encoding, transmission, reception, and decoding, and (c) performs optional isolation functions.

**physical topology:** The physical configuration, *i.e.*, interconnection, of network elements, *e.g.*, cable paths, switches, concentrators. *Note:* Physical topology is in contrast to logical topology. For example, a logical loop may consist of a physical star configuration, or a physical loop.

**picowatt:** *See* **pW**.

**picowatt, psophometrically weighted:** *See* **noise weighting**.

**picture:** *Synonym* **image**.

**picture black:** In TV and facsimile, pertaining to the signal or signal level that corresponds to the darkest part, *i.e.*, the spot with the lowest luminance or reflectivity, of the object being scanned.

**picture element:** *See* **pel, pixel**.

**picture frequency:** In analog facsimile systems, a baseband frequency generated by scanning an object. *Note:* Picture frequencies do not include frequencies that are present in a modulated carrier.

**picture white:** In TV and facsimile, pertaining to the signal level that corresponds to the brightest part, *i.e.*, the spot with the highest luminance or reflectivity, of the object being scanned.

**piecewise linear encoding:** *See* **segmented encoding law**.

**piecewise linear encoding law:** *Synonym* **segmented encoding law**.

**piggyback entry:** Unauthorized access to a data processing system via an authorized user's legitimate connection. [2382-pt.8]

**pigtail: 1.** A short length of optical fiber that is permanently affixed to an active device, *e.g.*, LED or laser diode, and is used to couple the device, using a splice or connector, to a longer fiber. [After FAA] **2.** A short length of single-fiber cable, usually tight-buffered, that has an optical connector on one end and a length of exposed fiber at the other end. *Note:* The exposed fiber of the pigtail is then spliced to one fiber of a multifiber trunk, *i.e.*, arterial, cable, to enable the multifiber cable to be "broken out" into individual single-fiber cables that may be connected to a patch panel or an input or output port of an optical receiver or transmitter. [After FAA] **3.** A short length of electrical conductor permanently affixed to a component, used to connect the component to another conductor.

**pilot: 1.** A signal, usually a single frequency, transmitted over a communications system for supervisory, control, equalization, continuity, synchronization, or reference purposes. *Note:* Sometimes it is necessary to employ several independent pilot frequencies. Most radio relay systems use radio or continuity pilots of their own but transmit also the pilot frequencies belonging to the carrier frequency multiplex system. **2.** *See* **palm-top**.

**pilot frequency:** *See* **synchronizing pilot**.

**pilot-make-busy (PMB) circuit: 1.** A circuit arrangement by which trunks provided over a carrier system are made busy to the switching equipment in the event of carrier system failure, or during a fade of the radio system. **2.** *In* **COMSEC**, *see* **traffic padding**.

**pilot subcarrier: 1.** A subcarrier that serves as a control signal for use in the reception of FM stereophonic sound broadcasts. [47 CFR 73.310] **2.** A subcarrier used in the reception of TV stereophonic aural or other subchannel broadcasts. [47 CFR 73.681]

**pilot tone:** *See* **pilot**.

**PIN:** *Abbreviation for* **personal identification number**. A code or password, unique to or associated with, a specific user, and entered into a data-processing device for purposes of verifying the identity of a person requesting, *e.g.*, a transaction or access.

**PIN diode:** *Acronym for* **positive-intrinsic-negative diode**. A photodiode with a large, neutrally doped intrinsic region sandwiched between p-doped and n-doped semiconducting regions. *Note:* A PIN diode exhibits an increase in its electrical conductivity as a function of the intensity, wavelength, and modulation rate of the incident radiation. *Synonym* **PIN photodiode**.

**ping:** *Abbreviation for* **packet Internet groper**. In TCP/IP, a protocol function that tests the ability of a computer to communicate with a remote computer by sending a query and receiving a confirmation response.

**pink noise:** In acoustics, noise in which there is equal power per octave.

**PIN photodiode:** *Synonym* PIN diode.

**piston:** In a hollow metallic waveguide, a longitudinally movable metallic plane surface that reflects essentially all the incident energy. *Note:* A piston is used for tuning, e.g., fine-tuning a resonant cavity. *Synonym* **plunger**.

**pitch:** *Synonym* lay length.

**pivot node:** The network element that routes a call to the release node, and informs the release node that it is capable of performing pivot functionality on that specific call. The pivot node performs the pivoting based on the new destination node information received from the release node. The pivot node must be a Signaling System No. 7 (SS7) signaling point. [T1.661-1997]

**pixel:** In a raster-scanned imaging system, the smallest discrete scanning line sample that can contain gray scale information.

**PKI:** *Abbreviation for* public key infrastructure.

**PLA:** *Abbreviation for* programmable logic array.

**plain old telephone service (POTS):** A call that requires nothing more than basic call handling. [T1.667-1999]

**plain text:** Unencrypted information. [INFOSEC-99] *Note:* Plain text includes voice. *Synonym* clear text.

**planar array:** An antenna in which all of the elements, both active and parasitic, are in one plane. *Note 1:* A planar array provides a large aperture and may be used for directional beam control by varying the relative phase of each element. *Note 2:* A planar array may be used with a reflecting screen behind the active plane.

**planar waveguide:** *Synonym* slab-dielectric waveguide.

**Planck's constant:** The constant of proportionality, represented by the symbol  $h$ , that relates the energy  $E$  of a photon with the frequency  $\nu$  of the associated wave through the relation  $E = h\nu$ , where  $h = 6.626 \times 10^{-34}$  joule•second.

**Planck's law:** The fundamental law of quantum theory that describes the essential concept of the quanta of electromagnetic energy. *Note 1:* Planck's law states that the quantum of energy,  $E$ , associated with an electromagnetic field is given by  $E = h\nu$ , where  $h$  is Planck's constant and  $\nu$  is the frequency of the electromagnetic radiation. *Note 2:* Planck's constant is usually given in joule•seconds and the frequency in hertz. Thus, the quantum of energy is usually given in joules. *Note 3:* The product of energy and time is sometimes referred to as the elementary quantum of action. Hence,  $h$  is sometimes referred to as the elementary quantum of action.

**plane:** A part of the intelligent network conceptual model. [T1.667-1999]

**plane polarization:** *Synonym* linear polarization.

**plane wave:** **1.** A wave whose surfaces of constant phase are infinite parallel planes normal to the direction of propagation. **2.** An electromagnetic wave that predominates in the far-field region of an antenna, and has a wavefront that is essentially in a plane. *Note:* In free space, the characteristic impedance of a plane wave is 377  $\Omega$ .

**plant:** All the facilities and equipment used to provide telecommunications services. *Note:* Plant is usually characterized as *outside plant* or *inside plant*. Outside plant, for example, includes all poles, repeaters and unoccupied buildings housing them, ducts, and cables—including the "inside" portion of interfacility cables outward from the main distributing frame (MDF) in a central office or switching center. Inside plant includes the MDF and all equipment and facilities within a central office or switching center.

**plastic-clad silica (PCS) fiber:** An optical fiber that has a silica-based core and a plastic cladding. *Note 1:* The cladding of a PCS fiber should not be confused with the polymer overcoat of a conventional all-glass fiber. *Note 2:* PCS fibers in general have significantly lower performance characteristics, i.e., higher transmission losses and lower bandwidths, than all-glass fibers. *Synonym* polymer-clad silica fiber.

**plate modulation:** The modulation produced by introduction of the modulating wave into the plate circuit of any tube in which the carrier frequency wave is present. [47 CFR 73.14]

**platform:** **1.** The type of computer on which a given operating system or application runs. *Synonym* hardware platform. **2.** The operating system in use on a given computer. *Synonym* operating system platform. **3.** The application program in use on a given computer and operating system. *Synonym* application platform. *Note 1:* The term platform, usually with some kind of accompanying qualifying verbiage, may also be applied to any combination of the foregoing. *Note 2:* The term cross-platform may be used to characterize an application program or operating system that may be run on more than one platform.

**plenum:** In a building, an enclosure, created by building components such as a suspended ceiling or false floor, and used for the movement of environmental air. *Note 1:* A plenum may be used to contain communications and power cables, e.g., to reach equipment installed in open office or laboratory space. *Note 2:* Cables installed in plenums must meet applicable environmental and fire protection regulations. This may mean enclosing them in suitable ducts or using cables having jackets and other components made of materials that are resistant to open flame and are non-toxic at high temperatures.

**plesiochronous:** That relationship between two signals such that their corresponding significant instants occur at nominally the same rate, any variations being constrained within a specified limit. *Note:* There is no limit to the phase difference that can accumulate between corresponding significant instants over a long period of time. [T1.X1] [T1.101-1999]

**PL/I:** A programming language that is designed for use in a wide range of commercial and scientific computer applications.

**PLL:** *Abbreviation for* phase-locked loop.

**plotter:** An output unit that presents data in the form of a two-dimensional graphic representation.

**PLS:** *Abbreviation for* physical signaling sublayer.

**plug and play:** Of or pertaining to the ability of certain operating systems to automatically (a) detect a new device that has been added to the system, (b) uniquely identify that device, and (c) install the appropriate drivers and system files for that device. *Note 1:* Identification is facilitated by means of predetermined identification numbers hard-coded into the device. When the operating system boots up, it polls all installed devices and checks the returned identification numbers against the list of previously installed devices. If an identification number is not on that list, the number is looked up in a master database (either locally or on-line) and the new device is identified. *Note 2:* Not all devices are plug-and-play compatible.

**plug in:** An extension to a browser (or other software) for handling special types of data not included in the basic software. [2382-pt.35] *Alternate spelling* **plug-in**.

**plunger:** *Synonym* piston.

**PM:** Abbreviation for phase modulation, preventive maintenance.

**PMB:** Abbreviation for pilot-make-busy. See pilot-make-busy circuit.

**Pockels cell:** An electro-optic device in which birefringence is modified under the influence of an applied voltage. *Note:* A Pockels cell may be used as an intensity modulator at optical wavelengths.

**POI:** Abbreviation for point of interface.

**point:** A physical connection to the entity being controlled or monitored. [T1.317-1993]

**point code (PC):** A unique address code that identifies a service provider (SP) within a signaling network. [T1.234-1993]

**pointer:** **1.** A function indicator that (a) is under the direct control of a computer operator, and (b) is used to indicate displayed information, to highlight data, to identify areas of interest, to serve as a graphic display cursor, and/or to select icons. **2.** In computer graphics, a manually operated functional unit used to specify an addressable point. **3.** In computer programming, an identifier that indicates the location of a data item.

**pointers:** A single octet that indicates the beginning of each mandatory variable parameter and optional part. [T1.110-1987]

**point in call (PIC):** A state in a basic call-state model. [T1.667-1999]

**point of access:** A subscriber's entrance to the telecommunications network. A logical view of this point of access has a relationship with the termination point as defined in the generic network model (GNM). In practice, this may be physically represented by a line card connected to the subscriber's access loop. For mobile communication services, where channels are assigned dynamically as the user moves, the point of access is considered to be at the service provider's location. In this case, there is one point of access for each channel and users who are moving use a sequence of different points of access (each one connected to a particular channel). [T1.250-1996]

**point of interface (POI):** In a telecommunications system, the physical interface between the local access and transport area (LATA) access and inter-LATA functions. *Note:* The POI is used to establish the technical interface, the test points, and the points of operational responsibility. *Synonym* interface point.

**point of presence (POP):** A physical layer within a local access and transport area (LATA) at which an inter-LATA carrier establishes itself for the purpose of obtaining LATA access and to which the local exchange carrier provides access services.

**point of termination (POT):** The point of demarcation between (exchange) carriers that establishes the technical interface, test points, and division of operational responsibility. [T1.501-1988] [T1.502-1988] [T1.104-1988] [T1.306-1989]

**point of train:** In infrared transmission systems, a steady infrared light that is used (a) to assist the transmitter in locating a receiving station and (b) for keeping the transmitted light pointed in the proper direction for satisfactory reception. [From Weik '89]

**point source:** A source of electromagnetic radiation such that (a) the source is so distant from a point of observation or measurement of the radiation that the wavefront of the radiation is a planar rather than a curved surface, regardless of the shape of the source, (b) the size or shape of the source has no influence on the shape of the wavefront at the point of observation or measurement, and (c) the source need not necessarily radiate with equal radiance in all directions. [From Weik '89]

**point-to-multipoint connection:** A distinctive type of multipoint connection, composed of a central connection endpoint (central CE) and other, peripheral, CEs, and in which data originating from the central CE are received by all other CEs, and data originating from peripheral CEs are received only by the central CE. [After T1.629-1999]

**point-to-point configuration:** **1.** A configuration where there are only two access points. [T1.620-1991] **2.** A communication circuit having only two nodes.

**point-to-point link:** A dedicated data link that connects only two stations.

**point-to-point transmission:** Communications between two designated stations only.

**Poisson distribution:** A mathematical statement of the probability that exactly  $k$  discrete events will take place during an interval of length  $t$ , expressed by

$$P(k, t) = \frac{(\lambda t)^k e^{-\lambda t}}{k!},$$

where  $k$  is a non-negative integer,  $e$  is the base of the natural logarithms (e2.71828),  $\lambda$  is the constant rate that the events occur, and  $\lambda t$  is the expected number of events occurring during an interval of length  $t$ .

**polar direct-current telegraph transmission:** A form of binary telegraph transmission in which positive and negative direct currents denote the significant conditions. *Synonym* double-current transmission.

**polarential telegraph system:** A direct-current telegraph system employing polar transmission in one direction and a form of differential duplex transmission in the other. *Note:* Two types of polarential systems, known as types A and B, are in use. In half-duplex operation of a type A polarential system, the direct-current balance is independent of line resistance. In half-duplex operation of a type B polarential system, the direct current is substantially independent of the line leakage. Type A is better for cable loops where leakage is negligible but resistance varies with temperature. Type B is better for open wire where variable line leakage is frequent.

**polarization:** Of an electromagnetic wave, the property that describes the orientation, *i.e.*, time-varying direction and amplitude, of the electric field vector. *Note 1:* States of polarization are described in terms of the figures traced as a function of time by the projection of the extremity of a representation of the electric vector onto a fixed plane in space, which plane is perpendicular to the direction of propagation. In general, the figure, *i.e.*, polarization, is elliptical and is traced in a clockwise or counterclockwise sense, as viewed in the direction of propagation. If the major and minor axes of the ellipse are equal, the polarization is said to be *circular*. If the minor axis of the ellipse is zero, the polarization is said to be *linear*. Rotation of the electric vector in a clockwise sense is designated *right-hand polarization*, and rotation in a counterclockwise sense is designated *left-hand polarization*. *Note 2:* Mathematically, an elliptically polarized wave may be described as the vector sum of two waves of equal wavelength but unequal amplitude, and in quadrature (having their respective electric vectors at right angles and  $\pi/2$  radians out of phase).

**polarization diversity:** Diversity transmission and reception wherein the same information signal is transmitted and received simultaneously on orthogonally polarized waves with

fade-independent propagation characteristics

**polarization-maintaining (PM) optical fiber:** An optical fiber in which the polarization planes of lightwaves launched into the fiber are maintained during propagation with little or no cross-coupling of optical power between the polarization modes. [2196] *Note 1:* Cross sections of polarization-maintaining optical fibers range from elliptical to rectangular. *Note 2:* Polarization-maintaining optical fibers are used in special applications, such as in fiber optic sensing and interferometry. *Synonym* **polarization-preserving (PP) optical fiber.**

**polarization-preserving (PP) optical fiber:** *Synonym* **polarization-maintaining optical fiber.**

**polar operation:** A telegraph system in which marking signals are formed by current or voltage pulses of one polarity and spacing signals by current or voltage pulses of equal magnitude but opposite polarity (bipolar signal).

**polar orbit:** An orbit for which the angle of inclination is 90°. *Note:* A satellite in polar orbit will pass over both the north and south geographic poles once per orbit.

**polar relay:** A dc relay in which the direction of movement of the armature depends on the direction of the current flow.

**polling:** **1.** Network control in which the control station invites tributary stations to transmit in the sequence specified by the control station. **2.** In point-to-point or multipoint communication, the process whereby stations are invited one at a time to transmit. **3.** Sequential interrogation of devices for various purposes, such as avoiding contention, determining operational status, or determining readiness to send or receive data. **4.** In automated HF radio systems, a technique for measuring and reporting channel quality.

**polyinstantiation:** In cryptography, the existence of a cryptographic key in more than one secure physical location. [After X9.49]

**polymer-clad silica fiber:** *Synonym* **plastic-clad silica fiber.**

**POP:** *Acronym for* **point of presence.**

**port:** **1.** Of a device or network, a point of access where signals may be inserted or extracted, or where the device or network variables may be observed or measured. **2.** In a communications network, a point at which signals can enter or leave the network en route to or from another network.

**portability:** **1.** The ability to transfer data from one system to another without being required to recreate or reenter data descriptions or to modify significantly the application being transported. **2.** The ability of software or of a system to run on more than one type or size of computer under more than one operating system. *See* **POSIX.** **3.** Of equipment, the quality of being able to function normally while being conveyed.

**portable station:** **1.** A station capable of being carried by one or more persons. *Note:* A portable station usually has a self-contained power source and can be operated while being carried. **2.** A station designed to be carried by a person and capable of transmitting and/or receiving while in motion or during brief halts at unspecified locations. [NTIA] [RR]

**portal:** A Web page that serves as a point of entry for surfers of the World Wide Web. *Note:* Most of the popular portals are designed to optimize their compatibility with one or more Web search engines. Many portals also offer value-added services such as e-mail accounts, Web page hosting, or filtered information flow, with the costs of these services being underwritten by advertising. *Loosely synonymous with* **Web-page search engine.**

**port operations service:** A maritime mobile service in or near a port, between coast stations and ship stations, or between ship stations, in which messages are restricted to those relating to the operational handling, the movement and the safety of ships and, in emergency, to the safety of persons. Messages which are of a public correspondence nature shall be excluded from this service. [NTIA] [RR]

**portrait mode:** **1.** In facsimile, the mode of scanning lines across the shorter dimension of a rectangular original. *Note:* CCITT Group 1, 2, and 3 facsimile machines use portrait mode. **2.** In computer graphics, the orientation of an image in which the shorter dimension of the image is horizontal. **3.** An orientation of printed text on a page such that the lines of text are perpendicular to the long dimension of the page.

**port station:** A coast station in the port operations service. [NTIA] [RR]

**positioned channel:** In integrated services digital networks (ISDN), a channel that occupies dedicated bit positions in the framed data stream. *Note:* Examples of positioned channels are the B, H, and D channels.

**positioned interface structure:** Within a framed interface, a structure in which positioned channels provide all services and signaling.

**positioning time:** *Synonym* **seek time.**

**positive control material:** [A] generic term referring to a sealed authenticator system, permissive action link, coded switch system, positive enable system, or nuclear command and control documents, material, or devices. [INFOSEC-99]

**positive feedback:** *Synonym* **regeneration.**

**positive justification:** *Synonym* **bit stuffing.**

**POSIX:** *Acronym for* **portable operating system interface for computer environments.** A Federal Information Processing Standard Publication (FIPS PUB 151-1) for a vendor-independent interface between an operating system and an application program, including operating system interfaces and source code functions. *Note:* IEEE Standard 1003.1-1988 was adopted by reference and published as FIPS PUB 151-1.

**post:** To send a message, electronically, to a computer or computer system from which it can be retrieved electronically on demand by multiple authorized entities and on multiple occasions. *Note:* Said, *e.g.*, of messages on an electronic bulletin board.

**postalize:** In communications, to structure rates or prices so that they are not distance sensitive, but depend on other factors, such as call duration, type of service, and time of day.

**post-detection combiner:** *Synonym* **maximal-ratio combiner.**

**post-development review:** *Synonym* **system follow-up.**

**post-implementation review:** *Synonym* **system follow-up.**

**posting:** A message in a computerized messaging system, and which can be retrieved by multiple entities on multiple occasions. *Synonym* **article.**

**post-production processing:** In broadband ISDN (B-ISDN), applications, the processing of audio and video information after contribution and prior to final use.

**POT:** *Abbreviation for* **point of termination.**

**POTS:** *Abbreviation for plain old telephone service, plain old telephone set.*

**power:** **1.** The rate of transfer or absorption of energy per unit time in a system. **2.** Whenever the power of a radio transmitter *etc.* is referred to, it shall be expressed in one of the following forms, according to the class of emission, using the arbitrary symbols indicated:

- peak envelope power (PX or pX);
- mean power (PY or pY);
- carrier power (PZ or pZ).

For different classes of emission, the relationships between peak envelope power, mean power and carrier power, under the conditions of normal operation and of no modulation, are contained in CCIR Recommendations which may be used as a guide. For use in formulae, the symbol p denotes power expressed in watts and the symbol P denotes power expressed in decibels relative to a reference level. [NTIA] [RR]

**power budget:** The allocation, within a system, of available electrical power, among the various functions that need to be performed. *Note:* An example of a power budget in a communications satellite is the allocation of available power among various functions, such as maintaining satellite orientation, maintaining orbital control, performing signal reception, and performing signal retransmission. *Synonym system budget.*

**power circuit breaker (PCB):** **1.** The primary switch used to apply and remove power from equipment. **2.** A circuit breaker used on ac circuits rated in excess of 1500V.

**power density:** *Deprecated synonym for irradiance.*

**power down:** With respect to an electrical and especially an electronic device, to turn off or otherwise disconnect its primary source of electric power.

**power entrance facility (PEF):** A space in a building where commercial ac power, standby ac power, or both, enter the building. The PEF contains the ac service equipment and may also contain secondary ac surge protective devices. [T1.321-1995]

**power factor:** In alternating-current power transmission and distribution, the cosine of the phase angle between the voltage and current. *Note 1:* When the load is inductive, *e.g.*, an induction motor, the current lags the applied voltage, and the power factor is said to be a *lagging* power factor. When the load is capacitive, *e.g.*, a synchronous motor or a capacitive network, the current leads the applied voltage, and the power factor is said to be a *leading* power factor. *Note 2:* Power factors other than unity have deleterious effects on power transmission systems, including excessive transmission losses and reduced system capacity. Power companies therefore require customers, especially those with large loads, to maintain, within specified limits, the power factors of their respective loads or be subject to additional charges.

**power failure transfer:** **1.** The switching of primary utilities to their secondary backup whenever the primary source operates outside its design parameters. **2.** In telephony, a function, which, when activated in the event of a commercial power failure or a low-voltage battery condition at a subscriber location, supplies power to predesigned subscriber equipment via the central office trunk. *Note:* Power-failure transfer is an emergency mode of operation in which one and only one instrument may be powered from each trunk line from the subscriber location to the central office.

**power gain of an antenna:** *Synonym antenna gain.*

**power-law index profile:** For optical fibers, a class of graded-index profiles characterized by

$$n(r) = \begin{cases} n_1 \sqrt{1 - 2\Delta \left(\frac{r}{\alpha}\right)^g}, & r \leq \alpha \\ n_1 \sqrt{1 - 2\Delta}, & r \geq \alpha \end{cases}$$

where  $\Delta = \frac{n_1^2 - n_2^2}{2n_1^2}$ ,

where  $n(r)$  is the nominal refractive index as a function of distance from the fiber axis,  $n_1$  is the nominal refractive index on axis,  $n_2$  is the refractive index of the homogeneous cladding ( $n(r) = n_2$  when  $r \geq \alpha$ ),  $\alpha$  is the core radius, and  $g$  is a parameter that defines the shape of the profile. *Note 1:*  $\alpha$  is often used in place of  $g$ . Hence, this is sometimes called an alpha profile. *Note 2:* For this class of profiles, multimode distortion is smallest when  $g$  takes a particular value depending on the material used. For most materials, this optimum value is approximately 2. When  $g$  increases without limit, the profile tends to a step-index profile.

**power margin:** The difference between available signal power and the minimum signal power needed to overcome system losses and still satisfy the minimum input requirements of the receiver for a given performance level. *Note:* System power margin reflects the excess signal level, present at the input of the receiver, that is available to compensate for (a) the effects of component aging in the transmitter, receiver, or physical transmission medium, and (b) a deterioration in propagation conditions. *Synonym system power margin.*

**power up:** With respect to an electrical and especially an electronic device, to turn on or otherwise connect its primary source of electric power.

**Poynting vector:** The vector obtained in the direction of a right-hand screw from the cross-product (vector product) of the electric field vector rotated into the magnetic field vector of an electromagnetic wave. *Note:* The Poynting vector, with transmission media parameters and constants, gives the irradiance and direction of propagation of the electromagnetic wave. Mathematically:  $P = E \times H$ . [From Weik '89]

**PPM:** *Abbreviation for pulse-position modulation.*

**PPP:** *Abbreviation for point-to-point. See point-to-point configuration.*



**pre-arbitrated slot:** A slot dedicated by the head-of-bus function for transferring isochronous service octets.

**preassignment access plan:** In satellite communications system operations, a fixed communication channel access plan, as opposed to a demand assignment access plan in which allocation of accesses or the number of channels per access is varied in accordance with the demand. [From Weik '89]

**precedence:** In communications, a designation assigned to a message by the originator to indicate to communications personnel the relative order of handling and to the addressee the order in which the message is to be noted. [After JP1] *Note:* The descending order of precedence for military messages is FLASH, IMMEDIATE, PRIORITY, and ROUTINE.

**precipitation attenuation:** The loss of energy by an electromagnetic wave because of scattering, refraction, and/or absorption during its passage through a volume of the atmosphere containing precipitation such as rain, snow, hail, or sleet.

**precipitation static (p-static):** Radio interference caused by the impact of charged particles against an antenna. *Note:* Precipitation static may occur in a receiver during certain weather conditions, such as snowstorms, hailstorms, rainstorms, dust storms, or combinations thereof.

**precise frequency:** A frequency that is maintained to the known accuracy of an accepted reference frequency standard. *Note:* Current uncertainty among international standards is approximately 1 part in  $10^{14}$  as of 1995.

**precise time:** A time mark that is accurately known with respect to an accepted reference time standard. *Note:* Current uncertainty among international standards is approximately 1 part in  $10^{14}$  as of 1995.

**precise time and time interval (PTTI):** The discipline that addresses precise timekeeping and time information transfer.

**precision:** 1. The degree of mutual agreement among a series of individual measurements, values, or results; often, but not necessarily, expressed by the standard deviation. 2. With respect to a set of independent devices of the same design, the ability of these devices to produce the same value or result, given the same input conditions and operating in the same environment. 3. With respect to a single device, put into operation repeatedly without adjustments, the ability to produce the same value or result, given the same input conditions and operating in the same environment. *Synonym [for defs. 1, 2, and 3 above] reproducibility.* 4. In computer science, a measure of the ability to distinguish between nearly equal values. 5. The degree of discrimination with which a quantity is stated; for example, a three-digit numeral to the base 10 discriminates among 1000 possibilities.

**precision-sleeve splicing:** Optical fiber splicing that uses a capillary tube, of suitable material, to align the mating fibers. *Note:* The capillary tube has an inside diameter slightly larger than the cladding diameter of the two optical fibers to be spliced. The fibers are inserted, one from either end, to form a butt joint. The capillary tube may contain an index-matching gel, or the fibers may be secured with an adhesive having a refractive index that approximates that of the fibers. [From Weik '89]

**precombining:** The combining of multiplexed signals prior to the modulation of the carrier. [From Weik '89] *Synonym premodulation combining.*

**predesignation:** An exchange carrier (EC) service that is provided by suitably equipped end-office switching systems, and by means of which are provided carrier identification codes for calling users' calls outside the access service area when they are dialed without a customer accounting code (CAC). [After T1.104-199]

**predetection:** Referring to that portion of the circuitry of a receiver which, with respect to the signal being processed, is chronologically prior to the detection. *Note:* Predetection signals contain the carrier signal and all modulation, and are basically at radio frequencies.

**predetection combining:** *Synonym maximal-ratio combiner.*

**preemphasis:** A system process designed to increase, within a band of frequencies, the magnitude of some (usually higher) frequencies with respect to the magnitude of other (usually lower) frequencies, in order to improve the overall signal-to-noise ratio by minimizing the adverse effects of such phenomena as attenuation differences, or saturation of recording media, in subsequent parts of the system. *Note:* Preemphasis has applications, for example, in audio recording and FM transmission.

**preemphasis improvement:** In FM broadcasting, the improvement in the signal-to-noise ratio of the high-frequency portion of the baseband, *i.e.*, modulating, signal, which improvement results from passing the modulating signal through a preemphasis network. *Note:* Preemphasis increases the magnitude of the higher signal frequencies, thereby improving the signal-to-noise ratio. At the output of the discriminator in the FM receiver, a deemphasis network restores the original signal power distribution.

**preemphasis network:** A network inserted in a system in order to increase the magnitude of one range of frequencies with respect to another. *Note:* Preemphasis is usually employed in FM or phase modulation transmitters to equalize the modulating signal drive power in terms of deviation ratio. The receiver demodulation process includes a reciprocal network, called a deemphasis network, to restore the original signal power distribution.

**preempting call:** *See multilevel precedence and preemption.*

**preemption:** The seizure, usually automatic, of military system facilities that are being used to serve a lower precedence call in order to serve immediately a higher precedence call.

**preemption tone:** In military telephone systems, a distinctive tone that is used to indicate to connected users, *i.e.*, subscribers, that their call has been preempted by a call of higher precedence. *Note:* An example of preemption tone is a distinctive, steady, high-pitch tone transmitted for three seconds or until the preempted user hangs up. [From Weik '89]

**prefix:** [In telephone communications,] an indicator consisting of one or more digits, that allows the selection of different types of number formats (*e.g.*, local, national or international), transit networks and/or the service. *Note 1:* Prefixes are not part of the number and are not signaled over internetwork and international boundaries. *Note 2:* When prefixes are used, they are always entered by the user or by automatic calling equipment. [T1.Rpt30-1994]

**prefix-free code:** *Synonym comma-free code.*

**pregroup combining:** In communications systems, assembling a number of narrowband channels, such as 4-kHz-wide telephone channels, into a specified frequency band such that, after pregroup translation, they may be formed with other pregroups into a standard group, such as an ITU-T basic group, by frequency-division multiplexing. [From Weik '89]

**pregroup translation:** In communications systems, the process of transposing, in frequency, a pregroup of channels, such as telephone or data channels, in such a manner that they may be formed into a standard group, such as a CCITT (an ITU-T) basic group, by frequency-division multiplexing. [From Weik '89]

**preliminary call:** In radio transmission, a call that (a) includes at least the identification of the calling station and the called station, (b) is designed to establish communications with a particular station, and (c) usually includes a request to the called station to reply, although the request may be implied by the recitation of the call signs. [From Weik '89] *Note:* A preliminary call may be made on a frequency dedicated to that purpose only, and the rest of the communications session take place on a different frequency or frequencies.

**premature disconnect:** The termination of an established connection, where the termination is not initiated by either of the connected end-users. [T1-507-1996]

**premature disconnect stimulus:** The untimely occurrence of an event or a combination of events that, according to the protocol, should result in a disconnection. In addition, the occurrence of one or more of the following criteria generated between the portion boundaries is defined to be a premature disconnect stimulus: (a) bit error ratio worse than  $10^{nb}$ , for  $X_b$  number of consecutive observation periods of  $N_b$  duration; (b) block error ratio worse than  $10^{nB}$ , for  $X_B$  number of consecutive observation periods of  $N_B$  duration; (c) more

than X number of consecutive severely errored units of time. Receipt of a premature disconnect stimulus may result in a connection being disconnected and then reestablished. *Note:* Only that subset of these criteria specified for a given service is considered. [T1.507-1996]

**premises wiring:** *See on-premises wiring.*

**premodulation combining:** *Synonym precombining.*

**presence noise:** In telephony, a low-level artificial noise introduced into the receiver to indicate that the connection is still in effect, even though no voice sound is being transmitted (no one is speaking) or no voice sound is audible. [Mattila]

**presentation context:** An association of an abstract syntax with a transfer syntax. [T1.208-1989]

**Presentation Layer:** *See Open Systems Interconnection--Reference Model.*

**presentation unit:** The smallest convenient division of a media stream (defined by the measurement system) that conveys an independent, self-contained unit of content, from among the content hierarchy levels present in the stream. [T1.801.04-1997]

**preset conference:** A service feature that permits the automatic connection of a fixed group of users, or a closed user group with outgoing access, by keying a single directory number. [From Weik '89]

**preset jammer:** A jammer in which the frequency of the jamming transmitter is fixed before the transmitter is placed in operation. *Note:* Preset jammers are most useful in airborne jamming operations where weight and space requirements may prohibit the use of operators or elaborate control equipment in flight. Preset jammers are usually used in barrage-jamming over a wide band, usually in overlapping series of frequency bands. [From Weik '89]

**press-to-talk operation:** *Synonym push-to-talk operation.*

**press-to-type operation:** *Synonym push-to-type operation.*

**preventive maintenance (PM):** **1.** The care and servicing by personnel for the purpose of maintaining equipment and facilities in satisfactory operating condition by providing for systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects. [JP1] **2.** Maintenance, including tests, measurements, adjustments, and parts replacement, performed specifically to prevent faults from occurring.

**PRF:** *Abbreviation for pulse repetition frequency.*

**PRI:** *Abbreviation for primary rate interface.*

**primary channel:** **1.** The channel that is designated as a prime transmission channel and is used as the first choice in restoring priority circuits. **2.** In a communications network, the channel that has the highest data rate of all the channels sharing a common interface. *Note:* A primary channel may support the transfer of information in one direction only, either direction alternately, or both directions simultaneously.

**primary coating:** The plastic overcoat in intimate contact with the cladding of an optical fiber, applied during the manufacturing process. *Note 1:* The primary coating typically has an outside diameter of approximately 250 to 750  $\mu\text{m}$ , and serves to protect the fiber from mechanical damage and chemical attack. It also enhances optical fiber properties by stripping off cladding modes, and in the case where multiple fibers are used inside a single buffer tube, it suppresses cross-coupling of optical signals from one fiber to another. *Note 2:* The primary coating should not be confused with a tight buffer, or the plastic cladding of a plastic-clad-silica (PCS) fiber. [After FAA] *Note 3:* The primary coating, which typically consists of many layers, may be color-coded to distinguish fibers from one another, e.g., in a buffer tube containing multiple fibers. *Synonyms primary polymer coating, primary polymer overcoat.*

**primary colors:** **1.** Any group of two or more (three, in most applications) discrete colors (optical wavelengths) that are (a) of relatively narrow spectral width, and (b) visible to the normal human visual system (eyes and nervous system, including the brain), the additive mixture of which colors may be perceived by humans with normal color vision as any of a theoretically infinite number of other colors lying within the bounds defined by the positions of the discrete colors on a chromaticity diagram, e.g., the familiar 1931 CIE (Commission Internationale de l'Éclairage; International Commission on Illumination) chromaticity diagram. *Note:* Additive mixing consists of the combining (simultaneous presence, or emission) of two or more discrete optical wavelengths (spectrally narrow sources). In practice, this may be accomplished by various means, including (a) large numbers of contiguous discrete emitters that are too small to be resolved individually by the eye, such as the microscopic groups of dots, or stripes, of phosphors in a color CRT, and (b) spectrally narrow beams projected onto a common area on a diffusely reflective screen, as in certain projection color television displays. When additive mixing takes place, the human observer may perceive colors that are not actually present as represented by spectrally pure, discrete wavelengths. The actual number of colors that may be perceived in practice is limited by subjective discernment on the part of the individual observer. With respect to a given display system, the range of colors that may be represented to the observer is defined by the area (e.g., triangle) enclosed by straight lines connecting the primary colors on the chromaticity diagram. (In the case of only two primary colors, the range of perceived colors lies along the line connecting the primaries on the chromaticity diagram.) Colors lying outside this area on the chromaticity diagram cannot be represented, and thus may not be perceived by the human observer. Three is the number of primary colors usually chosen for electronic color displays. Three properly chosen primary colors can produce in the standard observer the perception (illusion) of an esthetically satisfactory approximation of the range of colors that might otherwise be perceived through observation of (a) a monochromatic source as it is swept in frequency (wavelength) throughout the entire visible range, or (b) sets of wavelengths selectively absorbed and reflected by objects in the observer's environment. The additional cost and technical complexity that would be involved in using four or more primary colors to facilitate perception of the remaining unperceived colors is not justified. (Actually, not all of the remaining colors would be perceived; there would be only a relatively insignificant improvement over three primaries.) The area on the chromaticity chart bounded by the three selected primary colors is sometimes referred to as a color triangle. **2.** In color television or display technology, the three specific colors (the reddish-orange, the green, and the bluish-purple) chosen to define (standardize) the colorimetry of color displays. **3.** An analogous group of colors represented by pigments, the subtractive mixing of which creates the perception of other colors. *Note:* Subtractive mixing (which has application in printing, including colored hard copies from a computer) is distinguished from additive mixing. Subtractive mixing takes place when pigments are mixed. The perceived color is a function of selective reflection, and hence, selective absorption, by the pigments. An example of subtractive mixing is the familiar mixing of blue and yellow pigments to produce the perception of green. *Synonym principal colors.*

**primary distribution system:** A system of alternating current distribution for supplying the primaries of distribution transformers from the generating station or substation distribution buses.

**primary frequency:** **1.** A frequency that is assigned for usual use on a particular circuit. **2.** The first-choice frequency that is assigned to a fixed or mobile station for radiotelephone communications.

**primary frequency standard:** A frequency source that meets national standards for accuracy and operates without the need for calibration against an external standard. *Note:* Examples of primary frequency standards are hydrogen masers and cesium beam frequency standards.

**primary group:** *See group.*

**primary interexchange carrier (PIC):** A carrier chosen by a subscriber to be accessible via simplified dialing pattern. [T1.246-1998/99]

**primary point code (PPC):** The point code identification of the primary destination of the signaling connection control plan (SCCP) routing verification test (SRVT) message. [T1.226-1992]

**primary polymer coating:** *Synonym primary coating.*

**primary polymer overcoat:** *Synonym primary coating.*

**primary power:** The source of electrical power that usually supplies the station main bus. *Note 1:* The primary power source may be a Government-owned generating plant or a public utility power system. *Note 2:* A Class A primary power source assures, to a high degree of reliability, a continuous supply of ac electrical power.

**primary protector:** A protective device placed on telecommunications conductors in accordance with ANSI/NFPA 70. [T1.321-1995]

**primary radar:** A radiodetermination system based on the comparison of reference signals with radio signals reflected from the position to be determined. [NTIA] [RR]

**primary radiation:** Radiation that is incident upon a material and produces secondary emission from the material.

**primary rate access (PRA) path:** The logical connection between extended superframe termination points (*i.e.*, path terminations) on the customer access (CA) and the customer installation (CI). [After T1.217-1991]

**primary rate interface (PRI):** An integrated services digital network (ISDN) interface standard (a) that is designated in North America as having a 23B+D channels, (b) in which all circuit-switched B channels operate at 64 kb/s, and (c) in which the D channel also operates at 64 kb/s. *Note:* The PRI combination of channels results in a digital signal 1 (T1) interface at the network boundary.

**primary reference source:** Equipment that provides a timing signal whose long-term accuracy is maintained at  $1 \times 10^{-11}$  or better with verification to Coordinated Universal Time (UTC), and whose timing signal may be used as the basis of reference for the control of other clocks within a network. The primary reference source may generate a timing signal completely autonomous of other references, in which case cesium beam technology is suitable. Alternatively, the primary reference source may not be a completely autonomous implementation, in which case it may employ direct control from normal UTC-derived frequency and time services. *Not to be confused with primary time standard, primary frequency standard.* [T1.101-1999] [T1.X1]

**primary route:** The predetermined path of a message from its source, *i.e.*, sending or originating station, to a message sink, *i.e.*, receiving, addressee, or destination station. *Note 1:* In telephone switchboard operations, the primary route is the route that is attempted first by the operators or equipment when completing a call. *Note 2:* Alternate routing is based on network traffic conditions and supervisory policy. [From Weik '89]

**primary service area:** The service area of a broadcast station in which the groundwave is not subject to objectionable interference or objectionable fading. [47CFR]

**primary station: 1.** In a data communication network, the station responsible for unbalanced control of a data link. *Note:* The primary station generates commands and interprets responses, and is responsible for initialization of data and control information interchange, organization and control of data flow, retransmission control, and all recovery functions at the link level. **2.** A radio or television broadcast station whose signal is received by, and rebroadcast by, a translator station.

**primary substation:** Equipment that switches or modifies voltage, frequency, or other characteristics of primary power.

**primary time standard:** A time standard that does not require calibration against another time standard. *Note 1:* Primary time standards are realized in practice as primary frequency standards, time and frequency being the mathematical inverses of one another. Examples of primary frequency standards are cesium standards and hydrogen masers. *Note 2:* By international agreement, the unit of time (the second) is defined in terms of the interval that transpires during a specified number of cycles (9,192,631,770 cycles) of the electromagnetic radiation associated with atomic resonance transitions between the two hyperfine ground-state levels of the cesium-133 atom in a magnetically neutral environment. *Note 3:* Realizable cesium frequency standards use a strong electromagnet to deliberately introduce a magnetic field of known strength, and which overwhelms that of the Earth. The presence of this strong magnetic field causes a slight, but known, increase in the atomic resonance frequency. Despite this precaution, minuscule frequency variations still exist among individual realizable cesium frequency standards. These variations are caused, among other factors, by slight variations in calibrating the currents in their respective electromagnets.

**primary traffic:** Traffic measured or studied during one or more study weeks for which data are collected and processed. Normally, a study period consists of four study weeks. [After T1.Rpt 11-1991] *Synonyms first-route traffic, study period.*

**primitive:** An abstract, implementation-independent, interaction between a layer service user and a layer service provider. [T1.629-1999]

**principal clock:** Of a set of redundant clocks, the clock that is selected for normal use. *Note 1:* The principal clock may be selected because of a property, *e.g.*, superior accuracy, that makes it a unique member of the set. *Note 2:* The term "*principal clock*" should not be confused with, or used as a synonym for, the term "*primary frequency standard*."

**principal colors:** *Synonym primary colors.*

**principal ground point (PGP):** A point within a structure that provides a means to join conductors requiring an earth reference to grounding electrodes. This point may be a separate busbar located in the structure near the entrance of the grounding electrode conductor(s), or it may be a point on a grounding electrode. In a central office, the PGP is reference point 0.

**print suppression:** [In INFOSEC,] eliminating the display of characters in order to preserve their secrecy. [INFOSEC-99]

**print-through:** With respect to magnetically recorded data, especially tape-recorded data (analog or digital), the unintentional transfer of data from one physical location to another by virtue of prolonged, intimate physical contact of the recording media. *Note 1:* Print-through is probably most commonly encountered when magnetic tape, stored on reels (including cassettes), is left for prolonged periods without being intentionally disturbed. Data (magnetic disturbances) may then be transferred between layers of tape. *Note 2:* The effects of print-through may, in the case of magnetic tapes, be minimized by rewinding them at timely intervals. *Note 3:* The effects of print-through are most serious in analog recordings. Digital recordings may be equally affected in terms of the magnitude of the disturbance caused by print-through, but its effects may usually be eliminated altogether and the original data recovered essentially without errors. This may be accomplished by the simple expedient of reading the data from the affected medium, *e.g.*, tape, with the threshold for declaring a "one" or "mark" being above the level that is manifest from print-through, and re-recording the data onto a clean recording medium. Analog recordings may not be so treated because there is no prior knowledge of the structure of the recorded signal.

**priority: 1.** Priority, unless specifically qualified, is the right to occupy a specific frequency for authorized uses, free of harmful interference from stations of other agencies. [NTIA] **2.** *Synonym priority level. 3.* In DOD record communications systems, one of the four levels of precedence used to establish the time frame for handling a given message. **4.** In DOD voice communications systems, one of the levels of precedence assigned to a subscriber telephone for the purpose of preemption of telephone services.

**priority level:** In the Telecommunications Service Priority system, the level that may be assigned to an NS/EP telecommunications service, which level specifies the order in which provisioning or restoration of the service is to occur relative to other NS/EP or non-NS/EP telecommunication services. *Note:* Priority levels authorized are designated (highest to lowest) "E," "1," "2," "3," "4," and "5" for provisioning and "1," "2," "3," "4," and "5" for restoration. *Synonym priority.*

**priority level assignment:** The priority level(s) designated for the provisioning or restoration of a particular NS/EP telecommunications service.

**priority message:** A category of precedence reserved for messages that require expeditious action by the addressee(s) and/or furnish essential information for the conduct of

operations in progress when routine precedence will not suffice. [JP 1-02]

**privacy:** **1.** In a communications system or network, the protection given to information to conceal it from unauthorized persons having access to the system or network at large. *Synonym segregation.* **2.** In a communications system, protection given to unclassified information, such as radio transmissions of law enforcement personnel, that requires safeguarding from unauthorized persons. **3.** In a communications system, the protection given to prevent unauthorized disclosure of the information in the system. *Note 1:* The required protection may be accomplished by various means, such as by communications security measures and by directives to operating personnel. *Note 2:* The limited protection given certain voice and data transmissions by commercial crypto equipment is sufficient to deter a casual listener, but cannot withstand a competent cryptanalytic attack.

**privacy and authentication management:** Functions to ensure the validity of both maintenance information and telecommunications network traffic key management, intrusion surveillance, and fraud control. [T1.Rpt34-1994]

**privacy indicator:** In Signaling System 7 (SS7) switching, information contained in the calling-party number parameter, which information indicates whether the calling party authorizes presentation of the calling-party number (caller ID) to the called party.

**privacy system:** [In INFOSEC, a] commercial encryption system that affords telecommunications limited protection to deter a casual listener, but cannot withstand a technically competent cryptanalytic attack. [INFOSEC-99]

**private automatic branch exchange (PABX):** *See* PBX.

**private automatic exchange (PAX):** *See* PBX.

**private branch exchange (PBX):** *See* PBX.

**private exchange (PX):** A private telecommunication switch that usually includes access to the public switched network.

**private key:** **1.** In a public-key cryptosystem, that key of a user's key pair which is known only to that user. [After X9.42] **2.** A cryptographic key created and kept private by a party. *Note:* A private key may be used for the following: to compute the corresponding public key; to make a digital signature which may be verified by the corresponding public key; to decrypt the message encrypted by corresponding public key; or, together with other information, to compute a piece of common shared secret information. [After X9.42] **3.** Encryption methodology in which the encryptor and decryptor use the same key, which must be kept secret. [INFOSEC-99]

**private line:** **1.** In telephone industry usage, a service that involves dedicated circuits, private switching arrangements, predefined transmission paths, or combination thereof, whether virtual or physical, and which provide communications between specific locations. **2.** Among subscribers to the public switched telephone network(s), a one-party switched access line.

**private line service:** **1.** A service for communications between specified locations for a continuous period or for regularly recurring periods at stated hours. [47 CFR Pt.36-A] **2.** A service whereby facilities for communication between two or more designated points are set aside for the exclusive use or availability for use of a particular customer and authorized users during stated periods of time. [47CFR]

**private NS/EP telecommunications services:** Non-common-carrier telecommunications services, including private line, virtual private line, and private switched network services.

**private prime factors:** In cryptographic applications, the two prime numbers, namely  $p$  and  $q$ , whose product  $pq$  is the modulus  $n$ . [After X9.31]

**privileged access:** Explicitly authorized access of a specific user, process, or computer to a computer resource(s). [INFOSEC-99]

**probe:** [An] Attempt to gather information about an information system (IS) or its users. [INFOSEC-99]

**procedure-oriented language:** A problem-oriented computer programming language that facilitates expressing a procedure in the form of explicit algorithms. *Note:* Examples of procedure-oriented languages are Fortran, ALGOL, COBOL, and PL/I.

**proceed-to-select:** In communications systems operation, pertaining to a signal or event in the call-access phase of a data call, which signal or event confirms the reception of a call-request signal and advises the calling data terminal equipment to proceed with the transmission of the selection signals. *Note:* Examples of proceed-to-select pertain to a dial tone in a telephone system.

**proceed-to-select signal:** In a communications system, a signal that indicates that the system is ready to receive a selection signal. *Note:* An example of a proceed-to-select signal is a dial tone.

**process computer system:** A computer system, with a process interface system, that monitors or controls a technical process.

**process control:** Automatic control of a process, in which a computer system is used to regulate the usually continuous operations or processes.

**process control equipment:** Equipment that measures the variables of a technical process, directs the process according to control signals from the process computer system, and provides appropriate signal transformation. *Note:* Examples of process control equipment include actuators, sensors, and transducers.

**process control system:** A system consisting of a computer, process control equipment, and possibly a process interface system. *Note:* The process interface system may be part of a special-purpose computer.

**process gain:** In a spread-spectrum communications system, the signal gain, signal-to-noise ratio, signal shape, or other signal improvement obtained by coherent band spreading, remapping, and reconstitution of the desired signal.

**processing unit:** A functional unit that consists of one or more processors and their internal storage.

**process interface system:** A functional unit that adapts process control equipment to the computer system in a process computer system.

**processor:** In a computer, a functional unit that interprets and executes instructions. *Note:* A processor consists of at least an instruction control unit and an arithmetic unit.

**processor outage:** A situation in which a signaling link becomes unavailable due to factors at a functional level higher than level 2. This may be because of, for example, a central processor failure. It may also be due to a manually initiated blocking of an individual signaling link. [T1.226-1992]

**procurement:** In the Federal Government, the process of obtaining services, supplies, and equipment in conformance with applicable laws and regulations.

**procurement lead time:** The interval between the initiation of a procurement action and receipt of the products or services purchased as the result of such action.

**profile dip:** *Synonym* index dip.

**profile dispersion:** See dispersion.

**profile parameter ( $g$ ):** In the power-law index profile of an optical fiber, the parameter,  $g$ , that defines the shape of the refractive-index profile. *Note:* The optimum value of  $g$  for minimum dispersion is approximately 2.

**pro forma message:** A standard form of message, that has elements that usually are understood by prearrangement among the originator, the addressee, and the communications system operators. [From Weik '89]

**program: 1.** A plan or routine for solving a problem on a computer. *Note:* Processing may include the use of an assembler, a compiler, an interpreter, or a translator to prepare the program for execution, as well as the execution of the program. The sequence of instructions may include statements and necessary declarations. **2.** A sequence of instructions used by a computer to do a particular job or solve a given problem. **3.** To design, write, and test programs.

**program architecture:** For a computer program, (a) the structure, relationships, and arrangement of the components of the program, (b) the program interfaces, and (c) the interface requirements for the program operating environment. [From Weik '89]

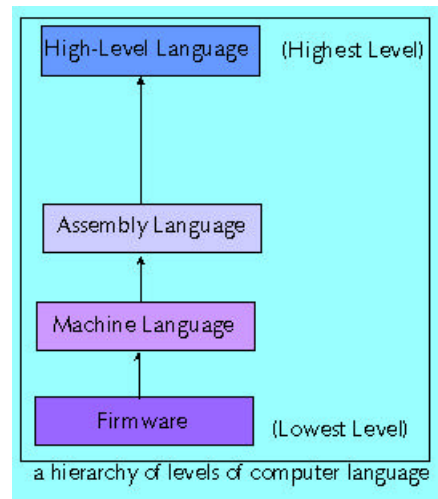
**programmable:** Pertaining to a device that can accept instructions that alter its basic functions.

**programmable logic array (PLA):** An array of gates having interconnections that can be programmed to perform a specific logical function.

**programmable read-only memory (PROM):** A storage device that, after being written to once, becomes a read-only memory.

**programmer: 1.** The part of digital equipment that controls the timing and sequencing of operations. **2.** A person who prepares computer programs, *i.e.*, writes sequences of instructions for execution by a computer.

**programming language:** An artificial language that is used to generate or to express computer programs. *Note:* The language may be a high-level language, an assembly language, or a machine language.



**programming system:** One or more programming languages and the software necessary for using these languages with particular automatic data processing equipment.

**program origin:** See computer program origin.

**Project 25:** A joint effort of U.S. Federal, state, and local governments to develop standards for interoperable digital, narrowband radios to meet public-safety user needs. *Note:* Secondary objectives of Project 25 include obtaining maximum radio spectrum efficiency, ensuring competition throughout the life of the systems.

**PROM:** Acronym for programmable read-only memory.

**prompt: 1.** In interactive display systems, a message on the display surface of a display device to help the user to plan and execute subsequent operations. *Note:* Examples of prompts include (a) a blinking message displayed on a screen to inform the system operator of the status, condition, or mode the system is in and requiring the operator to take some action, and (b) a message that the system is ready to accept a command. **2.** In a computer, communications, or data processing system, to inform a user that the system is ready for the next command, data element, or other input. [From Weik '89]

**propagation:** The motion of waves through or along a medium. *Note:* For electromagnetic waves, propagation may occur in a vacuum as well as in material media.

**propagation constant: 1.** For an electromagnetic field mode varying sinusoidally with time at a given frequency, the logarithmic rate of change, with respect to distance in a given direction, of the complex amplitude of any field component. *Note:* The propagation constant,  $\lambda$ , is a complex quantity given by  $\lambda = \alpha + i\beta$ , where  $\alpha$ , the real part, is the attenuation constant and  $\beta$ , the imaginary part, is the phase constant. **2.** In a physical transmission medium, *e.g.*, a coaxial cable or optical fiber, the velocity of an electrical or electromagnetic signal expressed as a decimal fraction of the speed of light in vacuo.

**propagation delay: 1.** The time required for a signal to travel from one point to another. **2.** In cryptography, the delay between the presentation of a clear text block to a TDEA mode and the availability of the resulting encrypted text. [After X9.52]

**propagation mode:** The manner in which radio signals travel from a transmitting antenna to a receiving antenna, such as ground wave, sky wave, direct wave, ground reflection, or scatter.

**propagation path obstruction:** A man-made or natural physical feature that lies near enough to a radio path to cause a measurable effect on path loss, exclusive of reflection effects. *Note:* An obstruction may lie to the side, above, or below the path. Ridges, bridges, cliffs, buildings, and trees are examples of obstructions. If the clearance from the nearest anticipated path position, over the expected range of Earth radius k-factor, exceeds 0.6 of the first Fresnel zone radius, the feature is not normally considered an obstruction.

**propagation time delay:** The time required for a signal to travel from one point to another.

**proprietary information:** Material and information relating to or associated with a company's products, business, or activities, including but not limited to financial information; data



or statements; trade secrets; product research and development; existing and future product designs and performance specifications; marketing plans or techniques; schematics; client lists; computer programs; processes; and know-how that have been clearly identified and properly marked by the company as "proprietary information," trade secrets, or company confidential information. The information must have been developed by the company and not be available to the Government or to the public without restriction from another source. [INFOSEC-99]

**proprietary standard:** Documentation by a commercial entity specifying equipment, practices, or operations unique to that commercial entity.

**proration: 1.** The proportional distribution or allocation of parameters, such as noise power and transmission losses, among a number of tandem-connected items, such as equipment, cables, links, or trunks, in order to balance the performance of communications circuits. *Synonym* **budgeting.** **2.** In a telephone switching center, the distribution or allocation of equipment or components proportionally among a number of functions, to provide a requisite grade of service.

**protected communications:** Telecommunications delivering their protection through use of type 2 products or data encryption standard equipment. [INFOSEC-99]

**protected distribution system (PDS):** [A] wireline or fiber-optic distribution system used to transmit unencrypted classified national security information through an area of lesser classification or control. [INFOSEC-99] *Note:* A complete protected distribution system includes the subscriber and terminal equipment and the interconnecting lines. *Deprecated synonym* **approved circuit.**

**protected frequency:** A frequency that is not to be deliberately jammed by friendly forces, usually during a specified period. [From Weik '89]

**protection:** *Synonym* **lockout.**

**protection channel:** The channel allocated to transport the working traffic during diversity routing. When diversity routing is invoked, traffic on the affected working channels is bridged onto the protection channels. [After T1.Rpt31-1994]

**protection equipment:** Type 2 product or data encryption standard equipment that the National Security Agency has endorsed to meet applicable standards for the protection of telecommunications or automated information systems containing national security information. [INFOSEC-1994 Draft]

**protection interval (PI):** In high-frequency (HF) radio automatic link establishment, the period between changes in the time-of-day portion of the time-varying randomization data used for encrypting transmissions.

**protection mapping:** Information that relates a protection requirement to a security transformation that is used to satisfy the specification. [After X9.41]

**protection profile (PP):** An implementation-independent set of security requirements for a family or category of targets of evaluation (TOEs) that meet specified consumer needs. [CC-99]

**protection ratio:** The minimum value of the wanted-to-unwanted signal ratio, usually expressed in decibels, at the receiver input determined under specified conditions such that a specified reception quality of the wanted signal is achieved at the receiver output. [NTIA] [RR]

**protection ring:** One of a hierarchy of privileged modes of an information system (IS) that gives certain access rights to user programs and processes that are authorized to operate in a given mode. [INFOSEC-99]

**protection switching (PS):** A feature of a transmission entity that enables data on a failed facility to be moved to an alternate facility. This feature may be either revertive or nonrevertive. [T1.231-1997]

**protective packaging:** [In INFOSEC.] packaging techniques for COMSEC material that discourage penetration, reveal a penetration has occurred or was attempted, or inhibit viewing or copying of keying material prior to the time it is exposed for use. [INFOSEC-99]

**protective technologies:** Special tamper-evident features and materials employed for the purpose of detecting tampering and deterring attempts to compromise, modify, penetrate, extract, or substitute information processing equipment and keying material. [INFOSEC-99]

**protector:** In telecommunications systems, a device used to protect facilities and equipment from abnormally high voltages or currents. *Note 1:* A protector may contain arresters. *Note 2:* Protectors may be designed to operate on short-duration phenomena, or long-duration phenomena. The duration should be specified.

**protocol: 1.** A formal set of conventions governing the format and control of interaction among communicating functional units. *Note:* Protocols may govern portions of a network, types of service, or administrative procedures. For example, a data link protocol is the specification of methods whereby data communications over a data link are performed in terms of the particular transmission mode, control procedures, and recovery procedures. **2.** In layered communications system architecture, a formal set of procedures that are adopted to facilitate functional interoperation within the layered hierarchy. **3.** [In INFOSEC, a] set of rules and formats, semantic and syntactic, permitting information systems (IS's) to exchange information. [INFOSEC-99]

**protocol abnormality:** In ISDN, a protocol event (a protocol error or other event) that indicates that a potential trouble condition exists on the ISDN interface. *Note:* Examples of events that are not protocol errors that may indicate potential trouble conditions are (a) the transmission of a DM (disconnect mode) in response to a SABME (set asynchronous balanced mode extended) command, and (b) transmission of a STATUS message. [After T1.218-1991]

**protocol-control information: 1.** The queries and replies among communications equipment to determine the respective capabilities of each end of the communications link. **2.** For layered systems, information exchanged between entities of a given layer, via the service provided by the next lower layer, to coordinate their joint operation.

**protocol converter:** A functional unit that uses a specified algorithm to translate a bit stream from one protocol to another, for interoperation.

**protocol data unit (PDU): 1.** Information that is delivered as a unit among peer entities of a network and that may contain control information, address information, or data. **2.** In layered systems, a unit of data that is specified in a protocol of a given layer and that consists of protocol-control information of the given layer and possibly user data of that layer.

**protocol discriminator (PD) field:** The first octet of the packet header that identifies the protocol used to transport the frame. [T1.509-1995]

**protocol hierarchy:** In open systems architecture, the distribution of network protocol among the various layers of the network. [From Weik '89]

**protocol translator:** In a communications system, the collection of hardware, software, firmware, or any combination of these, that is required or used to convert the protocols used in one network to those used in another network. [From Weik '89]

**prototype: 1.** A pre-production, functioning specimen(s) that is the first of its type, typically used for the evaluation of design, performance, and/or production potential. **2.** A model suitable for evaluation of design, performance, and production potential. [JP 1-02]

**provisioning: 1.** In telecommunications, the setting in place and configuring of the hardware and software required to activate a telecommunications service for a customer; in many cases the hardware and software may already be in place and provisioning entails only configuration tasks such as creating (or modifying) a customer record in a database and associating it with the service(s) and service level for which the customer has subscribed. **2.** The act of acquiring telecommunications service from the submission of the requirement

through the activation of service. *Note 1:* Provisioning includes all associated transmission, wiring, and equipment. *Note 2:* In NS/EP telecommunication services, "provisioning" and "initiation" are synonymous and include altering the state of an existing priority service or capability. **3.** Processes that arrange and connect equipment and facilities, and create their associated software and data base translations, in response to service demands and forecasts. In this sense, provisioning does not include equipment installations, but rather the state of the equipment, *i.e.*, in service, out of service, stand by, reserved, *etc.*, the state of which may also be controlled by provisioning functions. [After T1.226-1992] **4.** The act of supplying telecommunication service to a user, including all associated transmission, wiring, and equipment. [T1.211-1989] **5.** The process of establishing and supplying telecommunications service to a user, including an associated transmission, wiring, and telecommunications company equipment. [T1.222-1991]

**proxy:** **1.** See **firewall**. **2.** [An] Application acting on behalf of another application or system in responding to protocol requests. [INFOSEC-99]

**PRS:** See **primary reference source**.

**PS:** Abbreviation for **permanent signal**.

**pseudo bit-error ratio:** See **PBER**.

**pseudorandom noise:** Noise that satisfies one or more of the standard tests for statistical randomness. *Note 1:* Although it seems to lack any definite pattern, pseudorandom noise contains a sequence of pulses that repeat themselves, albeit after a long time or a long sequence of pulses. *Note 2:* For example, in spread-spectrum systems, modulated carrier transmissions appear as pseudorandom noise to a receiver (a) that is not locked on the transmitter frequencies or (b) that is incapable of correlating a locally generated pseudorandom code with the received signal.

**pseudorandom number generator:** **1.** A device that produces a stream of unpredictable, unbiased, and usually independent bits. **2.** In cryptosystems, a random bit generator used for key generation or to start all the crypto-equipment at the same point in the key stream.

**pseudorandom number sequence:** **1.** An ordered set of numbers that has been determined by some defined arithmetic process but is effectively a random number sequence for the purpose for which it is required. **2.** A sequence of numbers that satisfies one or more of the standard tests for statistical randomness. *Note:* Although a pseudorandom number sequence appears to lack any definite pattern, it will repeat after a very long time interval or after a very long sequence of numbers.

**p × 64:** In video teleconferencing, pertaining to a family of CCITT (now, ITU-T) Recommendations, where p is a non-zero positive integer indicating the number of 64 kb/s channels. *Note:* The p × 64 family includes Recommendations H.261, H.221, H.242, H.230, and H.320. These Recommendations form the basis for video telecommunications interoperability.

**PSK:** Abbreviation for **phase-shift keying**.

**PSN:** Abbreviation for **public switched network**.

**psophometer:** An instrument that provides a visual indication of the audible effects of disturbing voltages of various frequencies. *Note:* A psophometer usually incorporates a weighting network. The characteristics of the weighting network depend on the type of circuit under investigation, such as whether the circuit is used for high-fidelity music or for normal speech.

**psophometrically weighted dBm:** See **dBm(psoph)**, **dBm<sub>0p</sub>**.

**psophometric voltage:** Circuit noise voltage measured with a psophometer that includes a CCIF-1951 weighting network. *Note 1:* "Psophometric voltage" should not be confused with "psophometric emf," *i.e.*, the emf in a generator or line with 600 Ω internal resistance. For practical purposes, the psophometric emf is twice the corresponding psophometric voltage. *Note 2:* Psophometric voltage readings,  $V$ , in millivolts, are commonly converted to dBm(psoph) by  $\text{dBm(psoph)} = 20 \log_{10} V - 57.78$ .

**psophometric weighting:** A noise weighting established by the International Consultative Committee for Telephony (CCIF, which became CCITT and, more recently, ITU-T), designated as CCIF-1951 weighting, for use in a noise measuring set or psophometer. *Note:* The shape of this characteristic is virtually identical to that of F1A weighting. The psophometer is, however, calibrated with a tone of 800 Hz, 0 dBm, so that the corresponding voltage across 600 ohms produces a reading of 0.775 V. This introduces a 1-dBm adjustment in the formulas for conversion with dBa.

**PSTN:** Abbreviation for **public switched telephone network**.

**PTF:** Abbreviation for **patch and test facility**.

**PTM:** Abbreviation for **pulse-time modulation**.

**PTT:** Abbreviation for **postal, telegraph, and telephone (organization)**. In countries having nationalized telephone and telegraph services, the organization, usually a governmental department, which acts as its nation's common carrier.

**PTTI:** Abbreviation for **precise time and time interval**.

**public correspondence:** **1.** Any telecommunication which the offices and stations must, by reason of their being at the disposal of the public, accept for transmission. [NTIA] [RR] **2.** Any telecommunication which the offices and stations, by reason of their being at the disposal of the public, must accept for transmission. [47CFR]

**public cryptography:** [The] Body of cryptographic and related knowledge, study, techniques, and applications that is, or is intended to be, in the public domain. [INFOSEC-99]

**public data network (PDN):** A network established and operated by a telecommunications administration, or a recognized private operating agency, for the specific purpose of providing data transmission services for the public.

**public data transmission service:** A data transmission service that is established and operated by a telecommunication administration, or a recognized private operating agency, and uses a public data network. *Note:* A public data transmission service may include circuit-switched, packet-switched, and leased-circuit data transmission.

**public-key certificate:** **1.** *Synonym certificate*. **2.** Contains the name of a user, the public key component of the user, and the name of the issuer who vouches that the public key component is bound to the named user. [INFOSEC-99]

**public key cryptography:** **1.** The type of cryptography in which the encryption process is publicly available and unprotected, but in which a part of the decryption key is protected so that only a party with knowledge of both parts of the decryption process can decrypt the cipher text. *Note:* Commonly called non-secret encryption in professional cryptologic circles. FIREFLY is an application of public key cryptography. [NIS] **2.** [An] Encryption system using a linked pair of keys. What one pair of keys encrypts, the other pair decrypts. [INFOSEC-99]

**public-key encryption:** A form of encryption that utilizes a unique pair of keys, one (the "public key") being openly known, and the other (the "private key"), being known only to the recipient of an encrypted message. *Note 1:* At the recipient's discretion, the public key is made available to those who may have occasion to send an encrypted message to that recipient. The sender uses the recipient's public key to encrypt a message. The encrypted message, which cannot be decrypted by means of the public key, is then delivered by conventional means to the recipient, who uses the matching private key to decrypt the message. *Note 2:* Public-key encryption can also be used to add a digital signature to publicly

posted electronic messages. The poster of an electronic message feeds the text of the message into the encryption program, along with the poster's private key. A unique block of text (the digital signature) is generated and attached to the end of the message. Any other reader of the message can use the poster's public key to analyze the message text and the signature block. The encryption software will indicate whether or not the message text matches the digital signature. *Note 3:* Users of public-key encryption systems may register their public keys in several public databases.

**public key infrastructure (PKI):** [A] framework established to issue, maintain, and revoke public key certificates accommodating a variety of security technologies, including the use of software. [INFOSEC-99]

**public-key traceability:** In public-key cryptography, of the transmission protocol, the characteristic that facilitates verification, by the recipient of a message, of all public keys used in the intermediate relay steps involved in the transmission of the message.

**public key validation:** *See* key validation.

**public land mobile network (PLMN):** A network that is established and operated by an administration or by a recognized operating agency (ROA) for the specific purpose of providing land mobile telecommunications services to the public. *Note:* A PLMN may be considered as an extension of a fixed network, *e.g.* the Public Switched Telephone Network (PSTN) or as an integral part of the PSTN.

**public switched network (PSN):** **1.** Any common carrier network that provides circuit switching among public users. *Note:* The term is usually applied to public switched telephone networks, but it could be applied more generally to other switched networks, *e.g.* , packet-switched public data networks. **2.** A switched network accessible by the public for the purpose of originating and terminating telecommunications messages. [T1.209-1989] **3.** Any common carrier switched network, whether by wire or radio, including local exchange carriers, interexchange carriers, and mobile service providers, that use the North American Numbering Plan in connection with the provision of switched services. [47CFR]

**public switched NS/EP telecommunications services:** Those NS/EP telecommunications services utilizing public switched networks. *Note:* Public switched NS/EP telecommunication services may include both interexchange and intraexchange network facilities (*e.g.* , switching systems, interoffice trunks, and subscriber loops).

**public switched telephone network (PSTN):** A domestic telecommunications network usually accessed by telephones, key telephone systems, private branch exchange trunks, and data arrangements. *Note:* Completion of the circuit between the call originator and call receiver in a PSTN requires network signaling in the form of dial pulses or multifrequency tones.

**public utilities commission (PUC):** In the United States, a state regulatory body charged with regulating intrastate utilities, including telecommunications systems. *Note:* In some states this regulatory function is performed by public service commissions or state corporation commissions.

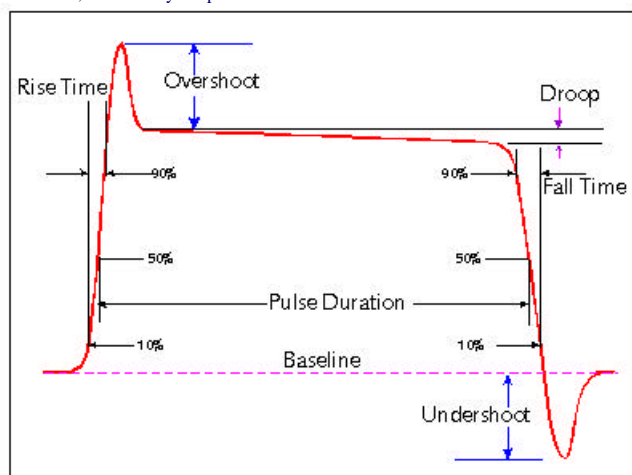
**PUC:** *Abbreviation for public utilities commission.*

**pull:** **1.** To request data from (a) another program, another computer or server, or (b) a data array within a program. [After Bahorsky] **2.** Of or relating to the technology designed to pull data from a server. [After Bahorsky]

**pull-in frequency range:** The maximum frequency difference between the local oscillator or clock and the reference frequency of a phase-locked loop over which the local oscillator can be locked.

**pulsating direct current:** A direct current (dc) that changes in value at regular or irregular intervals. *Note:* A pulsating direct current may change in value, *i.e.*, be always present but at different levels, or it may be a current that is interrupted completely at regular or irregular intervals, but when present, is always in the same direction.

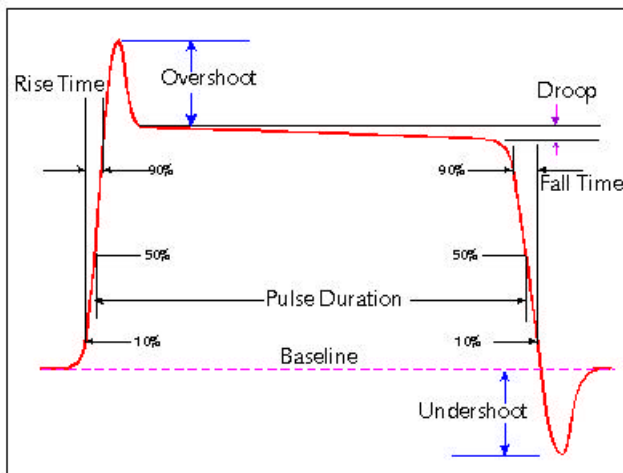
**pulse:** **1.** A rapid, transient change in the amplitude of a signal from a baseline value to a higher or lower value, followed by a rapid return to the baseline value. **2.** A rapid change in some characteristic of a signal, *e.g.*, phase or frequency, from a baseline value to a higher or lower value, followed by a rapid return to the baseline value.



representative pulse waveform

**pulse-address multiple access (PAMA):** The ability of a communication satellite to receive signals from several Earth terminals simultaneously and to amplify, translate, and relay the signals back to Earth, based on the addressing of each station by an assignment of a unique combination of time and frequency slots. *Note:* This ability may be restricted by allowing only some of the terminals access to the satellite at any given time.

**pulse amplitude:** The magnitude of a pulse parameter, such as the field intensity, voltage level, current level, or power level. *Note 1:* Pulse amplitude is measured with respect to a specified reference and therefore should be modified by qualifiers, such as "average," "instantaneous," "peak," or "root-mean-square." *Note 2:* Pulse amplitude also applies to the amplitude of frequency- and phase-modulated waveform envelopes.



representative pulse waveform

**pulse-amplitude modulation (PAM):** Modulation in which the amplitude of individual, regularly spaced pulses in a pulse train is varied in accordance with some characteristic of the modulating signal. *Note:* The amplitude of the amplitude-modulated pulses conveys the information.

**pulse broadening:** An increase in pulse duration. *Note:* Pulse broadening may be specified by the impulse response, the root-mean-square pulse broadening, or the full-duration-at-half-maximum pulse broadening.

**pulse carrier:** An electromagnetic wave that (a) consists of a series of pulses usually of constant length, amplitude, spacing, and repetition rate when not modulated and (b) usually is used as a subcarrier. [From Weik '89]

**pulse-code modulation (PCM):** Modulation in which a signal is sampled, and the magnitude (with respect to a fixed reference) of each sample is quantized and digitized for transmission over a common transmission medium. *Note 1:* In conventional PCM, before being digitized, the analog data may be processed (e.g., compressed), but once digitized, the PCM signal is not subjected to further processing (e.g., digital compaction) before being multiplexed into the aggregate data stream. *Note 2:* PCM pulse trains may be interleaved with pulse trains from other channels.

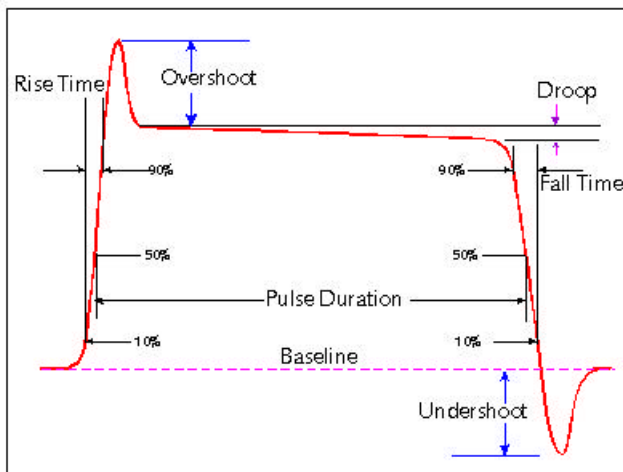
**pulse decay time:** *Synonym fall time.*

**pulse density:** A measure (or an expression) of the number of "ones" (marks, pulses) in relation to the total number of digit time slots transmitted. [After T1.408-1990]

**pulsed FM systems:** A spread spectrum system in which the RF carrier is modulated with a fixed period and fixed duty cycle sequence. *Note:* At the beginning of each transmitted pulse, the carrier frequency is frequency modulated which causes additional spreading of the carrier. The pattern of the frequency modulation depends upon the spreading function which is sweeping either up or down in frequency. [47 CFR 2.1]

**pulse distortion:** *See distortion.*

**pulse duration:** **1.** In a pulse waveform, the interval between (a) the time, during the first transition, that the pulse amplitude reaches a specified fraction (level) of its final amplitude, and (b) the time the pulse amplitude drops, on the last transition, to the same level. *Note:* The interval between the 50% points of the final amplitude is usually used to determine or define pulse duration, and this is understood to be the case unless otherwise specified. Other fractions of the final amplitude, e.g., 90% or  $1/e$  (where  $e = 2.71828...$ ), may also be used, as may the root-mean-square (rms) value of the pulse amplitude. *Deprecated synonyms pulse length, pulse width.* **2.** In radar, measurement of pulse transmission time in microseconds, that is, the time the radar's transmitter is energized during each cycle. [JP 1-02]



representative pulse waveform

**pulse-duration modulation (PDM):** Modulation in which the duration of pulses is varied in accordance with some characteristic of the modulating signal. *Deprecated synonyms pulse-length modulation, pulse-width modulation.*

**pulse duty factor:** In a periodic pulse train, the ratio of the pulse duration to the pulse period.

**pulse-frequency modulation (PFM):** Modulation in which the pulse repetition rate is varied in accordance with some characteristic of the modulating signal. *Note:* Pulse-frequency modulation is analogous to frequency modulation of a carrier wave, in which the instantaneous frequency is a continuous function of the modulating signal.

**pulse-interval modulation:** See **pulse-position modulation**.

**pulse length:** *Deprecated synonym for pulse duration.*

**pulse-length modulation:** *Deprecated synonym for pulse-duration modulation.*

**pulse link repeater (PLR):** A device that interfaces concatenated E&M signal paths. *Note 1:* A PLR converts a ground, received from the E lead of one signal path, to -48 Vdc, which is applied to the M lead of the concatenated signal path. *Note 2:* In many commercial carrier systems, the channel bank cards or modules have a "PLR" option that permits the direct connection, *i.e.*, concatenation, of E&M signaling paths, without the need for separate PLR equipment.

**pulse period:** The reciprocal of the pulse repetition rate.

**pulse-position modulation (PPM):** Modulation in which the temporal positions of the pulses are varied in accordance with some characteristic of the modulating signal.

**pulse-repetition frequency (PRF):** In radar applications, *synonym pulse repetition rate*.

**pulse repetition rate:** The number of pulses per unit time.

**pulse-repetition-rate modulation:** *Synonym pulse-frequency modulation.*

**pulse rise time:** See **rise time**.

**pulse string:** *Synonym pulse train.*

**pulse stuffing:** See **bit stuffing**.

**pulse-time modulation (PTM):** The general class of pulse-code modulation in which the time of occurrence of some characteristic of the pulsed carrier is varied with respect to some characteristic of the modulating signal. *Note:* PTM includes pulse-position modulation and pulse-duration modulation.

**pulse train:** A series of pulses having similar characteristics. *Synonym pulse string.*

**pulse width:** *Deprecated synonym for pulse duration.*

**pulse-width modulation (PWM):** *Deprecated synonym for pulse-duration modulation.*

**pulsing:** In telephony, the transmission of address information to a switching office by means of pulses, *i.e.*, signals, that originate from the subscriber, *i.e.*, user, equipment. *Note:* Examples of pulsing methods are dual-tone multifrequency (DTMF) signaling, in which a unique pair of audio frequencies represents each of the respective numerals or other characters on a keypad, and rotary dialing, in which dc pulses are generated by a rotary dial. *Synonyms key pulsing* (when using a keypad), **dial pulsing** (when using a rotary dial).

**pump frequency:** The frequency of an oscillator used to provide sustaining power to a device, such as a laser or parametric amplifier, that requires rf or optical power.

**pumping:** The action of an oscillator that provides cyclic inputs to an oscillating reaction device. *Note:* Examples of pumping are the action that results in amplification of a signal by a parametric amplifier, and the action that provides a laser or maser with an input signal at the appropriate frequency to sustain stimulated emission.

**pure binary numeration system:** See **binary notation**.

**purging:** Rendering stored information unrecoverable by laboratory attack. [INFOSEC-99]

**push:** **1.** In electronic marketing, to send data to another computer without a direct request from (via) that computer. [After Bahorsky] **2.** In networking, to send data from a server to a client in compliance with a previous request from (via) the client, as soon as the data are available. [After 2382-pt.35]

**pushbutton dialing:** Dialing in which (a) pushbuttons or keys are used to actuate and connect audible tone oscillators to a line, (b) each button or key corresponds to a unique frequency or set of frequencies (as in dual-tone multifrequency signaling or DTMF), and (c) each pushbutton or key represents a unique digit or symbol. [After Weik '89]

**push-down file:** See **last-in first-out**.

**push-to-talk (PTT) operation:** In telephone or two-way radio systems, that method of communication over a speech circuit in which the talker is required to keep a switch operated while talking. *Note:* In two-way radio, push-to-talk operation must be used when the same frequency is employed by both transmitters. For use in noisy environments, or for privacy, some telephone handsets have push-to-talk switches that allow the speaker to be heard only when the switch is activated. *Synonym press-to-talk operation.*

**push-to-type operation:** In telegraph or data transmission systems, that method of communication in which the operator at a station must keep a switch operated in order to send messages. *Note 1:* Push-to-type operation is used in radio systems where the same frequency is employed for transmission and reception. *Note 2:* Push-to-type operation is a derivative form of transmission and may be used in simplex, half-duplex, or duplex operation. *Synonym press-to-type operation.*

**PVC:** *Abbreviation for permanent virtual circuit.*

**pW:** *Abbreviation for picowatt.* A unit of power equal to  $10^{-12}$  W, *i.e.*, -90 dBm. *Note:* One picowatt is usually used as a reference level for both weighted and unweighted noise measurements. The type of measurement must be specified.

**PWM:** *Abbreviation for pulse-width modulation, which is a deprecated synonym for pulse-duration modulation.*

**pWp:** *Abbreviation for picowatt, psophometrically weighted.* See **noise weighting**.

**pWp0:** *Abbreviation for picowatts, psophometrically weighted*, measured at a zero-dBm transmission level point. See **dBm(psoph)**, **psophometer**.

**pX:** *Abbreviation for peak envelope power (of a radio transmitter).*

**PX:** **1.** *Abbreviation for private exchange*; See **PBX**. **2.** *Abbreviation for peak envelope power.*

**QA:** *Abbreviation for quality assurance.*



**QAM:** Abbreviation for **quadrature amplitude modulation**.

**QC:** Abbreviation for **quality control**.

**QCIF:** Abbreviation for **quarter common intermediate format**.

**QOS:** Abbreviation for **quality of service**.

**QPSK:** Abbreviation for **quadrature phase-shift keying**.

**QRS:** Abbreviation for **quasi-random signal**. A signal consisting of a bit sequence that approximates a random signal. [T1.201-1989] The unframed QRS (QRSS, QRTS, QRW) for DS1 consists of a PRBS with a 20-stage shift register with a constraint that forces the "put to a one" when the next 14 bits in the sequence would be zeros. The QRS generates every combination of 20-bit words, repeats every 1,048,575 bits, and contains high density sequences, low density sequences, and sequences that change from low density to high density and vice versa. When transmitted as the payload of a DS1 signal (framed), the QRS meets the pulse density definition "a" criteria, providing a maximum of 15-sequential zeros (14 + 1 when the frame bit is a zero), but does not meet the pulse density definition "b" criteria. (ANSI T1.403 states: 'the quasi-random signal may be transmitted without meeting these pulse density constraints.')[T1.Rpt25-1993] Contrast with **pseudorandom number sequence**.

**QRSS:** Abbreviation for **quasi-random signal source**.

**QRTS:** Abbreviation for **quasi-random test signal**.

**QRW:** Abbreviation for **quasi-random word**.

**quad:** A group of four wires composed of two pairs twisted together. *Note:* The pairs have a fairly long length of twist and the quad a fairly short length of twist.

**quadded cable:** A cable formed of multiples of quads, paired and separately insulated, and contained under a common jacket.

**QUADRANT:** [A] short name referring to technology that provides tamper-resistant protection to crypto-equipment. [INFOSEC-99]

**quadratic profile:** *Synonym* **parabolic profile**.

**quadrature:** **1.** The state of being separated in phase by 90° ( $\pi/2$  radians). **2.** Pertaining to the phase relationship between two periodic quantities varying with the same period, that is, with the same frequency or repetition rate, when the phase difference between them is one-quarter of their period.

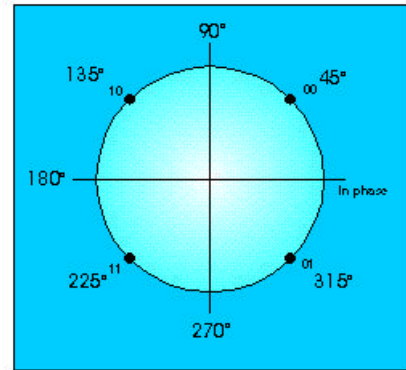
**quadrature amplitude modulation (QAM):** **1.** Quadrature modulation in which the two carriers are amplitude modulated. **2.** In analog communications, the representation (*i.e.*, transmission) of digital information by encoding bit sequences of fixed, specified length (number of bits), and representing these bit sequences as a function of (a) the amplitude of an analog carrier; or (b) a phase shift of the analog carrier with respect to the phase that represented the preceding bit sequence, and where the permissible phase shift is an integral multiple of  $\pi/2$  radians (90°, or one-quarter unit interval); or (c) both. *Note 1:* The name quadrature originates from the stipulation that a phase shift, when required, must be an integral multiple of  $\pi/2$  radians, *i.e.*, one-quarter of a cycle (unit interval, or baud). *Note 2:* A representative QAM table is presented below. If the baud (carrier) rate is 1200 Hz (the usual case in modems used on conventional telephone lines), this QAM scheme permits transmission of a data rate of 9600 b/s, which is the product of the baud rate and the number of permissible phase-amplitude states.

Bit Sequence Represented	Normalized Carrier Amplitude	Relative Phase Shift (Degrees)
000	1/2	0 (0°)
001	1	0 (0°)
010	1/2	$\pi/2$ (90°)
011	1	$\pi/2$ (90°)
100	1/2	$\pi$ (180°)
101	1	$\pi$ (180°)
110	1/2	$3 \pi/2$ (270°)
111	1	$3 \pi/2$ (270°)

Any continuous bit stream may be represented as a combination of the eight permissible bit sequences in the above table, and transmitted as such. *Note 3:* According to mathematical theory, there is no limit to the data rate that may be supported by, or associated with, a given baud rate in a perfectly stable, noiseless transmission environment. In practice, the governing factors are the amplitude (and consequently, phase) stability, and the amount of noise present, in both the terminal equipment and the transmission medium (carrier frequency, or communication channel) involved. Nor does the permitted relative (incremental) phase shift necessarily have to be a multiple of  $\pi/2$  radians, but of course the name "quadrature" would not apply if any other minimum phase shift were specified or permitted.

**quadrature modulation:** Modulation using two carriers out of phase by 90° and modulated by separate signals.

**quadrature phase-shift keying (QPSK):** Phase-shift keying in which four different phase angles are used. *Note:* In QPSK, the four angles are usually out of phase by 90°. *Synonyms* **quadriphase, quaternary phase-shift keying**.

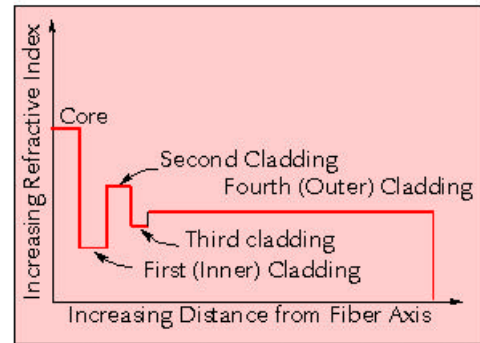


quadrature phase-shift keying

**quadrphase:** *Synonym* quadrature phase-shift keying.

**quadruple diversity:** In radio communication, diversity transmission and reception in which four independently fading signals are used. *Note:* Quadruple diversity may be accomplished through the use of space, frequency, angle, time, or polarization multiplexing, or combinations of these.

**quadruply clad fiber:** A single-mode optical fiber that has four claddings. *Note 1:* Each cladding has a refractive index lower than that of the core. With respect to one another, their relative refractive indices are, in order of distance from the core, lowest, highest, lower, higher. *Note 2:* A quadruply clad fiber has the advantage of very low macrobending losses. It also has two zero-dispersion points, and moderately low dispersion over a wider wavelength range than a singly clad fiber or a doubly clad fiber.



refractive index profile, quadruply clad single-mode fiber

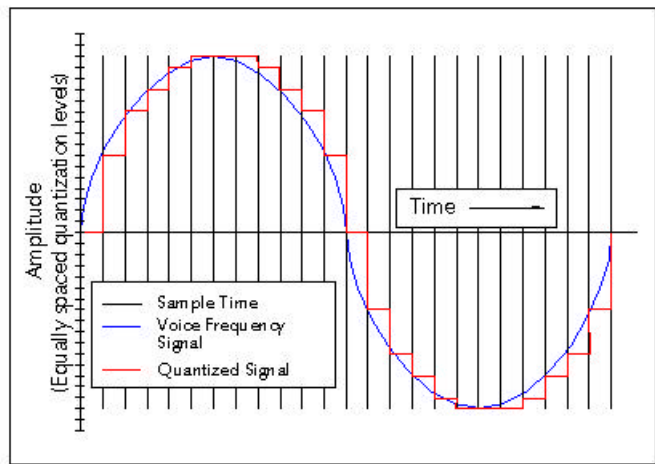
**quality assurance (QA):** **1.** All actions taken to ensure that standards and procedures are adhered to and that delivered products or services meet performance requirements. **2.** The planned systematic activities necessary to ensure that a component, module, or system conforms to established technical requirements. **3.** The policy, procedures, and systematic actions established in an enterprise for the purpose of providing and maintaining a specified degree of confidence in data integrity and accuracy throughout the life cycle of the data, which includes input, update, manipulation, and output.

**quality control (QC):** A management function whereby control of the quality of (a) raw materials, assemblies, produced material, and components, (b) services related to production, and (c) management, production, and inspection processes is exercised for the purpose of preventing undetected production of defective material or the rendering of faulty services.

**quality factor:** In a reactive circuit, the ratio of the reactance in ohms divided by the resistance in ohms.

**quality of service (QOS):** **1.** The performance specification of a communications channel or system. *Note:* QOS may be quantitatively indicated by channel or system performance parameters, such as signal-to-noise ratio (S/N), bit error ratio (BER), message throughput rate, and call blocking probability. **2.** A subjective rating of telephone communications quality in which listeners judge transmissions by qualifiers, such as excellent, good, fair, poor, or unsatisfactory.

**quantization:** A process in which the continuous range of values of an analog signal is sampled and divided into nonoverlapping (but not necessarily equal) subranges, and a discrete, unique value is assigned to each subrange. *Note:* An application of quantization is its use in pulse-code modulation. If the sampled signal value falls within a given subrange, the sample is assigned the corresponding discrete value for purposes of modulation and transmission.



quantization

**quantization error:** *Synonym quantizing distortion.*

**quantization level:** In the quantization process, the discrete value assigned to a particular subrange of the analog signal being quantized.

**quantization noise:** *Synonym quantizing noise.*

**quantized feedback:** In a digital feedback loop, the digital signal that is fed back. *Note 1:* Several forms of analog-to-digital converters contain a quantized feedback loop following the basic A-D converter. *Note 2:* The feedback signal is often processed before introducing it to the loop.

**quantizing distortion:** Distortion that results from the quantization process. *Synonym quantization error.*

**quantizing levels:** In digital transmission, the number of discrete signal levels transmitted as the result of signal digitization.

**quantizing noise:** Noise caused by the error of approximation in quantization. *Note:* Quantizing noise is dependent on the particular quantization process used and the statistical characteristics of the quantized signal. *Synonym quantization noise.*

**quantum efficiency:** In an optical source or detector, the ratio of the number of output quanta to the number of input quanta. *Note:* Input and output quanta need not both be photons.

**quantum-limited operation:** *Synonym quantum-noise-limited operation.*

**quantum noise:** Noise attributable to the discrete and probabilistic nature of physical phenomena and their interactions. *Note 1:* Quantum noise represents the fundamental limit of the achievable signal-to-noise ratio of an optical communication system. This limit is never achieved in practice. [After FAA] *Note 2:* Examples of quantum noise are photon noise in an optical signal and shot noise in an electrical conductor or semiconductor.

**quantum-noise-limited operation:** Operation wherein the minimum detectable signal is limited by quantum noise. *Synonym quantum-limited operation.*

**quarter common intermediate format (QCIF):** A video format defined in ITU-T Recommendation H.261 that is characterized by 176 luminance pixels on each of 144 lines, with half as many chrominance pixels in each direction. *Note:* QCIF has one-fourth as many pixels as the full common intermediate format.

**quartz clock:** A clock containing a quartz oscillator that determines the accuracy and precision of the clock.

**quartz oscillator:** An oscillator in which a quartz crystal is used to stabilize the frequency. *Note:* The piezoelectric property of the quartz crystal results in a nearly constant output frequency, which is dependent upon the crystal size, shape, and excitation.

**quasi-analog signal:** A digital signal that has been converted to a form suitable for transmission over a specified analog channel. *Note:* The specification of the analog channel should include frequency range, bandwidth, signal-to-noise ratio, and envelope delay distortion. When quasi-analog form of signaling is used to convey message traffic over dial-up telephone systems, it is often referred to as voice-data. A modem may be used for the conversion process.

**quasi-analog transmission:** Transmission in which a special-purpose modulator is used to convert digital signals into an analog form suitable for transmission over an analog voice-grade circuit. *Note:* A complementary demodulator is used to recover the digital signal at the other end of the circuit. *See modem.*

**quasi-associated mode of signaling:** A limited case of the nonassociated mode of signaling in which the path taken by a message through the signaling network is predetermined and fixed at a given point in time. [T1.226-1992]

**quasi-lossless compression:** In video and multimedia applications, the bit-rate reduction of an image signal, by an algorithm that recognizes the high degree of correlation ascertainable in specific images. *Note 1:* The final image does not replicate the original when viewed in direct comparison, but the losses are designed to be unrecognizable under the intended display conditions. *Note 2:* The algorithm may often apply transform coding, predictive techniques, and other modeling to the image signal, along with some form of entropy encoding. *Note 3:* While the image appears unaltered to normal human vision, it may show losses and artifacts when analyzed by other systems (*i.e.*, chroma key, computerized image analysis, *etc.*). [After SMPTE] *Note 4:* The lost information cannot be extracted from the compressed bit stream.

**quasi-random signal (QRS):** *See QRS.*

**quaternary phase-shift keying:** *Synonym quadrature phase-shift keying.*

**quaternary signal:** A digital signal having four significant conditions.

**query call:** In adaptive high-frequency (HF) radio, an automatic-link-establishment (ALE) call that requests responses from stations having connectivity to the destination specified in the call.

**queue:** A set of items, such as telephone calls or packets, arranged in sequence. *Note:* Queues are used to store events occurring at random times and to service them according to a

prescribed discipline that may be fixed or adaptive.

**queue traffic:** **1.** A series of outgoing or incoming calls waiting for service. **2.** In a store-and-forward switching center, the outgoing messages awaiting transmission at the outgoing line position.

**queuing:** The process of entering elements into or removing elements from a queue.

**queuing delay:** **1.** In a switched network, the time between the completion of signaling by the call originator and the arrival of a ringing signal at the call receiver. *Note:* Queues may be caused by delays at the originating switch, intermediate switches, or the call receiver servicing switch. **2.** In a data network, the sum of the delays between the request for service and the establishment of a circuit to the called data terminal equipment (DTE). **3.** In a packet-switched network, the sum of the delays encountered by a packet between the time of insertion into the network and the time of delivery to the addressee.

**queuing theory:** The theoretical study of waiting lines, expressed in mathematical terms—including components such as number of waiting lines, number of servers, average wait time, number of queues or lines, and probabilities of queue times—either increasing or decreasing. *Note:* Queuing theory is directly applicable to network telecommunications, server queuing, mainframe computer queuing of telecommunications terminals, and advanced telecommunications systems.

**quieting:** In an FM receiver, the phenomenon that results in less noise when an unmodulated carrier is present than when there is no carrier present. *Note:* Quieting is expressed in dB.

**quiet zone:** With respect to the rf spectrum, an area in which emissions are restricted for the purpose of minimizing possible impact on the operations of radio astronomy or other activities that are highly sensitive to rf interference.

**quincunx sampling:** **1.** In a digital video system, a sampling structure where the luminance and color-difference samples are generated from pixels arranged on one of two congruent rectilinear grids. *Note:* One grid is displaced horizontally from the other by half the horizontal pixel spacing. The alternate grid is usually chosen for alternate lines, but may also be chosen for alternate field/frames. [After SMPTE] **2.** In a digital video system, a sampling structure with an array of samples where alternate rows of pixel samples are displaced horizontally in the grid by half of the pitch of the pixel samples along the remaining rows. [After SMPTE] *Note:* The name of this sampling was chosen directly from the classical Latin, *quincunx*, for the symbolic resemblance to the figure "5" (as seen in the "X" arrangement of pips on dice or playing cards). [After SMPTE]

**raceway:** Within a building, an enclosure, *i.e.*, channel, used to contain and protect wires, cables, or bus bars.

**rack:** A frame upon which one or more units of equipment are mounted. *Note:* DOD racks are always vertical.

**racon:** See radar beacon.

**rad:** Acronym for radiation absorbed dose. The basic unit of measure for expressing absorbed radiant energy per unit mass of material. *Note 1:* A rad corresponds to an absorption of 0.01 J/kg, *i.e.*, 100 ergs/g. *Note 2:* The absorbed radiant energy heats, ionizes, and/or destroys the material upon which it is incident.

**rad.:** Abbreviation for radian(s).

**radar:** Acronym for radio detection and ranging. **1.** A radio detection system that transmits short bursts (pulses) of rf energy and detects their echoes from objects (targets) such as aircraft or ships. *Note:* The round-trip propagation time for the echo return may be used to determine the target's range (distance from the radar's antenna). If the transmitting antenna has a narrow beam (the usual case), the azimuth or elevation of the target may also be determined. *Synonym primary radar.* **2.** A radio detection device that provides information on range, azimuth, and/or elevation of objects. [JP 1-02] **3.** A radiodetermination system based on the comparison of reference signals with radio signals reflected, or retransmitted, from the position to be determined. [NTIA] [RR]

**radar beacon (racon):** **1.** A transmitter-receiver associated with a fixed navigational mark which, when triggered by a radar, automatically returns a distinctive signal which can appear on the display of the triggering radar, providing range, bearing and identification information. [NTIA] [RR] **2.** A receiver-transmitter combination which sends out a coded signal when triggered by the proper type of pulse, enabling determination of range and bearing information by the interrogating station or aircraft. [JP 1-02]

**radar blind range:** The range that corresponds to the situation in which a radar transmitter is on and hence the receiver must be off, so that the radar transmitted signal does not saturate, *i.e.*, does not blind, its own receiver. *Note:* Radar blind ranges occur because there is a time interval between transmitted pulses that corresponds to the time required for a pulse to propagate to the object, *i.e.*, to the target, and its reflection to travel back. This causes an attempt to measure the range just as the radar transmitter is transmitting the next pulse. However, the receiver is off, therefore this particular range cannot be measured. The width of the range value that cannot be measured depends on the duration of the time that the radar receiver is off, which depends on the duration of the transmitted pulse. The return-time interval could be coincident with the very next radar-transmitted pulse, *i.e.*, the first pulse following a transmitted pulse, or the second, or the third, and so on, giving rise to a succession of blind ranges. The blind ranges are given by  $r_m = (m c) / (2fn)$ , where  $r_m$  is the blind range for a given value of  $m$ ,  $m$  is a positive integer that indicates which of the blind ranges is being determined,  $c$  is the velocity of electromagnetic wave propagation in vacuum (approximately  $3 \times 10^8$  m/s),  $f$  is the radar pulse repetition rate, and  $n$  is the refractive index of the transmission medium (nearly 1 for air). The radar blind range is independent of the radar radio frequency (rf) of the radar pulse. [From Weik '89]

**radar blind speed:** The magnitude of the radial component of velocity of an object, *i.e.*, a target, relative to a radar site, that cannot be measured by the radar unit. *Note:* Radar blind speeds occur because of the relationship between the transmitted pulse repetition rate (PRR) and the received pulse-repetition rate. The Doppler pulse repetition rate is the difference between the transmitted and received pulse repetition rates. For example, when the object is stationary with respect to the radar site, the reflected PRR is the same as the transmitted PRR and therefore a net zero signal is indicated for the radial component of velocity. If it happens that the Doppler PRR is the same as the transmitted PRR, *i.e.*, the illuminating PRR, or it is a multiple of the transmitted PRR, a zero signal is also obtained and hence the radar is blind to these speeds, one for each multiple of the transmitted pulse repetition rate. It is not the absolute magnitude of the speed of the object that is measured, but only the radial component of the speed. The radial components of blind speeds,  $v_m$ , are given by  $v_m = m \lambda f / 102$ , where  $v$  is the blind speed in knots,  $m$  is the multiple of the radar pulse repetition rate and the number of the blind speed, namely a positive integer, 1, 2, 3, 4, . . ., for the first, second, third, fourth, and so on, blind speed,  $\lambda$  is the wavelength of the illuminating radar in centimeters;  $f$  is the transmitter pulse repetition rate in pps (pulses per second); and the 102 is a units conversion factor. [From Weik '89]

**radar cross section:** An expression of the extent to which an object, *i.e.*, a target, reflects radar pulses, usually with respect to their point of origin. *Note:* The radar cross section of an aircraft can vary by a factor of over 100, depending on the aspect angle of the aircraft to the radar transmitter. Radar reflection off the nose of the aircraft usually represents the smallest radar cross section, while a broadside presentation to the signal produces the greatest cross section. Shape, surface roughness, and reflective material as well as orientation also affect the radar cross section. [From Weik '89]

**radar intelligence (RADINT):** Intelligence derived from data collected by radar. [JP 1-02]

**radar line-of-sight (LOS) equation:** An equation that expresses the radar horizon range (RHR), given by

$$RHR_s = \sqrt{2h} + \sqrt{2a}$$

$$= 1.414(\sqrt{h} + \sqrt{a}) ,$$

where  $RHR_s$  is the radar horizon range in statute miles,  $h$  is the antenna height in feet, and  $a$  is the object critical altitude, *i.e.*, the target altitude in feet, below which the radar cannot illuminate the object. *Note:* The RHR is also given by

$$RHR_k = 4.12(\sqrt{h} + \sqrt{a}) ,$$

where  $RHR_k$  is the radar horizon range in kilometers when  $h$  and  $a$  are in meters. The effective Earth radius, namely 4/3 times the actual Earth radius, is used in deriving these formulas. The effective Earth radius for LOS varies with carrier frequency. Second-order differentials are neglected. They contribute less than 0.1%. [From Weik '89]

**radar mile:** The time required for a radar pulse to travel 1 mile (~1.6 km) to an object, *i.e.*, to a target; reflect; and return to the receiver. *Note:* A radar statute mile is approximately 10.8  $\mu$ s (microseconds); a radar nautical mile is approximately 12.4  $\mu$ s. The time for any other radar unit distance is readily determined, such as the radar meter or the radar kilometer. [From Weik '89]

**radar resolution cell:** The volume of space that is occupied by a radar pulse and that is determined by the pulse duration and the horizontal and vertical beamwidths of the transmitting radar. *Note:* The radar cannot distinguish between two separate objects that lie within the same resolution cell. The radar resolution cell depth ( $RCD$ ) remains constant regardless of the distance from the transmitting antenna. It does not increase with range. The  $RCD$  is given by  $RCD = 150d$ , where the  $RCD$  is in meters and  $d$  is the pulse duration in microseconds. The height of the cell and the width of the cell do increase with range. These are given by  $W = (HBW)(R/57)$  and  $H = (VBW)(R/57)$ , where  $W$  is the width of the cell,  $HBW$  is the horizontal beamwidth in degrees,  $R$  is the range,  $H$  is the height of the cell, and  $VBW$  is the vertical beamwidth in degrees. The range,  $R$ , is the distance from the radar antenna to the reflecting object, *i.e.*, the target. The width and height will come out in the same units in which the range is given. For example, if the range is given in meters, the width and height of the radar resolution cell will be in meters. The 57 merely converts degrees to radians. If the beamwidths are given in radian measure, the 57 is omitted. [From Weik '89]

**radar signature:** **1.** The detailed waveform of a detected radar echo. *Note:* Radar signatures may be used to identify or distinguish among objects, *i.e.*, targets, such as aircraft, decoys, missiles with warheads, and chaff. [From Weik '89] **2.** The detailed characteristics of a radar transmission. *Note:* Radar signatures based upon emission analysis may be used to identify or distinguish among specific radar types.

**RADHAZ:** Acronym for electromagnetic radiation hazards.

**radian (rad.):** A unit of plane angle measure equal to the angle subtended at the center of a circle by an arc equal in length to the radius of the circle. *Note:* One radian is equal to  $360^\circ/2\pi$ , which is approximately  $57^\circ 17' 44.6''$ .

**radiance:** Radiant power, in a given direction, per unit solid angle per unit of projected area of the source, as viewed from the given direction. *Note:* Radiance is usually expressed in watts per steradian per square meter.

**radiant emittance:** Radiant power emitted into a full sphere, *i.e.*,  $4\pi$  sr (steradians), by a unit area of a source, expressed in watts per square meter. *Synonym* **radiant exitance**.

**radiant energy:** Energy in the form of electromagnetic waves. *Note 1:* Radiant energy may be calculated by integrating radiant power with respect to time. *Note 2:* Radiant energy is usually expressed in joules.

**radiant exitance:** *Synonym* **radiant emittance**.

**radiant flux:** *Deprecated synonym for radiant power*.

**radiant intensity:** Radiant power per unit solid angle, usually expressed in watts per steradian.

**radiant power:** The rate of flow of electromagnetic energy, *i.e.*, radiant energy. *Note 1:* Radiant power is usually expressed in watts, *i.e.*, joules per second. *Note 2:* The modifier is often dropped and "power" is used to mean "radiant power". *Deprecated synonyms* **flux**, **radiant flux**.

**radiation:** **1.** In communication, the emission of energy in the form of electromagnetic waves. **2.** The outward flow of energy from any source in the form of radio waves. [NTIA] [RR]

**radiation angle:** In fiber optics, half the vertex angle of the cone of light emitted at the exit face of an optical fiber. *Note:* The cone boundary is usually defined (a) by the angle at which the far-field irradiance has decreased to a specified fraction of its maximum value or (b) as the cone within which there is a specified fraction of the total radiated power at any point in the far field. *Synonym* **output angle**.

**radiation efficiency:** At a given frequency, the ratio of the power radiated to the total power supplied to the radiator.

**radiation field:** *Synonym* **far-field region**.

**radiation-hardened fiber:** An optical fiber made with core and cladding materials that recover, within a specified period of time, a specified percentage of their intrinsic transparency after darkening from exposure to a radiation pulse.

**radiation mode:** For an optical fiber, an unbound mode. *Note:* In an optical fiber, a radiation mode is one having fields that are transversely oscillatory everywhere external to the waveguide, and which exists even at the limit of zero wavelength. Specifically, a radiation mode is one for which

$$\beta = \sqrt{n^2(\alpha)k^2 - (l/\alpha)^2} ,$$



where  $\beta$  is the imaginary part (phase term) of the axial propagation constant, integer  $l$  is the azimuthal index of the mode,  $n(a)$  is the refractive index, where  $a$  is the core radius, and  $k$  is the free-space wave number,  $k = 2\pi/\lambda$ , where  $\lambda$  is the wavelength. Radiation modes correspond to refracted rays in the terminology of geometric optics. *Synonym unbound mode.*

**radiation pattern: 1.** The variation of the field intensity of an antenna as an angular function with respect to the axis. *Note:* A radiation pattern is usually represented graphically for the far-field conditions in either horizontal or vertical plane. **2.** In fiber optics, the relative power distribution at the output of a fiber or active device as a function of position or angle. *Note 1:* The near-field radiation pattern describes the radiant emittance ( $W \cdot m^{-2}$ ) as a function of position in the plane of the exit face of an optical fiber. *Note 2:* The far-field radiation pattern describes the irradiance as a function of angle in the far-field region of the exit face of an optical fiber. *Note 3:* The radiation pattern may be a function of the length of the fiber, the manner in which it is excited, and the wavelength. *Synonym directivity pattern.*

**radiation resistance:** The resistance that, if inserted in place of an antenna, would consume the same amount of power that is radiated by the antenna.

**radiation scattering:** The diversion of radiation (thermal, electromagnetic, or nuclear) from its original path as a result of interaction or collisions with atoms, molecules, or larger particles in the atmosphere or other media between the source of radiation (e.g., a nuclear explosion) and a point some distance away. As a result of scattering, radiation (especially gamma rays and neutrons) will be received at such a point from many directions instead of only from the direction of the source. [JP1]

**RADINT:** *Acronym for radar intelligence.*

**radio: 1.** Telecommunication by modulation and radiation of electromagnetic waves. **2.** A transmitter, receiver, or transceiver used for communication via electromagnetic waves. **3.** A general term applied to the use of radio waves. [NTIA] [RR]

**radio access system controller:** A controller that supports the wireless mobility management and wireless access call control functions. It serves one or more subtending radio port controllers and may be associated with one or more PCS switching centers. [After T1.Rpt34-1994]

**radio altimeter:** Radionavigation equipment, on board an aircraft or spacecraft, used to determine the height of the aircraft or the spacecraft above the Earth's surface or another surface. [NTIA] [RR]

**radio and wire integration (RWI):** The combining of wire circuits with radio facilities. [JP 1-02]

**radio baseband:** *See baseband.*

**radiobeacon station:** A station in the radionavigation service the emissions of which are intended to enable a mobile station to determine its bearing or direction in relation to the radiobeacon station. [NTIA] [RR]

**radio beam:** A radiation pattern from a directional antenna, such that the energy of the transmitted electromagnetic wave is confined to a small angle in at least one dimension.

**radio channel:** An assigned band of frequencies sufficient for radio communication. *Note 1:* The bandwidth of a radio channel depends upon the type of transmission and the frequency tolerance. *Note 2:* A channel is usually assigned for a specified radio service to be provided by a specified transmitter.

**radio channel privacy:** An encryption treatment applied to signaling or user data, which treatment is intended to prevent an unauthorized detector of the data from extracting information. [T1.Rpt34-1994]

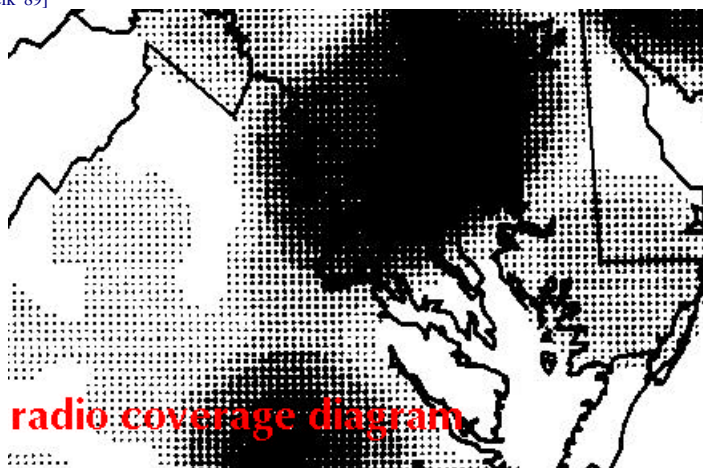
**radio common carrier (RCC):** A telecommunications common carrier that provides radio communications services but is not engaged in the business of providing landline local exchange telephone service. [47CFR]

**radiocommunication:** Telecommunication by means of radio waves. [NTIA] [RR] [47CFR]

**radiocommunication service:** A service as defined in this Section [of the *Radio Regulations*] involving the transmission, emission and/or reception of radio waves for specific telecommunication purposes. In these regulations, unless otherwise stated, any radiocommunication service relates to terrestrial radiocommunication. [NTIA] [RR]

**radio control:** The remote control of an apparatus by signals conveyed by electromagnetic waves. *Note:* Radio control may be used to control the movement of an aircraft, vehicle, missile, or other mobile unit, either manned or unmanned, from a radio station on the ground or in another mobile unit. [From Weik '89]

**radio-coverage diagram:** A diagram that shows the area within which a radio station is broadcasting an effective signal strength in relation to a given standard. *Note:* An example of a radio-coverage diagram is a polar plot, in each direction from the antenna, of the distance from the antenna at which the signal strength is equal to a specified value, i.e., it is the locus of all points at which the signal strength is equal to a specified value. [From Weik '89]



**radio detection:** The detection of the presence of an object by radiolocation without precise determination of its position. [JP 1-02]

**radio detection and ranging:** *See radar.*

**radiodetermination:** The determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the

propagation properties of radio waves. [NTIA] [RR] [47CFR]

**radiodetermination-satellite service:** A radiocommunication service for the purpose of radiodetermination involving the use of one or more space stations. This service may also include feeder links necessary for its own operation. [NTIA] [RR] [47CFR]

**radiodetermination station:** A station in the radiodetermination service. [NTIA] [RR]

**radio direction-finding [RDF]:** Radiodetermination using the reception of radio waves for the purpose of determining the direction of a station or object. [NTIA] [RR]

**radio direction-finding station:** A radiodetermination station using radio direction-finding. [NTIA] [RR]

**radio equipment:** As defined in *Federal Information Management Regulations*, any equipment or interconnected system or subsystem of equipment (both transmission and reception) that is used to communicate over a distance by modulating and radiating electromagnetic waves in space without artificial guide. This does not include such items as microwave, satellite, or cellular telephone equipment.

**radio facility:** The bearer/signaling connection between the radio port intermediary and the radio port controller. [T1.Rpt34-1994]

**radio fadeout:** See **flutter**.

**radio field intensity:** *Synonym field strength.*

**radio fix: 1.** The locating of a radio transmitter by bearings taken from two or more direction finding stations, the site of the transmitter being at the point of intersection. [JP 1-02] **2.** The location of a ship or aircraft by determining the direction of radio signals coming to the ship or aircraft from two or more sending stations, the locations of which are known. [JP 1-02]

**radio frequency:** See **RF**.

**radio frequency assignment:** See **frequency assignment**.

**radio frequency channel assignment:** *Synonym frequency assignment.*

**radio frequency interference (RFI):** *Synonym electromagnetic interference.*

**radio horizon:** The locus of points at which direct rays from an antenna are tangential to the surface of the Earth. *Note:* If the Earth were a perfect sphere and there were no atmospheric anomalies, the radio horizon would be a circle. In practice, the distance to the radio horizon is affected by the height of the transmitting antenna, the height of the receiving antenna, atmospheric conditions, and the presence of obstructions, e.g., mountains.

**radio horizon range (RHR):** The distance at which a direct radio wave can reach a receiving antenna of given height from a transmitting antenna of given height. *Note:* The radio horizon range in nautical miles,  $R$ , is given by the relation  $R = 1.23(h_t^{1/2} + h_r^{1/2})$ , where  $h_t$  and  $h_r$  are the heights of the transmitting and receiving antennas in feet. The radio horizon range,  $R$ , in nautical miles is also given by the relation  $R = 2.23(h_t^{1/2} + h_r^{1/2})$ , where  $h_t$  and  $h_r$  are the heights of the transmitting and receiving antennas in meters. The effective Earth radius, 4/3 times the actual Earth radius, is used in deriving the formulae. Second-order differentials are neglected. They are of the order of 0.1%. [From Weik '89]

**radio interface:** The common boundary between a mobile station and the radio equipment in the network, which is the boundary defined by functional characteristics, physical interconnection characteristics, signal characteristics, and other characteristics as appropriate.

**radiolocation:** Radiodetermination used for purposes other than those of radionavigation. [NTIA] [RR] [47CFR]

**radiolocation land station:** A station in the radiolocation service not intended to be used while in motion. [NTIA] [RR] [47CFR]

**radiolocation mobile station: 1.** A station in the radiolocation service intended to be used while in motion or during halts at unspecified points. [NTIA] [RR] **2.** A station intended to be used while in motion or during halts at unspecified points. [47CFR]

**radiolocation service:** A radiodetermination service for the purpose of radiolocation. [NTIA] [RR]

**radiological monitoring:** *Synonym monitoring.*

**radiometry:** The science of radiation measurement. See *Table of Radiometric Terms*.

TABLE OF RADIOMETRIC TERMS

Term	Symbol	Quantity	Unit
radiant energy	Q	energy	joule (J)
radiant power <i>Synonym optical power</i>	$\Phi$	power	watt (W)
irradiance	E	power incident per unit area (irrespective of angle)	$W \cdot m^{-2}$
spectral irradiance	$E_\lambda$	irradiance per unit wavelength interval at a given wavelength	$W \cdot m^{-2} \cdot nm^{-1}$
radiant emittance <i>Synonym radiant exitance</i>	W	power emitted (into a full sphere) per unit area	$W \cdot m^{-2}$
radiant intensity	I	power per unit solid angle	$W \cdot sr^{-1}$
radiance	L	power per unit angle per unit projected area	$W \cdot sr^{-1} \cdot m^{-2}$
spectral radiance	$L_\lambda$	radiance per unit wavelength interval at a given wavelength	$W \cdot sr^{-1} \cdot m^{-2} \cdot nm^{-1}$

**radionavigation: 1.** Radiolocation intended for the determination of position or direction or for obstruction warning in navigation. [JP 1-02] **2.** Radiodetermination used for the purposes of navigation, including obstruction warning. [NTIA] [RR] [47CFR]

**radionavigation land station:** A station in the radionavigation service not intended to be used while in motion. [NTIA] [RR]

**radionavigation mobile station:** A station in the radionavigation service intended to be used while in motion or during halts at unspecified points. [NTIA] [RR]

**radionavigation-satellite service:** A radiodetermination-satellite service used for the purpose of radionavigation. This service may also include feeder links necessary for its operation. [NTIA] [RR]

**radio net:** **1.** An organization of radio stations that is capable of direct communication on a common frequency. **2.** An organization of radio stations that broadcast common programming, not necessarily simultaneously, at different frequencies from different locations.

**radio paging:** The use of a pocket-size radio receiver capable of alerting its wearer that there is a phone call, either from a displayed phone number or to a predesignated number. *Note:* Radio paging may be considered a subset of paging. *Synonym* **beeping.**

**radio personal terminal (RPT):** A light-weight, pocket-size portable radio terminal (or "personal terminal") providing the capability for the user to be either stationary or in motion while accessing and using telecommunication services. [T1.244-1995] *Synonym* [loosely] **brick.**

**radio port:** A unit that supports transmission of signals over the air interface. [After T1.Rpt34-1994]

**radio port controller:** A controller that provides an interface between one or more subtending radio port intermediaries and a PCS switching center, and supports air interface independent radio frequency transmission and reception functions. [After T1.Rpt34-1994]

**radio range:** **1.** The distance from a transmitter at which the signal strength remains above the minimum usable level for a particular antenna and receiver combination. **2.** A radio aid to air navigation that creates an infinite number of paths in space throughout a given sector or azimuth angle by various methods of transmission and reception of electromagnetic waves. [From Weik '89]

**radio range station:** A radionavigation land station in the aeronautical radionavigation service providing radial equisignal zones. (In certain instances a radio range station may be placed on board a ship.) [NTIA]

**radio recognition and identification:** *See* **identification, friend or foe.**

**Radio Regulations:** As used in legal documents, the latest (*i.e.*, as of the document date) ITU Radio Regulations to which the United States is a party.

**Radio Regulations Board:** A permanent organization of the International Telecommunication Union (ITU) that implements frequency assignment policy and maintains the Master International Frequency Register (MIFR). *Note:* Formerly **International Frequency Registration Board (IFRB).**

**radio relay:** **1.** The reception and retransmission by a radio station of signals that are received either from another radio station or from a wire, fiber optic, microwave, coaxial cable, or other link of an integrated land line and radio communications system component. **2.** A terrestrial point-to-point communications system, such as a microwave-relay communications system or a satellite communications system. *Note:* The siting of radio-relay stations and the radio coverage diagrams of the antenna patterns are arranged for minimum interference with satellite Earth stations. The analog and digital baseband arrangements are similar to satellite systems. Radio-relay links may form part of the connection between an Earth station and a switching center. [From Weik '89]

**radio relay system:** A point-to-point radio transmission system in which signals are received, conditioned, and retransmitted by one or more intermediate radio stations.

**radiosonde:** An automatic radio transmitter in the meteorological aids service usually carried on an aircraft, free balloon, kite, or parachute, and which transmits meteorological data. [NTIA] [RR]

**radiotelegram:** A telegram, originating in or intended for a mobile station or a mobile Earth station transmitted on all or part of its route over the radiocommunication channels of the mobile service or of the mobile-satellite service. [NTIA] [RR]

**radio telegraphy:** The transmission of telegraphic codes by means of radio. [JP 1-02]

**radiotelemetry:** Telemetry by means of radio waves. [NTIA] [RR]

**radiotelephone call:** A telephone call, originating in or intended for a mobile station or a mobile Earth station, transmitted on all or part of its route over the radiocommunication channels of the mobile service or of the mobile-satellite service. [NTIA] [RR]

**radiotelephone distress frequency:** An international distress and calling frequency for mobile radiotelephone stations, survival craft, and emergency position-indicating radio beacons. *Note:* An example of a radiotelephone distress frequency is 2180 kHz. [From Weik '89]

**radio telephony:** The transmission of speech by means of modulated radio waves. [JP 1-02]

**radio teletypewriter (RTTY):** A teletypewriter employed in a communication system using radio circuits. *Note:* Such systems are spoken of as RATT systems.

**radiotelex call:** A telex call, originating in or intended for a mobile station or a mobile Earth station, transmitted on all or part of its route over the radiocommunication channels of the mobile service or the mobile-satellite service. [NTIA] [RR]

**radio termination (RT):** A device or functionality that terminates radio transmissions, performs radio channel management, provides rate adaptation between the radio channel and the user channel and provides mobility management functions. [T1.702-1995] [T1.705]

**radio wave:** An electromagnetic wave of a frequency arbitrarily lower than 3000 GHz. *Synonym* **Hertzian wave.**

**radio watch shift:** *Synonym* **area broadcast shift.**

**radio-wire integration:** *See* **radio and wire integration.**

**Rainbow Series:** [A] set of publications that interpret Orange Book requirements for trusted systems. [INFOSEC-99]

**RAM:** *Acronym for* **random access memory.**

**Raman amplifier:** *Synonym* **fiber amplifier.**

**Raman scattering:** The generation of many different wavelengths of light from a nominally single-wavelength source (a) by means of lasing action and interaction with molecules, thereby creating many different excited molecular energy levels that will produce photons of various energy levels, *i.e.*, various wavelengths, when transitions to lower excited states occur and (b) by the beating together of two frequencies, thus inducing dipole moments in molecules at the difference frequencies and thereby causing modulation of laser-molecule interaction, which, in turn, produces light at side frequencies, *i.e.*, side wavelengths relative to the nominal wavelength. [From Weik '89]

**random access discrete address (RADA):** A communications technique in which radio users share one wide frequency band instead of each user's being assigned a narrow band.

**random access memory (RAM):** A read/write, nonsequential-access memory used for the storage of instructions and data. *Note 1:* RAM access time is essentially the same for all storage locations. *Note 2:* RAM is characterized by a shorter access time than disk or tape storage. *Note 3:* RAM is usually volatile.

**random data:** Data that are (a) unpredictable and have no discernable pattern, or (b) satisfy certain mathematical criteria for statistical randomness.

**random errors:** Errors distributed over the signal in time so that they can be considered statistically independent from each other. [T1.226-1992]

**randomizer: 1.** A device used to invert the sense of pseudorandomly selected bits of a bit stream to avoid long sequences of bits of the same sense. *Note:* The same selection pattern must be used on the receive terminal in order to restore the original bit stream. **2.** [An] analog or digital source of unpredictable, unbiased, and usually independent bits. Randomizers can be used for several different functions, including key generation or to provide a starting state for a key generator. [INFOSEC-99]

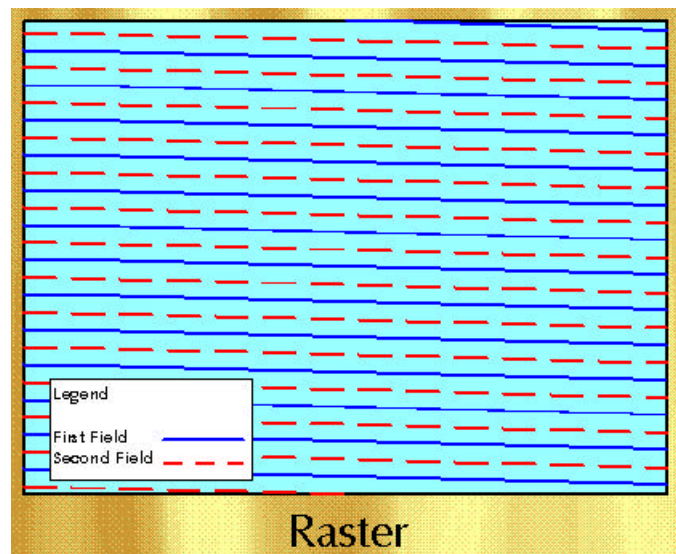
**random noise:** Noise consisting of a large number of transient disturbances with a statistically random time distribution. *Note:* Thermal noise is an example of random noise.

**random number: 1.** A number selected from a known set of numbers in such a way that each number in the set has the same probability of occurrence. **2.** A number obtained by chance. **3.** One of a sequence of numbers considered appropriate for satisfying certain statistical tests or believed to be free from conditions that might bias the result of a calculation.

**range:** See **radio range**.

**ranging:** The measurement of the distance to a remote object (target), from a known observation or reference point. *Note:* Ranging may be accomplished by geometric means, e.g., triangulation, or by the measurement of the transit time of an electromagnetic or acoustic signal. Ranging has application to navigation and cartography.

**raster:** A predetermined pattern of scanning lines within a display space. *Note:* An example of a raster is the pattern followed by an electron beam scanning the screen of a television camera or receiver.



**raster count:** The total number of raster scanning lines within a display space. [From Weik '89]

**raster density:** In display systems, the number of scanning lines per unit distance perpendicular to the scanning direction. [From Weik '89]

**raster graphics:** *Synonym [loosely] bitmapped graphics.*

**raster scanning:** Scanning in which the motion of the scanning spot follows a raster.

**rated output power:** That power available at a specified output of a device under specified conditions of operation. *Note:* Rated output power may be further described; e.g., maximum rated output power, average rated output power.

**ratio-squared combiner:** *Synonym maximal-ratio combiner.*

**ray:** A geometric representation of a lightwave by a line normal to the electromagnetic wavefront; i.e., in the direction of propagation of the wave. [FAA]

**Rayleigh distribution:** A mathematical statement, usually applied to frequency distributions of random variables, for the case in which two orthogonal variables are independent and normally distributed with unit variance.

**Rayleigh fading:** In electromagnetic wave propagation, phase-interference fading caused by multipath, and which may be approximated by the Rayleigh distribution.

**Rayleigh scattering:** Of an electromagnetic wave propagating in a material medium, scattering caused by refractive-index inhomogeneities that are small compared to the wavelength. *Note 1:* Rayleigh scattering losses vary as the reciprocal of the fourth power of the wavelength. *Note 2:* Ionospheric scattering is caused partly by Rayleigh scattering.

**ray optics:** *Synonym geometric optics.*

**RBOC:** Acronym for **Regional Bell Operating Company**.

**RCC:** Abbreviation for **radio common carrier**.

**R/C:** Abbreviation for **radio control, radio service**.

**RDF:** Abbreviation for **radio direction-finding**.

**read:** [A] fundamental operation in an information system (IS) that results only in the flow of information from an object to a subject. [INFOSEC-99]

**read access:** **1.** In computer or data processing technology, the privilege (or capability) of reading electronically the information in a file or data base, without the privilege (or capability) to modify it. *Synonym* **read-only access.** **2.** [In INFOSEC.] permission to read information in an information system (IS). [INFOSEC-99]

**read head:** A magnetic head capable of reading only.

**reading:** The acquisition or interpretation of data from a storage device, from a data medium, or from another source.

**read-only access:** *See* **read access.**

**read-only memory (ROM):** A memory in which data, under normal conditions, can only be read. *Synonym* **nonerasable storage.**

**read-only storage:** A storage device in which the contents cannot be modified, except by a particular user, or when operating under particular conditions, e.g., a storage device in which writing is prevented by a lockout. *Synonym* **fixed storage.**

**read/write opening:** *Synonym* **read/write slot.**

**read/write slot:** An opening in the jacket of a diskette to allow access to the read/write heads. *Synonym* **read/write opening.**

**ready-for-data signal:** **1.** A call-control signal that is transmitted by the data circuit-terminating equipment (DCE) to the data terminal equipment (DTE) to indicate that the connection is available for data transfer between both DTEs. **2.** A signal that (a) is sent in the backward direction in the interexchange data channel, to indicate that all the succeeding exchanges involved in the connection have been through-connected, or (b) is sent in the forward direction in the interexchange data channel to indicate that all the preceding exchanges involved in the connection have been through-connected. *Note:* The ready-for-data signal is sent by the user terminal. It corresponds to the ready-for-data state at the user interface. [From Weik '89]

**real power:** *See* **effective power.**

**real time:** **1.** The actual time during which a physical process occurs. **2.** Pertaining to the performance of a computation during the actual time that the related physical process occurs, in order that results of the computation can be used in guiding the physical process.

**real time call establishment procedures:** A set of on-demand procedures based on which the communication can be started in relatively short time (*i.e.*, on the order of few seconds) after the request is made. [T1.606-1990]

**real-time reaction:** [In INFOSEC, the] immediate response to a penetration attempt that is detected and diagnosed in time to prevent access. [INFOSEC-99]

**reasonable assurance:** A high degree of confidence by an individual, entity, or application that received data should be treated as valid and unaltered. [After X9.30-1]

**reasonableness check:** A test to determine whether a value conforms to specified criteria. *Note:* A reasonableness check can be used to eliminate questionable data points from subsequent processing. *Synonym* **wild-point detection.**

**reattach:** An action that re-establishes the communication with a participant of the conference. [T1.647-1995]

**receive-after-transmit time delay:** The time interval between (a) the instant of keying off the local transmitter to stop transmitting and (b) the instant the local receiver output has increased to 90% of its steady-state value in response to an rf signal from a distant transmitter. *Note 1:* The rf signal from the distant transmitter must exist at the local receiver input prior to, or at the time of, keying off the local transmitter. *Note 2:* Receive-after-transmit time delay applies only to half-duplex operation.

**received noise power:** **1.** The calculated or measured noise power, within the bandwidth being used, at the receive end of a circuit, channel, link, or system. **2.** The absolute power of the noise measured or calculated at a receive point. *Note:* The related bandwidth and the noise weighting must also be specified. **3.** The value of noise power, from all sources, measured at the line terminals of telephone set's receiver. *Note:* Either flat weighting or some other specific amplitude-frequency characteristic or noise weighting characteristic must be associated with the measurement.

**received signal level (RSL):** The signal level at a receiver input terminal. *Note 1:* The signal bandwidth and the established reference level must be specified. *Note 2:* The RSL is usually expressed in dB with respect to 1 mW, *i.e.*, 0 dBm.

**receive loudness rating (RLR):** *See* **receive objective loudness rating.**

**receive objective loudness rating (ROLR):** The ratio in dB of the voltage entering a loop and telephone to the sound pressure produced by the telephone's receiver. [After T1.255-1997]

**receive only (RO):** Pertaining to a device or a mode of operation capable of receiving messages, but not of transmitting messages.

**receiver:** The sink or terminator of any signal on a transmission medium. [T1.408-1990]

**receiver attack-time delay:** The time interval from (a) the instant a step rf signal, at a level equal to the receiver threshold of sensitivity, is applied to the receiver input to (b) the instant the receiver output amplitude reaches 90% of its steady-state value. *Note:* If a squelch circuit is operating, the receiver attack-time delay includes the time for the receiver to break squelch.

**receiver lockout system:** *Synonym* **lockout.**

**receiver overload:** The maximum acceptable value of the received average optical power consistent with a bit error ratio (BER) of  $1 \times 10^{-10}$  or better. [T1.646-1995]

**receiver release-time delay:** The time interval from removal of rf energy at the receiver input until the receiver output is squelched.

**receiver sensitivity:** The minimum value of average received power to achieve a  $1 \times 10^{-10}$  bit error ratio. It includes power penalties caused by use of a transmitter under standard operating conditions with worst-case values of extinction ratio, pulse rise and fall times, optical return loss, receiver connector degradations, and measurement tolerances. [T1.646-1995]

**recipient:** The switch or network to which a subscriber's directory number has been ported. [T1.711-1999]

**recognized operating agency (ROA):** Any operating agency, as defined in the ITU Convention (Geneva, 1992), which operates a public correspondence or broadcasting service and upon which the obligations provided for in Article 6 of the ITU Constitution are imposed by the Member in whose territory the head office of the agency is situated, or by the Member which has authorized this operating agency to establish and operate a telecommunication service on its territory. *Formerly* **recognized private operating agency (RPOA).**



**reconditioned carrier reception:** *Synonym exalted-carrier reception.*

**reconstructed sample:** An analog sample generated at the output of a decoder when a specified character signal is applied at its input. *Note:* The amplitude of the reconstructed sample is proportional to the value of the corresponding encoded sample.

**reconstructed signal:** In ADPCM (adaptive differential pulse code modulation), the sum of the signal estimate from adaptive prediction and the quantized difference signal from inverse adaptive quantization. [T1.310-1991]

**record:** **1.** A set of data treated as a unit. **2.** To write data on a medium, such as magnetic tape, magnetic disk, or optical disk. **3.** In PCS (personal communications services), a string of bytes within an extended frame (EF) handled as a single entity. [After T1.707-1998]

**record communication:** **1.** A telecommunications process that produces an electronic message that is transmitted, received, stored or archived, and may be retrieved. **2.** A telecommunications process, that produces a hard copy record of the transmission, such as a teletypewriter printout or a facsimile printout. **3.** Any transmission of intelligence which is reduced to visual record form at the point of reception. [47CFR]

**recorder warning tone:** A half-second burst of 1400 Hz applied to a telephone line every 15 seconds to indicate to the called party that the calling party is recording the conversation. *Note:* The recorder warning tone is required by law to be generated as an integral part of any recording device used for the purpose and is required to be not under the control of the calling party. The tone is recorded together with the conversation.

**record information:** All forms (*e.g.*, narrative, graphic, data, computer memory) of information registered in either temporary or permanent form so that it can be retrieved, reproduced, or preserved. [JP1]

**recording density:** *Synonym bit density.*

**recording spot:** In a facsimile recorder, the spot that is used to generate the recorded copy on the record medium.

**record medium:** **1.** The physical medium on which information is stored in recoverable form. **2.** In facsimile transmission, the physical medium on which the recorder forms an image of the object, *i.e.*, creates the recorded copy. *Note:* The record medium and the record sheet may be identical. *Synonym record sheet.*

**record number:** The number that identifies a record within an extended frame (EF). [After T1.707-1998]

**record pointer:** The pointer which is used to address one record in an extended frame (EF). [After T1.707-1998]

**record sheet:** *Synonym record medium.*

**record traffic:** **1.** Traffic that is recorded, in permanent or quasipermanent form, by the originator, the addressee, or both. **2.** Traffic that is permanently or semipermanently recorded in response to administrative procedures or public law.

**recovery:** In a database management system, the procedures and capabilities available for reconstruction of the contents of a database to a state that prevailed before the detection of processing errors and before the occurrence of a hardware or software failure that resulted in the destruction of some or all of the stored data.

**recovery procedure:** **1.** [The] action[s] necessary to restore data files of an information system (IS) and computational capability after a system failure. [INFOSEC-99]. **2.** In data communications, a process whereby a data station attempts to resolve conflicting or erroneous conditions arising during the transfer of data.

**RED:** [The] designation applied to information systems, and associated areas, circuits, components, and equipment in which national security information is being processed. [INFOSEC-99]

**RED/BLACK concept:** [The] Separation of electrical and electronic circuits, components, equipment, and systems that handle national security information (RED), in electrical form, from those that handle non-national security information (BLACK) in the same form. [INFOSEC-99]

**redirecting number (RN):** A set of digits and related indicators (type of number, numbering plan identification, screening indicator, presentation indicator) that provide numbering information related to the redirecting party. [T1.625-1993]

**RED signal:** **1.** [A] Telecommunications or automated information system signal that would divulge classified information if recovered and analyzed. [NIS] **2.** In cryptographic systems, a signal containing classified information that has NOT been encrypted. **3.** Any electronic emission (*e.g.*, plain text, key, key stream, subkey stream, initial fill, or control signal) that would divulge national security information if recovered. [INFOSEC-99]

**reduced carrier single-sideband emission:** A single-sideband emission in which the degree of carrier suppression enables the carrier to be reconstituted and to be used for demodulation. [NTIA] [RR]

**reduced carrier transmission:** A form of amplitude-modulation in which the carrier is transmitted at a controlled level below that which is required for demodulation, but at a level sufficient to serve as a frequency reference.

**redundancy:** **1.** In the transmission of data, the excess of transmitted message symbols over that required to convey the essential information in a noise-free circuit. *Note:* Redundancy may be introduced intentionally (as in the case of error detection or correction codes) or inadvertently (such as by oversampling a band-limited signal, inefficient formats, *etc.*). **2.** In a communication system, surplus capability usually provided to improve the reliability and quality of service.

**redundancy check:** **1.** A method of verifying that any redundant hardware or software in a communication system is in an operational condition. **2.** A check that uses one or more extra binary digits or characters attached to data for the detection of errors.

**redundant code:** A code using more signal elements than necessary to represent the intrinsic information. *Note:* The redundancy may be used for error-control purposes.

**reference antenna:** An antenna that may be real, virtual, or theoretical, and has a radiation pattern that can be used as a basis of comparison with other antenna radiation patterns. *Note:* Examples of reference antennas are unit dipoles, half-wave dipoles, and isotropic, *i.e.*, omnidirectional antennas. [From Weik '89]

**reference black level:** [In television,] The level corresponding to the specified maximum excursion of the luminance signal in the black direction. [47CFR]

**reference circuit:** A hypothetical circuit of specified equivalent length and configuration, and having a defined transmission characteristic or characteristics, used primarily as a reference for measuring the performance of other, *i.e.*, real, circuits or as a guide for planning and engineering of circuits and networks. *Note:* Normally, several types of reference circuits are defined, with different configurations, because communications are required over a wide range of distances. A group of related reference circuits is also called a *reference system*.

**reference clock:** **1.** A clock with which another clock is compared. **2.** A clock, usually of high stability and accuracy, used to govern a network of mutually synchronized clocks of

lower stability. *Note:* The failure of a reference clock does not necessarily cause loss of synchronism.

**reference color space:** The geometric representation of colors in three-dimensional space. [CIE 845-03-25] *Note:* There are three reference spaces recognized by ISO 8613: CMYK color space; CIE Luv color space, and R,G,B color space. [After SMPTE]

**reference configuration:** In ISDN, a combination and arrangement of functional groups and reference points that reflect possible network topology.

**reference frequency:** **1.** A standard fixed frequency from which operational frequencies may be derived or with which they may be compared. *Note:* The reference frequency may be used to specify an assigned frequency or fix a characteristic or carrier frequency. **2.** A frequency having a fixed and specific position with respect to the assigned frequency. The displacement of this frequency with respect to the assigned frequency has the same absolute value and sign that the displacement of the characteristic frequency has with respect to the center of the frequency band occupied by the emission. [NTIA] [RR] [47CFR]

**reference monitor:** **1.** A video display that is used to view a video signal to determine its image quality. **2.** [An] Access control concept referring to an abstract machine that mediates all accesses to objects by subjects. [INFOSEC-99] **3.** In security, the concept of an abstract machine that enforces target-of-evaluation (TOE) access control policies and security processes. [After CC-99]

**reference monitoring:** An access control concept utilizing an abstract machine to mediate all access to objects by subjects.

**reference noise:** The magnitude of circuit noise chosen as a reference for measurement. *Note:* Many different levels with a number of different weightings are in current use, and care must be taken to ensure that the proper parameters are stated. *See* **dBa, dBa0, dBm, dBm0, dBrn, dBrnC, dBrnC0, dBx.**

**reference point:** In ISDN, a logical point between two, nonoverlapping functional groups. *Note:* When equipment is placed at a reference point, that reference point is designated an interface.

**reference surface:** In optical-fiber technology, that surface of an optical fiber that is used to contact the transverse-alignment elements of a component such as a connector or mechanical splice. *Note:* For telecommunications-grade fibers, the reference surface is the outer surface of the cladding. For plastic-clad silica (PCS) fibers, which have a strippable polymer cladding (not to be confused with the polymer overcoat of an all-glass fiber), the reference surface may be the core.

**reference system:** A group of related reference circuits.

**reference transmission level point:** *See* **relative transmission level, transmission level point.**

**reference validation mechanism:** [The] Portion of a trusted computing base whose normal function is to control access between subjects and objects and whose correct operation is essential to the protection of data in the system. [INFOSEC-99]

**reference waveform:** The artificially generated time history of an earthquake, derived from the histories of many actual earthquake accelerometers. The reference waveform is to be used for test performance. [T1.329-1995] *Note:* The reference waveform is useful in CIP (communications infrastructure protection) efforts.

**reference white level:** [In television,] The level corresponding to the specified maximum excursion of the luminance signal in the white direction. [47CFR]

**reflectance:** The ratio of reflected power to incident power, generally expressed in dB or percent.

**reflected code:** *Synonym* **Gray code.**

**reflecting layer:** In the ionosphere, a layer that has a free-electron density sufficient to reflect radio waves. *Note 1:* The principal reflecting layers are the E, F<sub>1</sub>, and F<sub>2</sub> layers in the daylight hemisphere. *Note 2:* A critical frequency is associated with the reflection by each layer.

**reflecting loss:** *See* **reflection loss.**

**reflection:** The abrupt change in direction of a wave front at an interface between two dissimilar media so that the wave front returns into the medium from which it originated. *Note 1:* Reflection may be specular (*i.e.*, mirror-like) or diffuse (*i.e.*, not retaining the image, only the energy) according to the nature of the interface. *Note 2:* Depending on the nature of the interface, *i.e.*, dielectric-conductor or dielectric-dielectric, the phase of the reflected wave may or may not be inverted.

**reflection coefficient (RC):** **1.** The ratio of the amplitude of the reflected wave and the amplitude of the incident wave. **2.** At a discontinuity in a transmission line, the complex ratio of the electric field strength of the reflected wave to that of the incident wave. *Note 1:* The reflection coefficient may also be established using other field or circuit quantities. *Note 2:* The reflection coefficient is given by

$$RC = \frac{|Z_1 - Z_2|}{|Z_1 + Z_2|} = \frac{SWR - 1}{SWR + 1} ,$$

where  $Z_1$  is the impedance toward the source,  $Z_2$  is the impedance toward the load, the vertical bars designate absolute magnitude, and  $SWR$  is the standing wave ratio.

**reflection loss:** **1.** At a discontinuity or impedance mismatch, *e.g.*, in a transmission line, the ratio of the incident power to the reflected power. *Note 1:* Reflection loss is usually expressed in dB. *Note 2:* The reflection loss,  $L_r$ , is given by

$$L_r = 20 \log_{10} \frac{|Z_1 - Z_2|}{|Z_1 + Z_2|} = 10 \log_{10} \frac{(Z_1 - Z_2)^2}{(Z_1 + Z_2)^2} ,$$

where  $Z_1$  and  $Z_2$  are the respective impedances, and the vertical bars designate absolute magnitude. **2.** In an optical fiber, the loss that takes place at any discontinuity of refractive index, especially at an air-glass interface such as a fiber endface, at which a fraction of the optical signal is reflected back toward the source. *Note:* This reflection phenomenon is also called "*Fresnel reflection loss*," or simply, "*Fresnel loss*." At normal incidence, the fraction of reflected power is expressed by the formula,

$$L_f = 10 \log_{10} \frac{(n_1 - n_2)^2}{(n_1 + n_2)^2},$$

where  $n_1$  and  $n_2$  are the respective indices of refraction.

**reflective array antenna:** An antenna, such as a billboard antenna, in which the driven elements are situated at a predetermined distance from a surface designed to reflect the signal in a desired direction. *Note:* Reflective array antennas (a) usually have many driven elements working in conjunction with an electrically large reflecting surface to produce a unidirectional beam, (b) may be used to increase antenna gain, *i.e.*, reduce radiation in unwanted directions, and (c) may contain parasitic elements as well as driven elements.

**reflectivity:** The reflectance at the surface of a material so thick that the reflectance does not change with increasing thickness, *i.e.*, the intrinsic reflectance of the surface, irrespective of other parameters such as the reflectance of the rear surface. *Note:* The term "reflectivity" is no longer in common use. *See reflectance.*

**reflector: 1.** In an rf antenna, one or more conducting elements or surfaces that reflect incident radiant energy. *Note:* A reflector may consist of a large surface, as in a dish antenna, or a linear element, as in a Yagi antenna. **2. See mail reflector.**

**refracted ray: 1.** A ray that undergoes a change of velocity, or in the general case, both velocity and direction, as a result of interaction with the material medium in which it travels. **2.** In an optical fiber, a ray that is refracted from the core into the cladding. Specifically a ray having direction such that

$$\frac{n^2(r) - n^2(a)}{1 - (r/a)^2 \cos^2 \phi(r)} \leq \sin^2 \theta(r),$$

where  $r$  is the radial distance from the fiber axis,  $\phi(r)$  is the azimuthal angle of projection of the ray at  $r$  on the transverse plane,  $\theta(r)$  is the angle the ray makes with the fiber axis,  $n(r)$  is the refractive index at  $r$ ,  $n(a)$  is the refractive index at the core radius,  $a$ . Refracted rays correspond to radiation modes in the terminology of mode descriptors.

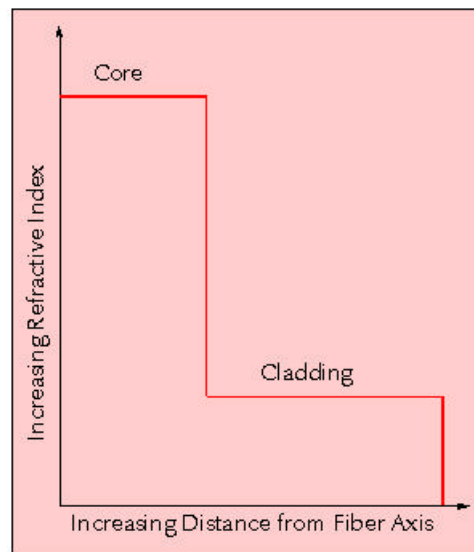
**refraction:** Retardation, and--in the general case--redirection, of a wavefront passing through (a) a boundary between two dissimilar media or (b) a medium having a refractive index that is a continuous function of position, *e.g.*, a graded-index optical fiber. *Note:* For two media of different refractive indices, the angle of refraction is closely approximated by Snell's Law.

**refraction profile:** *Synonym refractive index profile.*

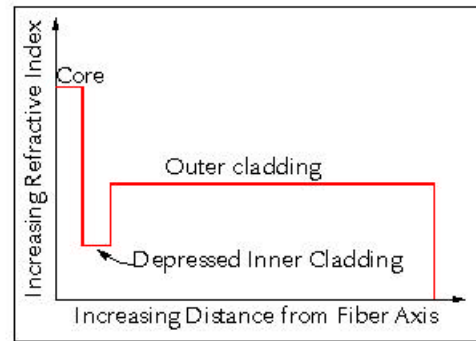
**refractive index ( $\eta$ ,  $n$ ):** Of a medium, the ratio of the velocity of propagation of an electromagnetic wave in vacuum to its velocity in the medium. *Synonym index of refraction.* *Note:* When the Greek character eta is unavailable, the letter  $n$  is used to represent the refractive index.

**refractive index contrast:** In an optical fiber, a measure of the relative difference in refractive index of the core and cladding. *Note:* Refractive index contrast,  $\Delta$ , is given by  $\Delta = (n_1^2 - n_2^2)/(2n_1^2)$ , where  $n_1$  is the maximum refractive index in the core and  $n_2$  is the refractive index of the homogeneous cladding.

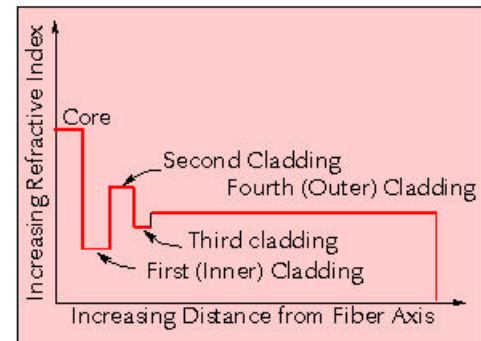
**refractive index profile:** Of the cross section of an optical fiber, the description, *i.e.*, plot, of the value of the refractive index as a function of distance from the fiber axis along a diameter. *Synonyms index profile, refraction profile.*



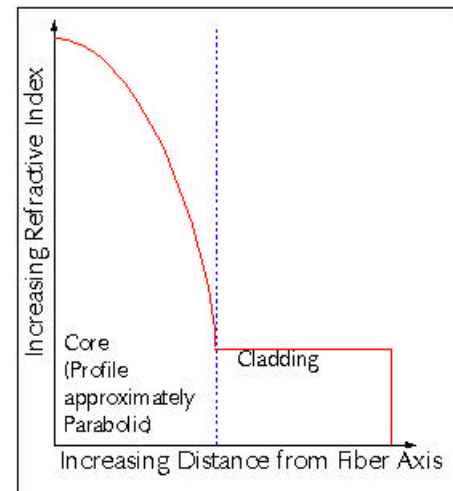
refractive index profile, multimode step-index fiber



refractive index profile, doubly clad single-mode fiber



refractive index profile, quadruply clad single-mode fiber



refractive index profile, graded-index multimode fiber

**reframing time:** The time interval between the instant at which a valid frame-alignment signal is available at the receiving data terminal equipment and the instant at which frame alignment is established. *Note:* The reframing time includes the time required for replicated verification of the validity of the frame-alignment signal. *Synonym* **frame-alignment recovery time.**

**refresh:** To reproduce, repeatedly, a display image on a display surface, so that the image remains visible.

**refresh packets:** Signaling packets that are transmitted on a periodic basis across a permanent virtual circuit in the direction of transmission from the channelized side to the packetized side. This allows the originating endpoint to update the knowledge of the terminating endpoint regarding the signaling information on the incoming channel and the status of the permanent virtual circuit status. [T1.312-1991]

**regeneration:** **1.** In a regenerative repeater, the process by which digital signals are amplified, reshaped, retimed, and retransmitted. *Synonym* **positive feedback.** **2.** In a storage or display device, the restoration of stored or displayed data that have deteriorated. *Note:* For example, conventional cathode-ray tube displays must be continually regenerated for the data to remain displayed. **3.** In computer graphics, the sequence of events needed to generate a display image from its representation in storage.

**regenerative feedback:** Feedback in which the portion of the output signal that is returned to the input has a component that is in phase with the input signal.

**regenerative repeater:** A repeater, designed for digital transmission, in which digital signals are amplified, reshaped, retimed, and retransmitted. *Synonym* **regenerator.**

**regenerator:** **1.** *Synonym regenerative repeater.* **2.** A device that reconstructs and retransmits a received pulse train. [T1.403-1989]

**Regional Bell Operating Company (RBOC):** Historically, one of the seven holding companies formed by divestiture by the American Telephone and Telegraph Company of its local Bell System operating companies, and to which one or more of the Bell System local telephone companies were assigned.

**regional center:** *See office classification.*

**register:** **1.** A device, accessible to one or more input circuits, that accepts and stores data. *Note:* A register is usually used only as a device for temporary storage of data. **2.** A temporary-memory device used to receive, hold, and transfer data (usually a computer word) to be operated upon by a processing unit. *Note:* Computers typically contain a variety of registers. General purpose registers may perform many functions, such as holding constants or accumulating arithmetic results. Special purpose registers perform special functions, such as holding the instruction being executed, the address of a storage location, or data being retrieved from or sent to storage.

**registered jack (RJ):** Any of the series of jacks, described in the *Code of Federal Regulations*, Title 47, part 68, used to provide interface to the public telephone network.

**registration:** **1.** The accurate positioning of, or the degree of accuracy in the positioning of, an entity relative to (a) another entity, or (b) an independent frame of reference. *Note:* For example, in color graphics applications involving the superposition of several colored rasters, such as in a CRT display, good registration (usually termed "*convergence*" in this context) is of paramount importance if the resulting image is not to have false colors, especially around the edges of objects. **2.** In telephony, *see FCC registration program.* **3.** In computer networking, the official assignment of a name (Internet Protocol address) to an information object or device, in a way that makes the assignment unduplicated anywhere else in the network and makes the device available for other devices to communicate with. [2382-pt.35]

**registration agent (RA):** An application process that receives an RRP (registration request protocol), message from the registration manager signaling it to start automatic registration. The result is that the RNE's (remote network element's) DUA (directory user agent) adds the NE (network element) system administrative information (*e.g.*, name, make, location, *etc.*) into the DIB (directory information base) via the "add Entry" operation of the DAP (directory access protocol). The RA extracts the DS (directory server) address from the RRP exchange and provides this address to the DUA. [T1.245-1997]

**registration authority:** In networking, an organization that performs registration for information objects and devices. [After 2382-pt.35]

**registration manager (RM):** An application process responsible for contacting the registration agent using the RRP (registration request protocol) to start automatic registration of a newly discovered NE (network element) into the DIB (directory information base). The RM provides the RA (registration agent) with the appropriate DSA (directory system agent) address. [T1.245-1997]

**registration procedure:** In networking, the procedure for performing registration or for amending or deleting existing registrations. [2382-pt.35]

**registration program:** *See FCC Registration Program.*

**rekeying:** The changing of one or more keys that are used for either COMSEC or TRANSEC functions.

**relational database:** A database that consists of data in simple tables (*i.e.*, rows and columns) and that has no system dependencies (*e.g.*, pointers to other data).

**relative address:** In computer and data processing programming, an address that is expressed as a difference in relation to a base address. [After Weik '96]

**relative error:** The ratio of an absolute error to the true, specified, or theoretically correct value of the quantity that is in error.

**relative spectral width:** *See spectral width.*

**relative transmission level:** The ratio of the signal power, at a given point in a transmission system, to a reference signal power. *Note:* The ratio is usually determined by applying a standard test tone at zero transmission level point (or applying adjusted test tone power at any other point) and measuring the gain or loss to the location of interest. A distinction should be made between the standard test tone power and the expected median power of the actual signal required as the basis for the design of transmission systems.

**relay:** **1.** To retransmit a received message from one station to another station. **2.** An electromechanical or semiconductor switch (*i.e.*, solid-state relay) in which a current or voltage applied across one port or terminal controls electrical currents or voltages that appear across another terminal or terminals.

**relay configuration:** An operating configuration in which a circuit is established between two stations via an intermediate relay station. Two links are used simultaneously and the channel connections at the relay station are accomplished completely within the station.

**relay station:** **1.** An intermediate station that passes information between terminals or other relay stations. **2.** A fixed station used for the reception and retransmission of the signals of another station or stations. [47CFR]

**released loop:** *Synonym switched loop.*

**release node:** The initial destination of a call from a pivot node. *Note:* A service or network capability provided at the release node, after determining the call should be connected to a destination node other than itself, may invoke RTP (registration request protocol) to have the new connection established from a pivot node earlier in the call path. After releasing the call to a pivot node, the release node no longer participates in the call. The release node must be a SS7 Signaling Point. [T1.661-1997]

**release prefix:** [A] prefix appended to the short title of U.S.-produced keying material to indicate its foreign releasability. "A" designates material that is releasable to specific allied nations and "U.S." designates material intended exclusively for U.S. use. [INFOSEC-99]

**release time:** **1.** The time interval between (a) the instant that an enabling signal (as in a vogad or echo suppressor) is discontinued, and (b) the instant at which suppression ceases. **2.** The time interval between (a) the instant a relay coil is de-energized, and (b) the instant that contact closure ceases (or, depending on the nature of the relay, is established).

**release timer:** A timer that specifies the period of time the network will wait for a release from the user after informing the user of a failure condition such as busy. This timer is on the order of 30 seconds. [T1.620-1991]

**reliability:** **1.** The ability of an item to perform a required function under stated conditions for a specified period of time. **2.** The probability that a functional unit will perform its required function for a specified interval under stated conditions. **3.** The continuous availability of communication services to the general public, and emergency response activities in particular, during normal operating conditions and under emergency circumstances with minimal disruption.

**reliability assessment:** **1.** The process of determining whether existing hardware, firmware, or software has achieved a specified level of operational reliability. **2.** The process of determining the achieved level of operational reliability of existing hardware, firmware, or software. *Synonym reliability evaluation.* [From Weik '89]

**reliability evaluation:** *Synonym reliability assessment.*

**reliability (performance):** *See performance reliability.*



**remanence:** Residual information remaining on storage media after clearing. [INFOSEC-99]

**remote access:** **1.** Pertaining to communication with a data processing facility from a remote location or facility through a data link. **2.** A PABX service feature that allows a user at a remote location to access by telephone PABX features, such as access to wide area telephone service (WATS) lines. *Note:* For remote access, individual authorization codes are usually required.

**remote access data processing:** Data processing in which some input/output functions are performed by devices that are connected to a computer system by means of data communication.

**remote access line:** An access line (*e.g.*, for WATS or TWX service) between a subscriber's premises in one toll rate center and a serving central office located in a different toll rate center. [47 CFR Pt.36-A]

**remote alarm:** In a PVP (packetized voice protocol) node, an indication that the far-end PVP node is experiencing an alarm condition. This occurs because of either the loss of keep-alive signaling packets, or the receipt of signaling packets with the normal/alarm (N/A) bit set to 1. [T1.312-1991]

**remote alarm indication (RAI):** A signal transmitted in the outgoing direction when a terminal determines that it has lost the incoming signal. RAI is commonly called the yellow alarm signal. For superframe (SF) operation, an RAI is transmitted by setting the bit-2 position of every channel time slot to zero. For extended superframe (ESF) operation, an RAI is transmitted by introducing a priority message codeword 1 1 1 1 1 1 1 00000000 (LtR) in the ESF datalink. [T1.Rpt25-1993]

**remote AllCall registration:** A feature that enables the UPT user to make a remote InCall registration and a remote OutCall registration to the same terminal address using one single procedure. The effect of a remote AllCall registration is as if remote InCall and remote OutCall registration had been carried out separately. [T1.701-1994]

**remote batch entry:** Submission of batches of data through an input unit that has access to a computer through a data link.

**remote batch processing:** Batch processing in which input-output units have access to a computer through a data link.

**remote boot:** Of a computer, its start or restart from a remote location. *Note:* A remote boot may be accomplished by a hardware or software trigger.

**remote call forwarding:** A service feature that allows calls coming to a remote call-forwarding number to be automatically forwarded to any answering location designated by the call receiver. *Note:* Customers may have a remote-forwarding telephone number in a central switching office without having any other local telephone service in that office.

**remote clock:** **1.** A clock that is remote from a particular facility, such as a communications station or node, with which it is associated. **2.** A clock that is remote from another clock to which it is to be compared.

**remote control equipment:** Devices used to perform monitoring, controlling, and/or supervisory functions, at a distance.

**remote defect indication (RDI):** A signal transmitted at the first opportunity in the outgoing direction when a terminal detects specific defects in the incoming signal. [T1.231-1997]

**remote digital terminal (RDT):** **1.** An intelligent network element that interfaces between customer access lines and digital facilities. [T1.508-1998] **2.** The digital loop carrier (DLC) multiplexer that is at the end of the DLC that is closest to the network interface (NI). [T1.216-1998]

**remote failure indication (RFI):** A signal transmitted in the outgoing direction when a terminal determines that specific defects have persisted long enough to declare a received signal failure. The RFI terminology is used with SONET in this standard to promote a more descriptive and consistent terminology. [T1.231-1997]

**remote job entry (RJE):** In computer operations, a mode of operation that allows execution of job instructions received from a remote site and return of the output to the same or a different remote site via a communications link.

**remote line location:** A remotely located subscriber line access unit which is normally dependent upon the central processor of the host office for call processing functions. [47 CFR Pt.36-A]

**remote linked registration:** A feature by which a linked registration for one specified terminal address can be carried out from another terminal address. [T1.701-1994]

**remote login:** A login that allows a user terminal to connect to a host computer via a network or direct telecommunications link, and to interact with that host computer as if the user terminal were directly connected to that host computer. *Synonym* **remote logon.**

**remote logon:** *Synonym* **remote login.**

**remote-network element (R-NE):** A type of network element (NE) that contains a DUA (directory user agent), an optional local cache, and possibly other application processes such as the registration agent. The R-NE communicates with the DSA (directory system agent) via the DAP (directory access protocol). [T1.245-1997]

**remote operations service element (ROSE) protocol:** A protocol that (a) provides remote operation capabilities, (b) allows interaction between entities in a distributed application, and (c) upon receiving a remote operations service request, allows the receiving entity to attempt the operation and report the results of the attempt to the requesting entity.

**remote orderwire:** An extension of a local orderwire to a point convenient for personnel to perform required operational and maintenance functions.

**remote procedure call (RPC):** A software process by which retrieval of a network-launched application is initiated.

**remote rekeying:** **1.** The encrypted transmission of keys from a remote source. **2.** [A] procedure by which a distant crypto-equipment is rekeyed electrically. [INFOSEC-99]

**remote switching unit (RSU):** The subtending remote switching device that depends in part on its host switch for call control but is capable of providing intra-unit switching. [T1.508-1998]

**remote terminal:** The location at which there is a transition between a telecommunications carrier facility and the local lines serving the individual customers. [T1.313-1997]

**remote trunk arrangement (RTA):** Arrangement that permits the extension of TSPS functions to remote locations. [47 CFR Pt.36A]

**REN:** *Acronym for* **ringer equivalency number.**

**reorder (RO):** A call-disposition category for a call processing failure. [T1.207-1998]

**reorder tone:** *See* **busy signal.**

**repeater:** **1.** An analog device that amplifies an input signal regardless of its nature, *i.e.*, analog or digital. **2.** A digital device that amplifies, reshapes, retimes, or performs a

combination of any of these functions on a digital input signal for retransmission. *Note:* The term "*repeater*" originated with telegraphy and referred to an electromechanical device used to regenerate telegraph signals. Use of the term has continued in telephony and data communications. **3.** A fixed transmitter that retransmits the signals of other stations. [47CFR]

**repeating coil:** A voice-frequency transformer characterized by a closed core, a pair of identical balanced primary (line) windings, a pair of identical but not necessarily balanced secondary (drop) windings, and low transmission loss at voice frequencies. *Note:* It permits transfer of voice currents from one winding to another by magnetic induction, matches line and drop impedances, and prevents direct conduction between the line and the drop.

**repeat-request (RQ) system:** *Synonym* ARQ.

**reperforator:** In teletypewriter systems, a device used to punch a tape in accordance with arriving signals, permitting reproduction of the signals for retransmission.

**repertory dialer:** A telephone set that stores a group of numbers frequently called by a customer and transmits the dialing information to the central office by a single action.

**reproducibility:** *Synonym* precision.

**reproducible fault:** In computer and telecommunications systems, a fault that will occur each time the set of conditions causing the fault occurs. *Note:* The conditions under which the fault occurs and the precision with which the fault occurs must be specified when determining the reproducibility of a fault.

**reproduction speed:** **1.** In facsimile systems, the rate at which recorded copy is produced. *Note:* The reproduction speed is usually expressed (a) as the area of recorded copy produced per unit time, such as square meters per second or (b) as the number of pages per minute. **2.** In duplicating equipment, the rate at which copies are made. *Note:* The reproduction speed is usually expressed in pages per minute.

**repudiation:** In cryptosystems, the denial by one of the entities involved in a communication of having participated in all or part of the communication.

**request acknowledgment:** A signal from a network in response to an access request, indicating the network's readiness to accept address information. [T1.507-1996]

**request data transfer:** A signal sent by the DTE to the DCE to request the establishment of a data connection.

**request-repeat (RQ) signal:** A signal from a receiver to a transmitter asking that a message be transmitted again. [From Weik '89]

**requests:** *See* click-through.

**request-to-send signal:** A signal that is generated by a receiver in order to condition a remote transmitter to commence transmission. [From Weik '89]

**reradiation:** **1.** Radiation, at the same or different wavelengths, *i.e.*, frequencies, of energy received from an incident wave. **2.** Undesirable radiation of signals locally generated in a radio receiver. *Note:* Radiation might cause interference or reveal the location of the device.

**rerouting:** Recommencement of route selection from the first point of routing control, when congestion is encountered at some intermediate switching point in the connection that is to be established.

**resale carrier:** A company that redistributes the services of a commercial carrier and retails the services to the public.

**resale service:** In FCC deliberations and rulings, the right of a buyer of basic telecommunication services, such as private lines, foreign exchanges, or WATS, to resell and/or share with others the unused capacity.

**resampling:** **1.** In television technology, the process of converting image information from one format (standard) to another. *Note:* The conversion may, for example, affect (involve) the frame rate, the number of lines per frame, the analog resolution per scanning line, or (in digital systems) the number of pixels per scanning line. **2.** In video post-production, the process of changing the image size (*e.g.*, by cropping, zooming, or distorting the image geometrically). *Note:* The altered video signal is sampled and the samples are then processed by a suitable algorithm and a new set of samples is generated that is compatible with the specifications of the target system. [After SMPTE]

**reseller:** Any access customer who resells the access service obtained from an exchange carrier. [T1.251-1996]

**reserve capacity:** Installed capacity of a system which is not normally utilized but can be made available when required.

**reserved circuit service:** In ISDN applications, a telecommunications service that establishes a communication path at a preset time (requested by the user) in response to a user-network signaling request.

**reserved word:** In programming languages, a keyword whose definition is fixed by the programming language and which cannot be changed by the user. *Note:* In Ada® and COBOL all keywords are reserved words, while Fortran has no reserved words.

**reserve keying material:** Key held to satisfy unplanned needs. [INFOSEC-99]

**reset mode:** The parameters initially programmed for basic operation.

**resettability:** A measure of the ability to duplicate controllable conditions. *Note:* An example of resettability is the ability to reset the frequency controls of radio equipment.

**resident:** Pertaining to computer programs that remain on a particular storage device.

**residual error rate:** *Synonym* undetected error ratio.

**residual error ratio:** **1.** The ratio of (a) the number of bits, unit elements, characters, or blocks incorrectly received but undetected or uncorrected by the error-control equipment to (b) the total number of bits, unit elements, characters or blocks. **2.** The error ratio that remains after attempts at correction are made.

**residual modulation:** *Synonym* carrier noise level.

**residual risk:** [In security, the] portion of risk remaining after security measures have been applied. [INFOSEC-99]

**residue:** Data left in storage after information processing operations are complete, but before degaussing or overwriting has taken place. [INFOSEC-99]

**resistance hybrid:** A network of resistors to which four branches of a circuit may be connected to make them conjugate in pairs. *Note:* The primary use of a resistance hybrid is to convert between 2-wire and 4-wire communications circuits. Such conversion is necessary when repeaters are introduced in a 2-wire circuit.

**resolution:** *Synonym* resolving power.

**resolver:** Computer software that allows user programs to interface with domain name servers. *Note:* The user program may be, for example, an FTP client. [2382-pt.35]

**resolving power:** A measure of the ability of a lens or optical system to form separate and distinct images of two objects with small angular separation. *Note 1:* An optical system cannot form a perfect image of a point (*i.e.*, point source). Instead, it performs what is essentially a Fourier transform, and the resolving power of an optical system may be expressed in terms of an optical transform (transfer function) called the *modulation transfer function (MTF)*. *Note 2:* The resolving power of an optical system is ultimately limited by (a) the wavelength involved, and (b) diffraction by the aperture, a larger aperture having greater resolving power than a smaller one. *Note 3:* While the term "resolving power" is usually applied to the traditional optical regime, it may also be applied to, *e.g.*, the radio regime, especially at, but not necessarily limited to, very short wavelengths, on the order of millimeters or centimeters. *Note 4:* Especially at longer wavelengths, certain schemes may be employed to create a very large synthetic aperture, thereby increasing resolving power. Some of these schemes involve precise measurements of the respective times of arrival, at geographically separate locations, of signals from separate sources. *Synonym resolution.*

**resonance:** In an electrical circuit, the condition that exists when the inductive reactance and the capacitive reactance are of equal magnitude, causing electrical energy to oscillate between the magnetic field of the inductor and the electric field of the capacitor. *Note 1:* Resonance occurs because the collapsing magnetic field of the inductor generates an electric current in its windings that charges the capacitor and the discharging capacitor provides an electric current that builds the magnetic field in the inductor, and the process is repeated. *Note 2:* At resonance, the series impedance of the two elements is at a minimum and the parallel impedance is a maximum. Resonance is used for tuning and filtering, because resonance occurs at a particular frequency for given values of inductance and capacitance. Resonance can be detrimental to the operation of communications circuits by causing unwanted sustained and transient oscillations that may cause noise, signal distortion, and damage to circuit elements. *Note 3:* At resonance the inductive reactance and the capacitive reactance are of equal magnitude. Therefore,  $\omega L = 1/\omega C$ , where  $\omega = 2\pi f$ , in which  $f$  is the resonant frequency in hertz,  $L$  is the inductance in henrys, and  $C$  is the capacity in farads when standard SI units are used. Thus,

$$f = \frac{\pi}{2\sqrt{LC}}$$

**resonant antenna:** *Synonym periodic antenna.*

**resonant cavity:** *See optical cavity.*

**resource controller (RC):** The processor(s) that control access to satellite payload communications resources within an individual satellite program.

**resource record:** A record, within a domain name server, that describes an Internet resource. *Note:* A resource record consists mainly of a domain name, its type, and a value. [2382-pt.35]

**respond opportunity:** In data transmission, the link level logical control condition during which a given secondary station may transmit a response.

**response frame:** In data transmission, all frames that may be transmitted by a secondary station.

**response PDU:** A protocol data unit (PDU) transmitted by a logical link control (LLC) sublayer in which the PDU command/response (C/R) bit is equal to "1".

**response spectrum:** A plot of the maximum response, as a function of oscillator frequency, of an array of single-degree-of-freedom (SDOF) damped oscillators subjected to the same base excitation. [T1.329-1995] *Synonym shock spectrum.*

**response time:** The time a system or functional unit takes to react to a given input. *Note:* For example, in data processing, the response time perceived by the end user is the interval between (a) the instant at which an operator at a terminal enters a request for a response from a computer and (b) the instant at which the first character of the response is received at a terminal. In a data system, the system response time is the interval between the receipt of the end of transmission of an inquiry message and the beginning of the transmission of a response message to the station originating the inquiry.

**response timer (T<sub>R</sub>):** In multilevel precedence and preemption, the device that controls the length of time that the call receiver of the precedence call has to accept the incoming precedence call. *Note:* The length of the time is usually set in the range of 4 s to 30 s.

**responsiveness:** Ability of an entity to provide service within the required time. *Note:* The term *timeliness* is sometimes used incorrectly to mean responsiveness.

**responsivity:** In a photodetector, the ratio of the electrical output to the optical input. *Note 1:* Responsivity is usually expressed in amperes per watt, or volts per watt, of incident radiant power. *Note 2:* Responsivity is a function of the wavelength of the incident radiation and the bandgap of the material of which the photodetector is made. *Deprecated synonym sensitivity.*

**restart:** The resumption of the execution of a computer program using the data recorded at a checkpoint.

**restitution:** A series of significant conditions determined by the decisions taken according to the products of the demodulation process.

**restoral limit (RL):** The bound on performance that is allowed when corrective action is taken to restore a parameter after an IAL (immediate action limit) failure. Performance as measured by a parameter is satisfactory if the value of the parameter is equal to or better than the limit. [T1.506-1989]

**restoration:** Of an impaired (degraded) or unserviceable telecommunications service or facility, action taken to repair it and return it to service. *Note:* Permanent or temporary restoration may be accomplished by various means, such as patching, rerouting, substitution of component parts, *etc.*

**restricted access:** A class of service in which users may be denied access to one or more of the system features or operating levels.

**restricted area:** *Synonym controlled space.*

**restricted channel:** In digital communications systems, a channel that has a useful capacity of only 56 kb/s (kilobits per second), instead of 64 kb/s. *Note:* The restricted channel, currently common in North America, was originally developed to satisfy a ones-density limitation in T1 circuits.

**restriction certificate:** In secure systems, an authorization certificate that indicates the security restrictions on documents and transactions that an entity may authorize. [After X9.45]

**retransmission buffer:** Storage in the signaling link control for signal units that have been transmitted but not yet positively acknowledged. [T1.226-1992]

**retrieval service:** In interactive telecommunications, a service allowing access to and retrieval of stored information, *e.g.*, the information within a database.

**retrograde orbit:** Of a satellite orbiting the Earth, an orbit in which the projection of the satellite's position on the (Earth's) equatorial plane revolves in the direction opposite that of the rotation of the Earth.

**return loss:** The ratio, at the junction of a transmission line and a terminating impedance or other discontinuity, of the amplitude of the reflected wave to the amplitude of the incident wave. *Note 1:* Return loss is usually expressed in dB. *Note 2:* Return loss is a measure of the dissimilarity between impedances in metallic transmission lines and loads, or between refractive indices in dielectric media, e.g., optical fibers. *Note 3:* In a metallic transmission line, return loss is given by

$$L_r = 10 \log_{10} \left| \frac{Z_1 + Z_2}{Z_1 - Z_2} \right|^2,$$

where  $Z_1$  is the impedance toward the source and  $Z_2$  is the impedance toward the load, and the vertical bars indicate magnitude. *Note 4:* For dielectric media, e.g., optical fibers, see **reflection loss**.

**return-to-zero (RZ):** **1.** A digital code having two information states, e.g., "0" and "1" or "mark" and "space", in which code the signal returns to a rest state during a portion of the bit period. **2.** A code form having two information states termed "zero" and "one" and having a third state or an at-rest condition to which the signal returns during each rest period. In this specification, the at-rest condition is the zero state. [T1.106-1988]

**reverse-battery signaling:** Loop signaling in which battery and ground are reversed on the tip and ring of the loop to give an "off-hook" signal when the call receiver answers. *Note:* Reverse-battery signaling may be used either for a short period, or for the duration of a call, to indicate that it is a toll call.

**reversible public key cryptography:** An asymmetric cryptographic algorithm whereby (a) messages encrypted using the public key can only be decrypted by using the private key, and (b) data that are encrypted using the private key can only be decrypted by using the public key. [After X9.31]

**revertive pulsing:** In telephone networks, a means of controlling distant switching selections by pulsing. *Note:* In revertive pulsing, the near end receives signals from the far end.

**RF:** Also **rf**. *Abbreviation for radio frequency.* Of, or pertaining to, any frequency within the electromagnetic spectrum normally associated with radio wave propagation. *Note:* For designation of subdivisions, see **electromagnetic spectrum** and its associated diagram.

**rf bandwidth:** See **occupied bandwidth, necessary bandwidth**.

**RFC:** *Abbreviation for Request for Comments.* The document series, begun in 1969, which describes the Internet suite of protocols and related experiments. Not all (in fact very few) RFCs describe Internet standards, but all Internet standards are written up as RFCs. [Bahorsky]

**RFI:** *Abbreviation for radio frequency interference. See electromagnetic interference. Abbreviation for remote failure indication.*

**rf power margin:** **1.** The amount of transmitter power above that which is computed by the link designer as the minimum required to meet specified link performance. *Note:* The rf power margin allows for uncertainties in (a) empirical components of the signal level prediction method, (b) terrain characteristics, (c) atmospheric conditions, and (d) equipment performance parameters. **2.** At any given time in an operational link, the reserve transmitter power over that which is required to maintain specified link performance.

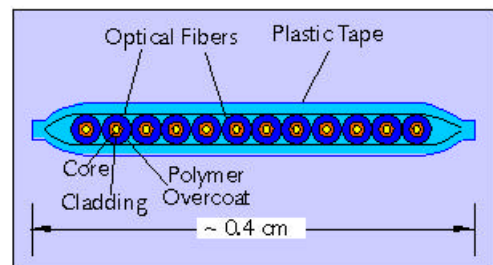
**rf tight:** Offering a high degree of electromagnetic shielding effectiveness.

**RGB:** *Abbreviation for red-green-blue.* Pertaining to the use of three separate signals to carry the red, green, and blue components, respectively, of a color video image. *Note:* The image is not NTSC-encoded; RGB typically results in higher resolution than that specified by the National Television Standards Committee.

**rhombic antenna:** A directional antenna that is composed of long-wire radiators that form the sides of a rhombus, the two halves of which are fed equally in opposite phase at one apex. [From Weik '89] *Note:* A rhombic antenna is usually terminated at the apex opposite the driven apex, which termination makes its radiation pattern unidirectional. It is bidirectional if the opposite apex is unterminated.

**RI:** *Abbreviation for routing indicator.*

**ribbon cable:** **1.** Any cable constructed as a ribbon with parallel elements. **2.** A fiber optic cable in which the optical fibers are held in grooves and laminated within a flat semirigid strip of material, such as plastic, that positions, holds, and protects them. *Note:* Ribbon cables may be stacked to produce fiber optic cables with large numbers of fibers. Buffers, strength members, fillers, and jacketing are usually added to produce the final cable. [After 2196]



ribbon cable

**right-hand (or clockwise) polarized wave:** An elliptically or circularly polarized wave, in which the electric field vector, observed in any fixed plane, normal to the direction of propagation, whilst looking in the direction of propagation, rotates with time in a right-hand or clockwise direction. [NTIA] [RR] *Synonym clockwise polarized wave.*

**right-hand rule:** *Synonym Fleming's rule.*

**ring:** **1.** In telephony, a signal of specific duration and character that indicates to a user (customer, subscriber) that a calling party is engaged in an access attempt. **2.** *Synonym ring network. See network topology.*

**ringaround:** **1.** The improper routing of a call back through a switching center already engaged in attempting to complete the same call. **2.** In secondary surveillance radar, the presence of false targets declared as a result of transponder interrogation by side lobes of the interrogating antenna.

**ringback signal: 1.** In telephony, a signal, usually consisting of an audio tone interrupted at a slow rate, provided to a caller to indicate that the called-party instrument is receiving a ringing signal. *Note:* This signal may be generated by the called-party servicing switch or by the calling-party switch. **2.** A ringing signal returned to a caller to indicate that one of the types of delayed automatic calling is now ringing the called party.

**ringback tone:** *Synonym audible ringing tone.*

**ringdown:** In telephony, a method of signaling an operator in which telephone ringing current is sent over the line to operate a lamp and cause the drop of a self-locking relay. *Note 1:* Ringdown (a) is used in manual operation, as distinguished from dialing, (b) uses a continuous or pulsed ac signal transmitted over the line, and (c) may be used with or without a switchboard. *Note 2:* The term "ringdown" originated in magneto telephone signaling in which cranking the magneto in a telephone set would not only "ring" its bell but also cause a lever to fall "down" at the central office switchboard.

**ringdown circuit:** In telephony, a circuit in which manually generated signaling power is used to perform ringdown.

**ringdown signaling:** In telephony, the application of a signal to a line (a) to operate a line signal lamp or a supervisory signal lamp at a switchboard or (b) to ring a called receiver instrument.

**ringer equivalency number (REN):** A number determined in accordance with the *Code of Federal Regulations*, Title 47, part 68, which number represents the ringer loading effect on a line. *Note:* A ringer equivalency number of 1 represents the loading effect of a single traditional telephone set ringing circuit. Modern telephone instruments may have a REN lower than 1. The total REN expresses the total loading effect of the subscriber's equipment on the central office ringing current generator. The service provider usually sets a limit, e.g., 3, 4, or 5 (representing "extension," i.e., parallel-connected telephones), to the total REN on a subscriber's loop. The actual number of instruments across the loop may be greater than the service provider's REN limit, if their respective individual RENs are less than 1.

**ringing:** Oscillations that occur in the output of systems after a sudden change in the input. [T1.646-1995]

**ringing cycle:** In traditional telephony, a nominal period (usually approximately 6 seconds) composed of alternate (a) ringing signals (ringing current) and (b) a silent interval.

**ringing signal: 1.** The alternating current (ac) component of the alerting signal. [T1.401-1988] [T1.407-1990] **2.** An ac signal applied across the network interface (NI) of such magnitude, frequency, and duration to cause an electromechanical ringer to ring. Used to alert the customer installation (CI) of an incoming call. [T1.401-1998]

**ring latency:** In a ring network, such as a token ring network, the time required for a signal to propagate once around the ring. *Note 1:* Ring latency may be measured in seconds or in bits at the data transmission rate. *Note 2:* Ring latency includes signal propagation delays in (a) the ring medium, (b) the drop cables, and (c) the data stations connected to the ring network.

**ring network:** *See network topology.*

**ring topology:** *See network topology.*

**ring transit time:** *See round-trip delay time.*

**ring trip:** Removal of an alerting signal in response to a loop closure. [T1.407-1997]

**R interface:** For a basic rate access in an ISDN environment, the interfacing specifications covering pre-ISDN standards (e.g., EIA-232C).

**rip:** *Slang.* To encode, compress, transfer, and copy digitized audio or video data from a compact disc (CD) to a computer hard drive. *Note:* Ripping is usually done with the intent of transferring those files to another user or another device.

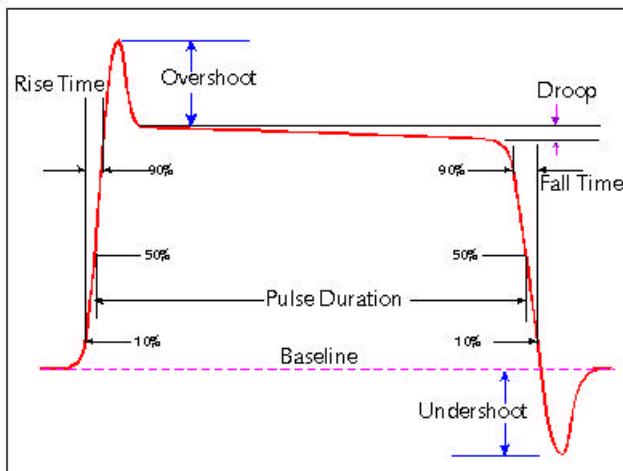
**rip cord:** Of an optical cable, a parallel cord of strong yarn that is situated under the jacket(s) of the cable for the purpose of facilitating jacket removal preparatory to splicing or breaking out. *Note:* The rip cord is exposed by carefully removing or severing a portion of the jacket near the end of the cable. It is then grasped with the fingers, or usually, with a tool such as a pair of pliers, and pulled to sever the jacket for the remainder of the desired distance. [After FAA]

**ripple voltage: 1.** In a dc voltage, the alternating component that is residually retained from rectification of ac power, or from generation and commutation. **2.** In a dc voltage, the alternating component that is coupled into a circuit from a source of interference.

**RISC:** *Acronym for reduced instruction set chip, reduced instruction set computing.* *Note:* Pronounced "risk."

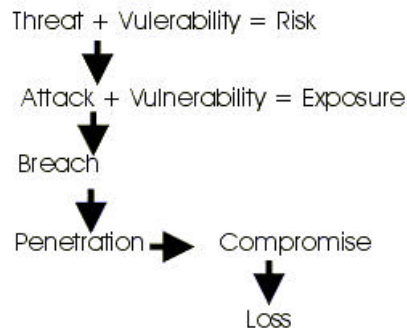
**rise time:** In the approximation of a step function, the time required for a signal to change from a specified low value to a specified high value. Typically, these values are 10% and 90% of the step height.





representative pulse waveform

**risk:** The possibility that a particular threat will exploit a particular vulnerability of a data processing system. [2382-pt.8]



**risk acceptance:** A managerial decision to accept a certain degree of risk, usually for technical or cost reasons. [2382-pt.8]

**risk analysis:** 1. A systematic method of identifying the assets of a data processing system, the threats to those assets, and the vulnerability of the system to those threats. [2382-pt.8] 2. In COMSEC (communications security), an organized method of estimating or calculating the probability of compromise. [After X9.49] 3. *Synonym [in INFOSEC] risk assessment.*

**risk assessment:** 1. *See risk analysis.* 2. [In INFOSEC, the] process of analyzing threats to and vulnerabilities of an information system (IS) and the potential impact the loss of information or capabilities of a system would have on national security. The resulting analysis is used as a basis for identifying appropriate and cost-effective countermeasures. [INFOSEC-99]

**risk index:** [The] difference between the minimum clearance or authorization of information system (IS) users and the maximum sensitivity (e.g., classification and categories) of data processed by the system. [INFOSEC-99]

**risk management:** [The] Process concerned with the identification, measurement, control, and minimization of security risks in information systems to a level commensurate with the value of the assets protected. [INFOSEC-99]

**RJ:** *Abbreviation for registered jack.*

**RJE:** *Abbreviation for remote job entry.*

**rms pulse duration:** *See root-mean-square pulse duration.*

**RO:** *Abbreviation for receive only.*

**roaming:** In cellular technology (mobile telephone technology), the use of a wireless telephone outside a specified tariffed geographic area defined by the service provider (which area is usually called the "home" area); outside of the home area, additional charges usually apply. [After FCC]

**robot:** Computer software that runs continuously and responds automatically to a user's activity. *Note:* Some robots are created for the benefit of the user, such as those that send information when a user requests it, those that perform automated searches, and those that monitor messages in a forum and delete messages that are repetitive or violate the forum's rules of netiquette. Other robots are created to harm the user (e.g., a computer virus) or spam the user (e.g., a program that, whenever a user posts a message to a forum, automatically sends a response to the user containing unrelated advertisements).

**robotic librarian:** *Synonym droid.*

**ROM:** *Acronym for read-only memory.*

**roofing filter:** A low-pass filter used to reduce unwanted higher frequencies.

**room noise level:** *Synonym ambient noise level.*

**room preset:** In multimedia and virtual reality, information that may be used to select a video source, and then control the video source to provide the desired view. The ability to provide presets is optional and may not be supported in all terminals. [After T1.800.08-1995]

**root:** In computer science, the highest level of a hierarchy.

**root-mean-square (rms) deviation:** A single quantity,  $\sigma_{\text{rms}}$ , characterizing a function,  $f(x)$ , given by

$$\sigma_{\text{rms}} = \sqrt{\frac{1}{M_0} \int_{-\infty}^{\infty} (x - M_1)^2 f(x) dx} \quad , \text{ where}$$

$$M_0 = \int_{-\infty}^{\infty} f(x) dx \quad , \text{ and}$$

$$M_1 = \frac{1}{M_0} \int_{-\infty}^{\infty} x f(x) dx$$

*Note:* The term "rms deviation" is also used in probability and statistics, where the normalization,  $M_0$ , is unity. Here, the term is used in a more general sense.

**root-mean-square (rms) pulse broadening:** The temporal rms deviation of the impulse response of a system.

**root-mean-square (rms) pulse duration:** A special case of root-mean-square deviation where the independent variable is time and  $f(t)$  describes the pulse waveform.

**rope lay conductor:** A conductor composed of a central core surrounded by one or more layers of helically wound groups of wires.

**rotary dial:** A signaling mechanism--usually incorporated within a telephone set--that when rotated and released, generates dc pulses required for establishing a connection in a telephone system.

**rotary hunting:** Hunting in which all the numbers in the hunt group are selected in a prescribed order. *Note:* In modern electronic switching systems, the numbers in the hunt group are not necessarily selected in consecutive order.

**rotary switching:** In telephone systems, an electro-mechanical switching method whereby the selecting mechanism consists of a rotating element using several groups of wipers, brushes, and contacts.

**rotational position sensing:** [In magnetic media,] A technique used to locate a given sector, a desired track, and a specific record by continuous comparison of the read/write head position with appropriate synchronization signals.

**rounding:** Deleting the least-significant digits of a number and applying some rule of correction to the part retained. [After SMPTE]

**round-trip delay time:** **1.** The elapsed time for transit of a signal over a closed circuit. *Note:* Round-trip delay time is significant in systems that require two-way interactive communication such as voice telephony or ACK/NAK data systems where the round-trip time directly affects the throughput rate. It may range from a very few microseconds for a short line-of-sight (LOS) radio system to many seconds for a multiple-link circuit with one or more satellite links involved. This includes the node delays as well as the media transit time. **2.** In primary or secondary radar systems, the time required for a transmitted pulse to reach a target and for the echo or transponder reply to return to the receiver.

**route:** **1.** In communications systems operations, the geographical path that is followed by a call or message over the circuits that are used in establishing a chain of connections. **2.** To determine the path that a message or call is to take in a communications network. *Note:* In a Transmission Control Protocol/Internet Protocol (TCP/IP) internet, each IP datagram is routed separately. The route a datagram follows may include many gateways and many physical networks. **3.** To construct the path that a call or message is to take in a communications network in going from one station to another or from a source user end instrument to a destination user end instrument. [From Weik '89]

**route diversity:** The allocation of circuits between two points over more than one geographic or physical route with no geographic points in common.

**route index:** A pointer to a specific trunk group. [T1.667-1999]

**route list:** A specific list of trunk groups. [After T1.667-1999]

**route matrix:** In communications network operations, a record that indicates the interconnections between pairs of nodes in the network, and is used to produce direct routes, alternate routes, and available route tables from point to point. [From Weik '89]

**router:** In data communications, a functional unit used to interconnect two or more networks. *Note 1:* Routers operate at the network layer (layer 3) of the ISO Open Systems Interconnection--Reference Model. *Note 2:* The router reads the network layer address of all packets transmitted by a network, and forwards only those addressed to another network.

**route verification:** Procedures that permit a signaling point to determine the accuracy and consistency of its routing data by sending a test message and analyzing the response message to determine whether the sent message traversed the expected route. [T1.226-1992]

**routine:** A computer program, called by another program, that may have some general or frequent use.

**routine message:** A category of precedence to be used for all types of messages that justify transmission by rapid means unless of sufficient urgency to require a higher precedence. [JP 1-02]

**routing:** The process of determining and prescribing the path or method to be used for establishing telephone connections or forwarding messages.

**routing address:** *Synonym routing number, routing table.*

**routing diagram:** In a communications system, a diagram that (a) shows all links between all switchboards, exchanges, switching centers, and stations in the system, such as the links between primary relay, major relay, minor relay, and tributary stations as well as supplementary links, (b) is used to identify the stations and links, and (c) is used to indicate tape-relay routes, transfer circuits, refile circuits, radio links, operational status, line conditions, and other network information required for network operations and management. [From Weik '89]

**routing directory:** *See routing table.*

**routing indicator (RI):** **1.** A group of letters assigned to indicate: (a) the geographic location of a station; (b) a fixed headquarters of a command, activity, or unit at a geographic location; and (c) the general location of a tape relay or tributary station to facilitate the routing of traffic over the tape relay networks. [JP 1-02] **2.** In a message header, an address, *i.e.*, group of characters, that specify routing instructions for the transmission of the message to its final destination. *Note:* Routing indicators may also include addresses of intermediate points.

**routing label:** The part of the message label that is used for message routing in the signaling network. It includes the destination point code, the originating point code, and the signaling link selection field. [T1.110-1992]

**routing number:** *Synonym routing address, routing table.*

**routing protocol:** In an internet, a service protocol that is used (by routers, but not by hosts) to maintain routing tables; routing protocols are classified as either (a) interior gateway protocols, or (b) exterior gateway protocols.

**routing table:** A matrix associated with a network control protocol, which gives the hierarchy of link routing at each node.

**RQ:** *Abbreviation for repeat-request. See ARQ.*

**RSL:** *Abbreviation for received signal level.*

**RTA:** *Abbreviation for remote trunk arrangement.*

**RTTY:** *Abbreviation for radio teletypewriter.*

**rubidium clock:** A clock containing a quartz oscillator stabilized by a rubidium standard.

**rubidium standard:** A frequency standard in which a specified hyperfine transition of electrons in rubidium-87 atoms is used to control the output frequency. *Note:* A rubidium standard consists of a gas cell, which has an inherent long-term instability. This instability relegates the rubidium standard to its status as a secondary standard.

**run:** The execution of one or more computer jobs or programs.

**run-length encoding:** A redundancy-reduction technique for facsimile in which a run of consecutive picture elements having the same state (gray scale or color) is encoded into a single code word.

**rural radio service:** A public radio service rendered by fixed stations on frequencies below 1000 MHz used to provide (1) Basic Exchange Telecommunications Radio Service, which is public message communication service between a central office and subscribers located in rural areas, (2) public message communication service between landline central offices and different exchange areas which it is impracticable to interconnect by any other means, or (3) private line telephone, telegraph, or facsimile service between two or more points to which it is impracticable to extend service via landline. [47CFR]

**rural subscriber station:** **1.** A fixed station in the rural radio service used by a subscriber for communication within a central office station. **2.** One or more fixed transmitters in the rural radiotelephone service that receive service from central office transmitters. [47CFR]

**RWI:** *Abbreviation for radio and wire integration.*

**RX:** *Abbreviation for receive, receiver.*

**RZ:** *Abbreviation for return-to-zero.*

**s:** *Abbreviation for second.*

**safeguarding statement:** [A] statement affixed to a computer output or printout that states the highest classification being processed at the time the product was produced and requires control of the product, at that level, until determination of the true classification by an authorized person. *Synonym [in INFOSEC] banner.* [INFOSEC-99]

**safety service:** Any radiocommunication service used permanently or temporarily for the safeguarding of human life and property. [NTIA] [RR]

**sampled data:** Data in which the information content exists only for instantaneous values measured or determined at or for discrete intervals. *Note:* Sampled data can be analog or digital. [After SMPTE]

**sample key:** Key intended for off-the-air demonstration use only. [INFOSEC-99]

**sampling:** *See signal sampling.*

**sampling frequency:** *See sampling rate.*

**sampling interval:** The reciprocal of the sampling rate, *i.e.*, the interval between corresponding points on two successive sampling pulses of the sampling signal.

**sampling rate:** The number of samples taken per unit time, *i.e.*, the rate at which signals are sampled for subsequent use, such as for modulation, coding, and quantization. *Deprecated synonym sampling frequency.*

**sampling theorem:** *Synonym Nyquist's theorem.*

**sanitize:** [In INFOSEC, the] process to remove information from media such that data recovery is not possible. It includes removing all classified labels, markings, and activity logs. [INFOSEC-99]

**sanitizing:** Of a recording medium, erasing or overwriting all data in such a manner that it cannot be recovered, even by extraordinary, *e.g.*, laboratory, means. *Note:* Sanitizing is distinguished from simply "deleting" or "erasing" data. For example, a software-based deletion command may simply mark a file or block of data to the effect that it may be overwritten during a subsequent "save" of different data. Until such a save is performed, the deleted data may be recovered, sometimes by the simple expedient of executing a

software command. Likewise, digital data, for example, may be "erased," from a magnetic recording medium, but still be recoverable if subjected to laboratory techniques that can identify residual magnetism left after the erasure.

**SAP:** *Abbreviation for service access point.*

**satellite:** A body which revolves around another body of preponderant mass and which has a motion primarily and permanently determined by the force of attraction of that other body. [NTIA] [RR] *Note:* A parent body and its satellite revolve about their common center of gravity.

**satellite access:** In satellite communications systems, the establishment of contact with a communications satellite space station. *Note:* An example of satellite access is access at the moment at which an Earth station commences to use a satellite space station as a signal repeater, *i.e.*, to use its transponder. Each radio frequency (rf) carrier that is relayed by a satellite space station at any time occupies an access channel. Accesses, *i.e.*, channels, are distinguishable by various system parameters, such as frequency, time, or code. [From Weik '89]

**satellite communications:** A telecommunications service provided via one or more satellite relays and their associated uplinks and downlinks.

**satellite digital audio radio service (SDARS):** **1.** A satellite-based direct-broadcast radio service in which digitally encoded audio entertainment material is broadcast to Earth-based receivers, either directly from an orbiting satellite, or--in cases in which the receiver is in a shielded location--from the satellite to the receiver via a repeater station. **2.** A radiocommunication service in which audio programming is digitally transmitted by one or more space stations directly to fixed, mobile, and/or portable stations, and which may involve complementary repeating terrestrial transmitters, telemetry, tracking and control facilities. [47CFR] **3.** A radiocommunication service in which compact-disc quality programming is digitally transmitted by one or more space stations. [47CFR]

**satellite Earth terminal:** *Synonym Earth terminal.*

**satellite emergency position-indicating radiobeacon:** An Earth station in the mobile-satellite service the emissions of which are intended to facilitate search and rescue operations. [RR]

**satellite link:** A radio link between a transmitting Earth station and a receiving Earth station through one satellite. A satellite link comprises one uplink and one downlink. [NTIA] [RR]

**satellite network:** **1.** A satellite system or a part of a satellite system, consisting of only one satellite and the cooperating Earth stations. [RR] **2.** A satellite system, or part of a satellite system, and the cooperating Earth stations.

**satellite operation:** *See satellite PBX.*

**satellite PBX:** A PBX system that is not equipped with attendant positions, and is associated with an attended main PBX system. *Note:* The main attendant provides attendant functions for the satellite system.

**satellite period:** *See period (of a satellite).*

**satellite relay:** An active or passive satellite repeater that relays signals between two terminals.

**satellite system:** A space system using one or more artificial Earth satellites. [NTIA] [RR] [47CFR]

**saturation:** **1.** In a communications system, the condition in which a component of the system has reached its maximum traffic handling capacity. *Note:* Saturation is equivalent to one erlang per circuit. **2.** The point at which the output of a linear device, such as a linear amplifier, deviates significantly from being a linear function of the input when the input signal is increased. *Note:* Modulation often requires that amplifiers operate below saturation.

**scalability:** The degree to which video and image formats can be sized in systematic proportions for distribution over communications channels of varying capacities. [After SMPTE]

**scan:** **1.** To examine sequentially, part by part. **2.** To examine every reference in every entry in a file routinely as part of a retrieval scheme. **3.** In radar, one complete rotation of the interrogating antenna. **4.** In SONAR, to search 360° or a specific search sector by the use of phased array of transducers. **5.** To sweep, *i.e.*, rotate, a beam about a point or about an axis.

**scan line:** **1.** The line produced on a recording medium frame by a single sweep of a scanner. [JP1] **2.** *Synonym scanning line.*

**scanner:** **1.** In computer graphics, a device that sequentially samples and records digitally the color and intensity of successive elements of an object or image (*e.g.*, a flat, paper object such as a photograph or drawing), for digital storage, transmission, or processing. *Note:* The collected data are usually stored in one of several computer graphics formats. **2.** In television technology, a device that (a) scans successive frames (images) on motion-picture film, and (b) transcodes the digital data so obtained into an electronic signal (*e.g.*, analog NTSC signal, or other signal, including a digital signal) that conforms to any standard or accepted video format. *Note:* Scanners may also scan video images in non-real-time transcoding. The scanner may provide input to a recorder, to a signal processor, to a transmission channel, or to any other desired peripheral system. **3.** In computer (specifically, word-processing) technology, a device that examines text, *e.g.*, on a printed page, and applies certain character-recognition algorithms or principles to determine the text elements (letters, numerals, and other characters) in sequence and convert them into standard (*e.g.*, ASCII) digital code for storage or further processing. *Note:* This special application of character-recognition technology eliminates laborious manual transcription of text, by keyboard entry, into digital files. **4.** A device that examines a spatial pattern, one part after another, and generates analog or digital signals corresponding to the pattern. *Note:* Scanners are often used in mark sensing, pattern recognition, and character recognition. **5.** A radio receiver that is automatically and rapidly tuned (*i.e.*, sweeps) across a predetermined range of frequencies (band), locking onto any frequency at which a signal is detected. *Note:* A scanner provides a means of monitoring a range of frequencies, and any traffic that may be present, but will usually not permit the simultaneous monitoring of more than one frequency.

**scanning:** **1.** In telecommunications systems, examination of traffic activity to determine whether further processing is required. *Note:* Scanning is usually performed periodically. **2.** In television, facsimile, and picture transmission, the process of successively analyzing the colors and densities of the object according to a predetermined pattern. **3.** The process of tuning a device through a predetermined range of frequencies in prescribed increments and at prescribed times. *Note:* Scanning may be performed at regular or random increments and intervals. **4.** In radar and radio direction-finding, the slewing of an antenna or radiation pattern for the purpose of probing in a different direction. *Note 1:* In radar, scanning may be mechanical, using a rotary microwave joint to feed the antenna, or electronic, using a phased array of radiators, the radiated pattern (beam) of which depends on the relative phases of the signals fed to the individual radiators. *Note 2:* In civilian air traffic control radar, scanning usually implies continuous rotation of the antenna or beam about a vertical axis. In military radars, scanning may occur about other than a vertical axis, and may not encompass a full 360°.

**scanning direction:** In facsimile transmitting equipment, the scanning of an object, such as a message surface or the developed plane in the case of a drum, along parallel lines in a specified pattern. *Note 1:* The scanning direction is equivalent to scanning over a right-hand helix on a drum. *Note 2:* The orientation of the message on the scanning plane will depend upon its dimensions. *Note 3:* In facsimile receiving equipment, scanning from right to left and top to bottom, is called "positive" reception and from left to right and top to bottom, is called "negative" reception. *Note 4:* Scanning direction conventions are included in ITU-T Recommendations for phototelegraphic equipment.

**scanning field:** In facsimile systems, the total of the areas that are actually explored by the scanning spot during the scanning of the object by the transmitter or during scanning of the record medium by the receiver. [From Weik '89]

**scanning line:** In an imaging system, the path traversed by a scanning spot during a single line sweep.

**scanning line frequency:** In facsimile, the frequency at which a fixed line perpendicular to the direction of scanning is crossed by a scanning spot. *Note:* The scanning line frequency is equivalent to drum speed in some mechanical systems. *Synonym scanning line rate.*

**scanning line length:** In facsimile systems, the total length of a scanning line, equal to the spot speed divided by the scanning line frequency. *Note:* The scanning line length is usually greater than the length of the available line.

**scanning line period:** In facsimile systems, the time interval between (a) the instant at which the scanning spot probes or writes to a given spot on one scanning line, and (b) the instant at which the scanning spot probes or writes to the corresponding spot on the next scanning line.

**scanning line rate:** *Synonym scanning line frequency.*

**scanning pitch:** The distance between the centers of consecutive scanning lines.

**scanning rate:** In facsimile and television systems, the rate of displacement of the scanning spot along the scanning line.

**scanning spot:** In facsimile systems, the area on the object, *i.e.*, the original, covered instantaneously by the pickup system of the scanner.

**scan-stop lockup:** In automatic link establishment (ALE) radios, the undesired condition in which the normal process of (a) scanning radio channels, (b) stopping on the desired channel, or (c) returning to scan is terminated by the equipment.

**scatter:** *See scattering.*

**scattering:** Of a wave propagating in a material medium, a phenomenon in which the direction, frequency, or polarization of the wave is changed when the wave encounters discontinuities in the medium, or interacts with the material at the atomic or molecular level. *Note:* Scattering results in a disordered or random change in the incident energy distribution.

**scattering center:** In the microstructure of a transmission medium, a site at which electromagnetic waves are scattered. *Note 1:* Examples of scattering centers are vacancy defects; interstitial defects; inclusions, such as a gas molecules, hydroxide ions, iron ions, and trapped water molecules; and microcracks or fractures in dielectric waveguides. *Note 2:* Scattering centers are frozen in the medium when it solidifies and may not necessarily cause Rayleigh scattering, which varies inversely as the fourth power of the wavelength. For example, in glass optical fibers, there is a high attenuation band at 0.95  $\mu\text{m}$ , primarily caused by scattering and absorption by OH (hydroxyl) ions. [From Weik '89]

**scattering coefficient:** The factor that expresses the attenuation caused by scattering, *e.g.*, of radiant or acoustic energy, during its passage through a medium. *Note:* The scattering coefficient is usually expressed in units of reciprocal distance.

**scattering cross section:** The area of an incident wavefront, at a reflecting surface or medium, such as an object in space, through which will pass radiant energy, that, if isotropically scattered from that point, would produce the same power at a given receiver as is actually provided by the entire reflecting surface. [From Weik '89]

**scattering loss:** The part of the transmission (power) loss that results from scattering within a transmission medium or from roughness of a reflecting surface.

**scavenge:** To search, without authorization, through residual data to acquire sensitive information. [2382-pt.8]

**scavenging:** Searching through object residue to acquire data. [INFOSEC-99]

**SCC:** *Abbreviation for specialized common carrier.*

**scene:** *In video, synonymous with clip.*

**scene cut:** Video imagery in which consecutive frames are highly uncorrelated.

**scene cut response:** In video systems, the perceived impairments associated with a scene cut.

**schematic:** **1.** A diagram, drawing, or sketch that details the elements of a system, such as the elements of an electrical circuit or the elements of a logic diagram for a computer or communications system. **2.** Pertaining to a diagram, drawing, or sketch that details the elements of a system, such as the elements of an electrical circuit or the elements of a logic diagram for a computer or communications system.

**scintillation:** In electromagnetic wave propagation, a small random fluctuation of the received field strength about its mean value. *Note:* Scintillation effects become more significant as the frequency of the propagating wave increases.

**scrambler:** A device that transposes or inverts signals or otherwise encodes a message at the transmitter to make the message unintelligible at a receiver not equipped with an appropriately set descrambling device. *Note:* Scramblers usually use a fixed algorithm or mechanism. However, a scrambler provides communications privacy that is inadequate for classified traffic.

**scratch pad store (SPS):** Temporary key storage in crypto-equipment. [INFOSEC-99]

**scream:** *Synonym bang.*

**screen:** **1.** In a telecommunications, computing, or data processing system, to examine entities that are being processed to determine their suitability for further processing. **2.** A nonferrous metallic mesh used to provide electromagnetic shielding. **3.** To reduce undesired electromagnetic signals and noise by enclosing devices in electrostatic or electromagnetic shields. **4.** A viewing surface, such as that of a cathode ray tube or liquid crystal display (LCD).

**screen capture:** In computers, the process or act by which the data currently displayed on a monitor, usually representing a single frame of information, are stored or processed in a graphical format. *Note:* A screen capture thus represents an instantaneous "snapshot" of the state of the display.

**screened-host gateway:** *Synonym bastion host.*

**screened subnetwork:** A subnetwork that permits access from both untrusted external networks and from trusted internal networks, but does not permit traffic flow between the two. [2382-pt.35]

**screening router:** A network router capable of discriminating network-based traffic on the protocol type and the value of the protocol fields within the packet. [2382-pt.35]

**script:** A relatively short computer program that performs one specific task. *Note:* A script is normally used to automate complex or advanced features or procedures within a system. Scripts are commonly used to process user information from Web pages (for example, a search engine is a script).



**scripting language:** A programming language supported by and specific to a particular program. *Note:* A scripting program is normally used to automate complex or advanced features or procedures within the program. [After Bahorsky]

**scroll:** In a display device, to move the display window of the screen vertically to view the contents of a stored document. *Note:* Scrolling may be performed continuously or incrementally.

**scroll-mode terminal:** A terminal in which the data are displayed (or pass by) a line at a time.

**SCSI:** *Acronym for small computer system interface.* An intelligent interface device that expands a microprocessor (CPU) bus to facilitate connections to multiple peripherals (e.g., CD-ROM drives, hard drives, or scanners) and exchange data with those peripherals via a separate communications bus. *Note 1:* The original SCSI was capable of supporting up to 7 devices at a data rate of 5 Mb/s over an 8-bit parallel bus. Subsequent SCSI versions feature a parallel communications bus having greater width and speed. *Note 2:* Since SCSI exchanges data with the peripherals over a separate communications bus rather than the processor bus, the CPU can devote the saved processing time to other tasks. *Note 3:* *Pronounced "scuzzy."*

**SDARS:** *See satellite digital audio radio service.*

**SDL:** *Abbreviation for synchronous data link control.* A proprietary, code-independent, link-control protocol.

**search engine:** A specialized program that facilitates information retrieval from large segments of the Internet. *Note 1:* Search engines attempt to help a user locate desired information or resources by seeking matches to user-specified key words. The usual method for finding and isolating this information is to compile and maintain an index of Web resources that can be queried for the key words or concepts entered by the user. The indices are often built from specific resource lists, and may also be created from the output of Web crawlers, wanderers, robots, spiders, or worms. The indices are usually compiled during times of minimum network traffic. *Note 2:* Different engines are appropriate for different kinds of searches, and most can be optimized for specified results.

**search robot:** *See bot, droid.*

**search time:** In data processing systems, the time interval required to locate a particular data element, record, or file in a storage device.

**SECAM:** *Acronym for système électronique couleur avec memoire.* A television signal standard (625 lines, 50 Hz, 220 V primary power) used in France, eastern European countries, the former USSR, and some African countries.

**second (s):** In the International System of Units (SI), the time interval equal to 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium-133 atom.

**secondary channel:** In a system in which two channels share a common interface, a channel that has a lower data signaling rate (DSR) capacity than the primary channel.

**secondary emission:** Particles or radiation, such as photons, Compton recoil electrons, delta rays, secondary cosmic rays, and secondary electrons, that are produced by the action of primary radiation on matter.

**secondary frequency standard:** A frequency standard that does not have inherent accuracy, and therefore must be calibrated against a primary frequency standard. *Note:* Secondary standards include crystal oscillators and rubidium standards. A crystal oscillator depends for its frequency on its physical dimensions, which vary with fabrication and environmental conditions. A rubidium standard is a secondary standard even though it uses atomic transitions, because it takes the form of a gas cell through which an optical signal is passed. The gas cell has inherent inaccuracies because of gas pressure variations, including those induced by temperature variations. There are also variations in the concentrations of the required buffer gases, which variations cause frequency deviations.

**secondary radar:** A radiodetermination system based on the comparison of reference signals with radio signals retransmitted from the position to be determined. [NTIA] [RR] *Note:* An example of secondary radar is the transponder-based surveillance of aircraft. *Synonym secondary surveillance radar.*

**secondary radiation:** *See secondary emission.*

**secondary service area:** [T]he service area of a broadcast station served by the skywave and not subject to objectionable interference and in which the signal is subject to intermittent variations in strength. [47CFR]

**secondary station:** In a communications network, a station that (a) is responsible for performing unbalanced link-level operations as instructed by the primary station and (b) interprets received commands and generates responses.

**secondary surveillance radar:** *Synonym secondary radar.*

**secondary time standard:** A time standard that requires periodic calibration against a primary time standard.

**second dialtone:** **1.** Dialtone presented to the call originator after an access code has been dialed for access to a second, outside, telecommunications system or service. **2.** Dialtone returned to the call originator after she/he has dialed an access number and has reached a switch providing access to modem, to a fax machine, to another telephone, etc.

**second window:** Of silica-based optical fibers, the transmission window at approximately 1.3  $\mu$ m. *Note:* The second window is the minimum-dispersion window in silica-based glasses. [After FAA]

**SECORD:** *Acronym for secure voice cord board.* A desk-mounted patch panel that provides the capability for controlling (a) sixteen 50-kb/s wideband or sixteen 2400-b/s narrowband user lines and (b) 5 narrowband trunks to DSN or other narrowband facilities.

**secret key:** A key that is intended for use by a limited number of correspondents for encryption and decryption. [2382-pt.8]

**secret key encryption:** Any encryption process that (a) depends on only one encryption key, known only to message senders and receivers, and (b) is used to both encode and decode the message. [After Mattila]

**SECTEL:** *Acronym for secure telephone. See STU.*

**section:** The portion of a transmission facility, including terminating points, between (a) a terminal network element (NE) and a regenerator (for example, a central office/remote terminal and customer location equipment such as a DTE) or (b) two regenerators. A terminating point is the point after signal regeneration at which performance monitoring is or may be done. [After T1.105-1988]

**section boundary:** The boundary that separates a network section from the adjacent circuit section, or separates an access circuit section from the adjacent DTE (data terminal equipment). *Synonym boundary.*

**sector:** A predetermined, addressable angular part of a track or band on a magnetic drum or magnetic disk.

**sector alignment:** A copy-protection technique for copy protection that determines whether a diskette is an unauthorized copy by checking whether sectors are positioned properly from track to track. [2382-pt.8]

**sectoring:** In magnetic or optical disk storage media, the division of tracks into a specified number of segments, for the purpose of organizing the data stored thereon.

**secure communications:** Telecommunications deriving security through use of type 1 products and/or protected distribution systems. [INFOSEC-99]

**secure hash standard:** [The] specification for a secure hash algorithm that can generate a condensed message representation called a message digest. [INFOSEC-99]

**secure operating system:** Resident software controlling hardware and other software functions in an information system (IS) to provide a level of protection or security appropriate to the classification, sensitivity, and/or criticality of the data and resources it manages. [INFOSEC-99]

**secure state:** [The] condition in which no subject can access any object in an unauthorized manner. [INFOSEC-99]

**secure subsystem:** [A] Subsystem containing its own implementation of the reference monitor concept for those resources it controls. Secure subsystem must depend on other controls and the base operating system for the control of subjects and the more primitive system objects. [INFOSEC-99]

**secure telephone unit:** See STU.

**secure transmission:** **1.** In transmission security, see **secure communications**. **2.** In spread-spectrum systems, the transmission of binary coded sequences that represent information that can be recovered only by persons or systems that have the proper key for the spread-spectrum code-sequence generator, *i.e.*, have a synchronized generator that is identical to that used for transmission. [From Weik '89]

**secure voice cord board:** See SECORD.

**security:** **1.** A condition that results from the establishment and maintenance of protective measures that ensure a state of inviolability from hostile acts or influences. [JP1] **2.** With respect to classified matter, the condition that prevents unauthorized persons from having access to official information that is safeguarded in the interests of national security. [After JP1] **3.** Measures taken by a military unit, an activity or installation to protect itself against all acts designed to, or which may, impair its effectiveness. [JP1]

**security alarm:** A security-related event that has been identified by a security policy as a potential breach of security. [T1.233-1993]

**security attribute:** Information, other than cryptographic keys, that is needed to establish and describe the protection mechanisms that secure the communications between two entities. [After X9.41]

**security audit:** Of data processing operations, an independent review and examination of system records and activities to (a) determine the adequacy of system controls, (b) ensure compliance with established security policy and operational procedures, (c) detect breaches in security, and (d) recommend any indicated changes in any of the foregoing.

**security category:** A nonhierarchical grouping of sensitive information used to control access to data more finely than with hierarchical security classification alone. [2382-pt.8]

**security classification:** **1.** Of information, the process of determining and designating the specific degree of protection against disclosure the information requires. **2.** The level (degree) of protection so determined. [After 2382-pt.8] *Note:* Examples of security classifications are: "top secret," "secret," and "confidential." **3.** *Synonym security label.*

**security exchange:** The mechanism for conveying, or the conveyance of, security-related information between two entities. [After X9.41]

**security fault analysis:** [An] Assessment, usually performed on information system (IS) hardware, to determine the security properties of a device when hardware fault is encountered. [INFOSEC-99]

**security filter:** **1.** In communications security, the hardware, firmware, or software used to prevent access to specified data by unauthorized persons or systems, such as by preventing transmission, preventing forwarding messages over unprotected lines or circuits, or requiring special codes for access to read-only files. [From Weik '89] **2.** [An] Information-system (IS) -trusted subsystem that enforces security policy on the data that passes through it. [INFOSEC-99]

**security flaw:** [An] Error of commission or omission in an information system (IS) that may allow protection mechanisms to be bypassed. [INFOSEC-99]

**security kernel:** **1.** In computer and communications security, the central part of a computer or communications system hardware, firmware, and software that implements the basic security procedures for controlling access to system resources. **2.** A self-contained usually small collection of key security-related statements that (a) works as a part of an operating system to prevent unauthorized access to, or use of, the system and (b) contains criteria that must be met before specified programs can be accessed. **3.** Hardware, firmware, and software elements of a trusted computing base implementing the reference monitor concept. Security kernel must mediate all accesses, be protected from modification, and be verifiable as correct. [INFOSEC-99]

**security label:** Information representing the sensitivity of a subject or object, such as its hierarchical classification ("confidential," "secret," "top secret") together with any applicable nonhierarchical security categories (*e.g.*, sensitive compartmented information, critical nuclear weapon design information). [INFOSEC-99] *Synonym security classification.*

**security level:** The combination of a hierarchical security classification and a set of security categories that represents the sensitivity of an object or the security clearance of a subject. [2382-pt.8]

**security life:** The time over which cryptographically protected data or other security processes have value. [After X9.67]

**security management:** In network management, the set of functions (a) that protects telecommunications networks and systems from unauthorized access by persons, acts, or influences and (b) that includes many subfunctions, such as creating, deleting, and controlling security services and mechanisms; distributing security-relevant information; reporting security-relevant events; controlling the distribution of cryptographic keying material; and authorizing subscriber access, rights, and privileges.

**security objective:** A statement of intent to counter specified threats and/or satisfy specified organizational security policies or assumptions.

**security perimeter:** All components/devices of an information system (IS) to be accredited. Separately accredited components generally are not included within the perimeter. [INFOSEC-99]

**security range:** [The] highest and lowest security levels that are permitted in or on an information system (IS), system component, subsystem, or network. [INFOSEC-99]

**security safeguards:** Protective measures and controls prescribed to meet the security requirements specified for an information system (IS). Safeguards may include security features, management constraints, personnel security, and security of physical structures, areas, and devices. [INFOSEC-99]

**security specification:** Detailed description of the safeguards required to protect an information system (IS). [INFOSEC-99]

**security target (ST):** A set of security functional and assurance requirements and specifications to be used as the basis for evaluation of an identified product or system.

**security test and evaluation:** Examination and analysis of the safeguards required to protect an information system (IS), as they have been applied in an operational environment, to determine the security posture of that system. [INFOSEC-99]

**security testing:** [The] process to determine that an information system (IS) protects data and maintains functionality as intended. [INFOSEC-99]

**seed:** A random value, either from a random-number generator or a pseudorandom number generator, used as an input to a hash function, whose output is then used as an input parameter into a key-generation algorithm. [After X9.31]

**SEED:** *Acronym for self-electro-optic effect device.* An optically bistable device used for photonic switching. *Note:* A self-electro-optic device consists of multiple elements, biased by an external voltage which creates an external field that shifts the wavelength of the onset of absorption, thus varying the intensity of the transmitted light.

**seed key:** [In INFOSEC, an] initial key, used to start an updating or key generation process. [INFOSEC-99]

**seek:** To position selectively the access mechanism of a direct access [storage] device.

**seek time:** The time required for the access arm of a direct-access storage device to be positioned on the appropriate track. *Synonym* **positioning time.**

**segment:** In a distributed queue dual bus (DQDB) network, a protocol data unit (PDU) that (a) consists of 52 octets transferred between DQDB-layer peer entities as the information payload of a slot, (b) contains a header of 4 octets and a payload of 48 octets, and (c) is either a pre-arbitrated segment or a queued arbitrated segment.

**segmented encoding law:** An encoding law in which an approximation to a curve defined by a smooth encoding law is obtained by a number of linear segments. *Synonym* **piecewise linear encoding law.**

**segregation:** *Synonym* **privacy.**

**seizing:** The temporary dedication of various parts of a communications system to a specific use, usually in response to a user request for service. *Note:* The parts seized may be automatically connected, such as by direct distance dialing (DDD), or may require operator intervention.

**seizure signal:** In telephone systems, a signal used by the calling end of a trunk or line to indicate a request for service. *Note:* A seizure signal also locks out the trunk or line to other demands for service.

**selcall:** *Acronym for selective calling.* Calling from one station in which call identification is sent to signal automatically one or more remote stations and to establish links among them. *Note 1:* Selective calling may be used to un-mute the speakers at designated stations or to initiate a handshake for link establishment. *Note 2:* Selective calling is specified in ITU-R Recommendations for HF and VHF/UHF radio, generally for ship-to-shore, ship-to-ship, aircraft-to-aircraft, and aircraft-to-ground communications.

**selected network:** For a particular message path, any intermediate network between a branch point and a subsequent branch point or convergence point is a selected network. [T1.118-1992]

**selection position:** *Synonym* **decision instant.**

**selective calling:** *See* **selcall.**

**selective combiner:** *Synonym* **maximal-ratio combiner.**

**selective fading:** Fading in which the components of the received radio signal fluctuate independently.

**selective jamming:** *See* **electronic warfare.**

**selective ringing:** In a party line, ringing only the desired user instrument. *Note:* Without selective ringing, all the instruments on the party line will ring at the same time, selection being made by the number of rings.

**selectivity:** A measure of the ability of a receiver to discriminate between a wanted signal on one frequency and unwanted signals on other frequencies.

**self-authentication: 1.** A procedure in which a transmitting station, *i.e.*, a calling station, establishes its own validity without the participation of the receiving station, *i.e.*, the called station. *Note:* The calling station establishes its own authenticity and the called station is not required to challenge the calling station. Self-authentication is usually used only when one-time authentication systems are used to derive the authentication. [From Weik '89] **2.** Implicit authentication, to a predetermined level, of all transmissions on a secure communications system. [INFOSEC-99]

**self-delineating block:** A block in which a bit pattern or a flag identifies the beginning or end of a block.

**self-electro-optic effect device:** *See* **SEED.**

**self-focusing:** In the optical regime, the property of an element (rod or slab of material) that (a) has a refractive index gradient that is a defined function of the radial distance from its optical axis, and (b) by virtue of which gradient, is capable of focusing light in a manner after that of a conventional simple lens. *Note 1:* For example, a self-focusing slab (*i.e.*, a plane-parallel, usually circular) element that is analogous in function to a convex simple lens, is relatively thin with respect to its diameter. By virtue of the fact that its refractive index is at a maximum along its optical axis (which is perpendicular to the faces of the slab), and decreases radially as a function of distance from the optical axis, it is able to bring a beam of light to a focus. If the thickness of the slab is increased greatly, so that it becomes a rod having a length very many times its diameter, it is able to relay a beam or image in a cyclical fashion in much the same manner as a series of discrete conventional lenses and bring it to a final focus, *e.g.*, at or just outside the endface of the rod. (This phenomenon should not be confused with the relaying of images by means of a spatially coherent bundle of a large number of individual optical fibers, each having a diameter of microscopic proportions, and each of which in effect relays a single pixel, and within which bundle no focusing takes place.) *Note 2:* Within a self-focusing element, the rays traverse curved paths, unlike the straight internal paths that characterize conventional lenses or lens elements that are made of homogeneous materials having a uniform refractive index. In a conventional single- or multi-element lens, the rays may change direction abruptly at a refractive discontinuity, such as an air-glass boundary, or the boundary between the crown and flint elements of an achromatic lens, but within each such element, the ray paths are straight. *Note 3:* Self-focusing elements do not produce images of a quality that may be obtained with the best conventional multi-element lenses.

**self-relative address:** In computer programming, a partial computer address that uses the base address of the computer program, in which it appears, as the ellipsed component of the partial address. *Note 1:* A program that uses self-relative addresses will be portable, in that all related programs and subroutines can be moved, together, to a different computer or subdirectory, and all components will still be accessible. *Note 2:* An example would be a Web page with a complete address of <http://www.example.com/menu.html>. If that page links to another page, at that same website, with the complete address of <http://www.example.com/index.html>, that link could be written as a self-relative address, as **index.html**. A browser, reading this link, would "assume" that the complete address of that page must include the base address of the first page (*i.e.*, <http://www.example.com/>).

**self-synchronizing code:** A code in which the symbol stream formed by a portion of one code word, or by the overlapped portion of any two adjacent code words, is not a valid code word. *Note 1:* A self-synchronizing code permits the proper framing of transmitted code words provided that no uncorrected errors occur in the symbol stream. *Note 2:* External synchronization is not required. *Note 3:* High-level data link control (HDLC) and Advanced Data Communication Control Procedures (ADCCP) frames represent self-synchronizing code words.

**self-testing circuit:** A circuit that uses the data it is retransmitting to perform tests on itself to ensure that it is transmitting properly, *i.e.*, to ensure that all circuit components are functioning properly. [After Weik '96]

**semiautomated tactical command and control system:** A machine-aided command and control system in which human intervention is required in varying degrees to operate the system.

**semiautomatic switching system:** **1.** In telephone systems, a switching system in which telephone operators receive call instructions orally from users and complete them by automatic equipment. **2.** At tape-relay intermediate stations, the manual routing or rerouting of taped messages without rekeying them.

**semiconductor laser:** *Synonym injection laser diode.*

**semiduplex operation:** **1.** A method which is simplex operation at one end of the circuit and duplex operation at the other. *RR Footnote:* In general, duplex operation and semiduplex operation require two frequencies in radiocommunication; simplex operation may use either one or two. [NTIA] [RR] **2.** Operation of a communications network in which a base station operates in a duplex mode with a group of remote stations operating in a half-duplex mode. *Note:* The terms "*half-duplex*" and "*simplex*" are used differently in wire and radio communications.

**semi-permanent connection:** A connection established via a service order or via network management. [T1.627-1993]

**sender:** A device that accepts address information from a register or routing information from a translator, and then transmits the proper routing information to a trunk or to local equipment. *Note:* Sender and register functions are often combined in a single unit.

**sending-end crossfire:** In teletypewriter (TTY) systems, interference, in a given channel, caused by transmissions from one or more adjacent TTY channels transmitting from the end at which the crossfire, *i.e.*, interference, is measured.

**sending loudness rating (SLR):** The ratio in dB of the sound pressure produced by a speaker to the voltage produced by a telephone and loop as defined by ITU-T Recommendation P.79. [T1.255-1997]

**send loudness rating (SLR):** *See sending loudness rating.* [T1.508-1998]

**sensitive information:** Information, the loss, misuse, or unauthorized access to or modification of, which could adversely affect the national interest or the conduct of federal programs, or the privacy to which individuals are entitled under 5 U.S.C. Section 552a (the Privacy Act), but that has not been specifically authorized under criteria established by an Executive Order or an Act of Congress to be kept classified in the interest of national defense or foreign policy. (Systems that are not national security systems, but contain sensitive information, are to be protected in accordance with the requirements of the Computer Security Act of 1987 (P.L.100-235).) [INFOSEC-99]

**sensitivity:** **1.** In an electronic device, *e.g.*, a communications system receiver, or detection device, *e.g.*, PIN diode, the minimum input signal required to produce a specified output signal having a specified signal-to-noise ratio, or other specified criteria. *Note 1:* The signal input may be expressed as power in dBm or as field strength in microvolts per meter, with input network impedance stipulated. *Note 2:* "*Sensitivity*" is sometimes improperly used as a synonym for "*responsivity*." **2.** In INFOSEC, a measure of the importance assigned to information by its owner, for the purpose of denoting its need for protection. [After 2382-pt.8]

**sensitivity label:** Information representing elements of the security label(s) of a subject and an object. Sensitivity labels are used by the trusted computing base (TCB) as the basis for mandatory access control decisions. [INFOSEC-99]

**sensor:** A device that responds to a physical stimulus, such as thermal energy, electromagnetic energy, acoustic energy, pressure, magnetism, or motion, by producing a signal, usually electrical.

**sentinel:** *See flag.*

**separate channel signaling:** Signaling in which the whole or a part of one or more channels in a multichannel system is used to provide for supervisory and control signals for the message traffic channels. *Note:* The same channels, such as frequency bands or time slots, that are used for signaling are not used for message traffic.

**separation of duties:** In secure communications, dividing responsibility for sensitive information so that no individual acting alone can compromise the security of the data processing system. [2382-pt.8]

**separations:** The process by which telecommunication property costs, revenues, expenses, taxes, and reserves are apportioned among the operations. [47 CFR Pt.36-A]

**septet:** A byte composed of seven binary elements. *Synonym seven-bit byte.*

**sequence:** An arrangement of items according to a specified set of rules, for example, items arranged alphabetically, numerically, or chronologically.

**sequence number (SEQ):** In a packet, a field of the packet header that is used by the terminating endpoint to determine if the packets arrive in sequence. [T1.509-1995]

**sequential access:** *Synonym serial access.*

**sequential logic element:** A device that has at least one output channel and one or more input channels, all characterized by discrete states, such that the state of each output channel is determined by the previous states of the input channels.

**sequential transmission:** *Synonym serial transmission.*

**serial:** **1.** Pertaining to a process in which all events occur one after the other; for example, the serial transmission of the bits of a character according to the ITU-T V.25 protocol. **2.** Pertaining to the sequential or consecutive occurrence of two or more related activities in a single device or channel. **3.** Pertaining to the sequential processing of the individual parts of a whole, such as the bits of a character or the characters of a word, using the same facilities for successive parts.

**serial access:** **1.** Pertaining to the sequential or consecutive transmission of data into or out of a device, such as a computer, transmission line, or storage device. **2.** A process by which data are obtained from a storage device or entered into a storage device in such a way that the process depends on the location of those data and on a reference to data previously accessed. *Synonym sequential access.*

**serial computer:** **1.** A computer that has a single arithmetic and logic unit. **2.** A computer, some specified characteristic of which is serial; for example, a computer that manipulates all bits of a word serially.

**serializer:** *See parallel-to-serial conversion.*

**serial port:** A port through which data are passed serially, *i.e.*, one bit at a time, and that requires only one input channel to handle a set of bits, *e.g.*, all the bits of a byte.

**serial-to-parallel conversion:** Conversion of a stream of data elements received in time sequence, *i.e.*, one at a time, into a data stream consisting of multiple data elements transmitted simultaneously.

**serial transmission:** The sequential transmission of the signal elements of a group representing a character or other entity of data. *Note:* The characters are transmitted in a sequence over a single line, rather than simultaneously over two or more lines, as in parallel transmission. The sequential elements may be transmitted with or without interruption. *Synonym sequential transmission.*

**series T junction:** A three-port waveguide junction that has an equivalent circuit in which the impedance of the branch waveguide is predominantly in series with the impedance of the main waveguide at the junction.

**server:** A network device that provides service to the network users by managing shared resources. *Note 1:* The term is often used in the context of a client-server architecture for a local area network (LAN). *Note 2:* Examples are a printer server and a file server.

**service:** In the Open Systems Interconnection--Reference Model (OSI--RM), a capability of a given layer, and the layers below it, that (a) is provided to the entities of the next higher layer and (b) for a given layer, is provided at the interface between the given layer and the next higher layer.

**service access:** In personal communications service (PCS), the ability for the network to provide user access to features and to accept user service requests specifying the type of bearer services or supplementary service that the users want to receive from the PCS network.

**service access code (SAC):** A 3-digit code in the (NPA) numbering plan area (NXX) format, which are used as the first three digits of a 10-digit address in a North American Numbering Plan dialing sequence. Although NPA codes are normally used to the purpose of identifying specific geographical areas, certain of these NPA codes have been allocated to identify generic services or to provide access capability, and these are known as service access codes (SACs). The common trait, which is in contrast to an NPA code, is that SACs are nongeographic. One of the key requirements associated with an address containing a SAC is the ability to discern the appropriate carrier. To satisfy this requirement and to alleviate confusion, the term SAC is subdivided into categories that characterize their carrier identification requirements. The 3 subdivisions are ancillary carrier identification, embodied carrier identification, and external carrier identification. [T1.104-1988]

**service access point (SAP):** **1.** A physical point at which a circuit may be accessed. **2.** In an Open Systems Interconnection (OSI) layer, a point at which a designated service may be obtained.

**service affecting limit (SAL):** A parameter value consistent with minimum service objectives that are necessary to support high-speed modems. When any parameter values exceeds the SAL, voiceband data performance may be adversely affected, depending on the performance of the remainder of the connection. [T1.506-1989]

**service availability:** Of a virtual connection section, the long-term percentage of scheduled service time during which that section is available. [After T1.504-1989]

**service bit:** A system overhead bit used for providing a network service, such as a request for a repetition or for a numbering sequence. *Note:* A service bit is not a check bit.

**service channel:** *Synonym orderwire circuit.*

**service class:** *See class of service.*

**service code:** A two-digit code used in the EC-to-IC (exchange carrier-to-interexchange carrier) facility/service selective signaling protocol and the IC-to-EC facility/service selective signaling protocol that identifies the type of service requested. [T1.104-1991]

**service control:** Direction of the functions or processes used to provide a specific telecommunications service. [T1.667-1999]

**service control point (SCP):** An entity in the intelligent network that implements a service control function. [T1.667-1999]

**service data unit (SDU):** In layered systems, a set of data that is sent by a user of the services of a given layer, and is transmitted to a peer service user semantically unchanged.

**service feature:** In telephony, any of a number of special functions that may be specified initially, or added to, the user's basic service. *Note:* Modern telephone switches are capable of providing a wide variety of service features, such as call forwarding and call waiting.

**service identification:** The information that uniquely identifies an NS/EP telecommunications service to the service vendor and the service user.

**service independence:** Not necessarily specific to one service. [T1.667-1999]

**service integrity:** The degree to which a service is provided without excessive impairment, once obtained. [NATO]

**service logic:** A sequence of processes/functions used to provide a specific service. [T1.667-1999]

**service management access function (SMAF):** The entity equivalent to the work station function between network operators and/or subscribers and network service management functional entities. [T1.667-1999]

**service node (SN):** A physical entity that contains the service control function, service data function, specialized resource function and service switching/call control functions. The SSF/CCF is closely coupled to the SCF within the SN and is not accessible by other SCFs. [T1.667-1999]

**service outage:** The state of a service when (a) a network failure impairs or prevents the initiation of new requests for the service, (b) continued use of the service is impaired or not possible, or (c) certain service parameters fall outside prescribed limits. [After T1.Rpt38-1994]

**service probability:** The probability of obtaining a specified (or higher) grade of service during a given period of time.

**service profile:** *Synonym UPT service profile.*

**service profile management:** *Synonym UPT service profile management.*

**service program:** *Synonym utility program.*

**service provider:** **1.** An organization that provides services for content providers and for users of a computer network. *Note:* The services may include access to the computer network, content hosting, server of a private message handling system, news server, *etc.* [After 2382-pt.35] **2.** A company, organization, administration, business, *etc.*, that sells, administers, maintains, charges for, *etc.*, the service. The service provider may or may not be the provider of the network. [T1.653-1996] [ANSI T1.620-1991]



**service-provider portability:** A faculty that allows an end user to retain the same directory number after changing from one service provider to another. [After T1.708-1998]

**service routine:** *Synonym utility program.*

**service signals:** Signals that enable data systems equipment to function correctly, and possibly to provide ancillary facilities. *Synonym housekeeping signals.*

**service subscriber (SS):** An entity that contracts for services offered by service providers. [T1.667-1999]

**service switching and control point (SSCP):** A physical entity that contains the service control function, service data function and the service switching/call control functions. [T1.667-1999]

**service switching function (SSF):** The set of processes that provide for interaction between a call control function and a service control function. [T1.667-1999]

**service switching point (SSP):** A physical entity that implements a service switching function. [T1.667-1999]

**service termination point:** The last point of service rendered by a commercial carrier under applicable tariffs. *Note 1:* The service termination point is usually on the customer premises. *Note 2:* The customer is responsible for equipment and operation from the service termination point to user end instruments. *Note 3:* The service termination point usually corresponds to the demarcation point.

**service user:** An individual or organization, including a service vendor, that is provided a telecommunications service for which a priority level has been requested or assigned.

**serving area ID:** Information that identifies the local serving area where the network provider operates. [After T1.667-1999]

**session key:** An encryption key that provides privacy during a call and may be changed dynamically by the system. [T1.Rpt22-1993]

**Session Layer:** *See Open Systems Interconnection--Reference Model.*

**set: 1.** A finite or infinite number of objects, entities, or concepts, that have a given property or properties in common. **2.** To configure all or part of a device into a specified state.

**SET:** *Abbreviation for secure electronic transaction.*

**set-top:** Referring to an auxiliary device that usually rests on top of or adjacent to a television receiver and that is used in direct analog or digital satellite transmissions and digital television to be viewed on analog television; a set-top device may convert cable TV or Web signals to a form or format that allows end-user channel selection or interaction via a separate desktop computer or key pad. It may tune channels that the TV does not tune and may include descrambling circuitry. It may also include an electronic program guide. *Synonyms set-top box, set-top converter.*

**set-top box:** *Synonyms set-top, set-top converter.*

**seven-bit byte:** *Synonym septet.*

**seven-hundred (700) service:** A personal telephone service that allows individuals to receive, via a single number, telephone calls in various locations (*e.g.*, home, office, or car) from call originators using the same common carrier.

**severely errored second (SES):** A one-second period that contains >30% errored blocks or at least one severely disturbed period. A severely disturbed period occurs when, over a period of time equivalent to 1 ms, all the contiguous blocks are affected by a high bit error density. *Note:* A period of loss of signal or a bit error density of  $>10^{-2}$  is considered a period of errored blocks with high bit error density. It is not required to verify this bit error ratio (BER) by an actual in-service or out-of-service measurement. [T1.514-1995]

**severely errored unit of time: 1.** A specified period of time, during which bits are transferred from a source to a destination, where 30% of the blocks received are errored, or at least one severely disturbed period occurred. A severely disturbed period occurs when, over a period of time equivalent to four contiguous blocks or 1 ms, whichever is larger, all the contiguous blocks are affected by a high bit error density of  $10^{-2}$ . This definition applies for a specified block size. *Note:* Where a suitable block is not available, an alternate definition (#2 below) can be used. **2.** A specified period of time, during which bits are transferred from a source to a destination, where a bit error ratio worse than  $10^{-3}$  occurs. [T1.503-1996]

**sexadecimal:** *Synonym hexadecimal.*

**sextet:** A byte composed of six binary elements. *Synonym six-bit byte.*

**S-F:** *Abbreviation for store-and-forward.*

**SF:** *Abbreviation for single-frequency. See single-frequency signaling.*

**SFTS:** *Abbreviation for standard frequency and time signal. See standard time and frequency signal service.*

**SGML:** *Abbreviation for Standard Generalized Mark-up Language.* A file format for storage of text and graphics files.

**shadow:** In secure systems, a permutation of the bits in a byte or other data unit, which permutation is used to increase redundancy during the signature process. [After X9.31-1]

**shadow loss: 1.** The attenuation caused to a radio signal by obstructions in the propagation path. **2.** In a reflector antenna, the relative reduction in the effective aperture of the antenna caused by the masking effect of other antenna parts, such as a feed horn or a secondary reflector, which parts obstruct the radiation path.

**shannon (Sh):** The unit of information derived from the occurrence of one of two equiprobable, mutually exclusive, and exhaustive events. *Note:* A bit may, with perfect formatting and source coding, contain 1 Sh of information. However, the information content of a bit is usually be less than 1 Sh.

**Shannon's law:** A statement defining the theoretical maximum rate at which error-free digits can be transmitted over a bandwidth-limited channel in the presence of noise, usually expressed in the form  $C = W \log_2(1 + S/N)$ , where  $C$  is the channel capacity in bits per second,  $W$  is the bandwidth in hertz, and  $S/N$  is the signal-to-noise ratio. *Note:* Error-correction codes can improve the communications performance relative to uncoded transmission, but no practical error correction coding system exists that can closely approach the theoretical performance limit given by Shannon's law.

**shaping network:** A network inserted in a circuit for the purpose of improving or modifying the waveform of signals.

**shared service link connection:** A service link connection that can be used by any service customer (SC) in a predefined set of SCs on a first-come, first-service-basis; that is, during

a specific time period, only one SC can use the service link connection, and the right to use the service link connection is assigned on a first-come, first-served basis. [After T1.263-1998]

**shareware:** Software available for downloading from public networks and bulletin board systems, usually at little cost. *Note:* At the end of a trial period, users are asked to pay the software developer a small amount for use of the software. [After Bahorsky]

**sharpness:** The informal, subjective evaluation of detail in the clarity or resolution seen in an image. *Note:* Often sharpness and resolution are assumed to be directly related, because images possessed of greater sharpness are assumed to have greater resolution. An increase in subjective sharpness is usually reported when objects are more clearly delineated from each other and from background having hard, sharply defined edges. A major contribution to subjective sharpness is this high contrast at edge transitions, as is emphasized by both edge enhancement and aperture correction, for example. In many practical systems, increasing the contrast at edge transitions is often accompanied by a reduction in fine detail, and under these conditions sharpness and resolution may describe opposite characteristics. [After SMPTE]

**sheath:** Of a communications or power cable, the outer covering or coverings of tough material, often plastic, that is resistant to environmental hazards such as abrasion, liquid intrusion, solar radiation, *etc.*, and is used to protect cable component(s) such as optical fibers or metallic conductors that transport the signal or power. *Note:* There may be more than one sheath surrounding a given cable. For example, some cable designs use an inner sheath surrounded by metallic armor, over which is an outer sheath. *Synonym jacket.*

**sheath kilometers:** The actual length of cable in route kilometers. [47 CFR Pt.36-A]

**sheath miles:** The actual length of cable in route miles. [47CFR]

**shell:** In a computer environment, an operating system command interpreter, *i.e.*, a software utility that reads an input specifying an operation, and that may perform, direct, or control the specified operation. *Note 1:* For example, a shell may permit a user to switch among application programs without terminating any of them. *Note 2:* A shell may take its input from either a user terminal or from a file.

**SHF:** *Abbreviation for super high frequency. See electromagnetic spectrum.*

**shield:** **1.** A housing, screen, sheath, or cover that substantially reduces the coupling of electric, magnetic, or electromagnetic fields into or out of circuits or transmission lines. **2.** A protective cover that prevents the accidental contact of objects or persons with parts or components operating at hazardous voltage levels.

**shielded enclosure:** [A] room or container designed to attenuate electromagnetic radiation. [INFOSEC-99]

**shielded pair:** A 2-wire transmission line surrounded by a sheath of conductive material that protects it from the effects of external fields and confines fields produced within the line.

**shielded twisted pair:** A transmission line composed of a twisted 2-wire metallic transmission line surrounded by a sheath of conductive material that protects it from the effects of external fields and confines fields produced within the line.

**shielding:** *See shield.*

**shielding effectiveness:** The factor that expresses the attenuation caused by scattering, *e.g.*, of radiant or acoustic energy, during its passage through a medium. *Note:* The scattering coefficient is usually expressed in units of reciprocal distance.

**shift:** **1.** The movement of some or all of the characters or bits of a word by the same number of character or bit positions in the direction of a specified end of a word. **2.** In radar, the ability to move the origin of a radial display away from the center of the cathode ray tube.

**shift register:** A storage device, usually in a central processing unit (CPU), in which device a serially ordered set of data may be moved, as a unit, into a discrete number of storage locations. *Note 1:* Shift registers may be configured so that the stored data may be moved in more than one direction. *Note 2:* Shift registers may be configured so that data may be entered and stored from multiple inputs. *Note 3:* Shift registers may be grouped into arrays of two or more dimensions in order to perform more complex data operations.

**ship Earth station:** A mobile Earth station in the maritime mobile-satellite service located on board ship. [NTIA] [RR]

**ship's emergency transmitter:** A ship's transmitter to be used exclusively on a distress frequency for distress, urgency or safety purposes. [NTIA] [RR]

**ship station:** A mobile station in the maritime mobile service located on board a vessel which is not permanently moored, other than a survival craft station. [NTIA] [RR]

**shock excitation:** *Synonym impulse excitation.*

**shock spectrum:** *Synonym response spectrum.*

**shopping basket:** In electronic commerce (also called "e-commerce"), an application allowing users of a commercial Web site to select products from the screen display as they browse, and then to securely pay for all of those selected products in one secure transaction. [After Bahorsky]

**short haul toll traffic:** A general term applied to message toll traffic between nearby points. In common usage, this term is ordinarily applied to message toll traffic between points less than 20 to 50 miles apart. [47CFR]

**short interruption event (SIE):** An event beginning with the occurrence of a bit error ratio (BER) of  $10^{-2}$  or worse, continuously for each of three or more consecutive seconds, which can last up to 120 seconds. An SIE clears when 10 consecutive seconds pass in which none of them is an SES. *Note:* The  $10^{-2}$  BER continuously over each second implies that all sub-intervals, where the second is divided into at least 10 equal subintervals, have a BER of  $10^{-2}$  or worse. [After T1.514-1995]

**short message service (SMS):** A service in GSM mobile telephony systems that allows the user to send and receive short (maximum 160-character) messages independently of voice calls; a nearly real-time service that stores messages in message centers if the receiving mobile telephone cannot be contacted. *Note:* SMS is both the handset function and the network service. SMS is used to inform users of pending voice messages, network outages, *etc.*, but the principal use is in user-to-user messaging. Addressing is by telephone numbers (GSM only). Networks usually relay messages over network boundaries. There are gateways from e-mail and Web to SMS and from SMS to e-mail, but only on an experimental-service basis. The cost of SMS messages is usually fixed and is lower than for a short voice call.

**shortwave:** In radio communications, pertaining to the band of frequencies approximately between 3 MHz and 30 MHz. *Note:* "Shortwave" is not a term officially recognized by the international community.

**short wavelength:** In optical communication, optical radiation having a wavelength less than approximately 1  $\mu$ m.

**shot noise:** The noise caused by random fluctuations in the motion of charge carriers in a conductor. *Note:* There is often a minor inconsistency in referring to shot noise in an optical system: many authors refer to shot noise loosely when speaking of the mean square shot noise current (amperes<sup>2</sup>) rather than noise power (watts).

**SI:** Abbreviation for **International System of Units**.

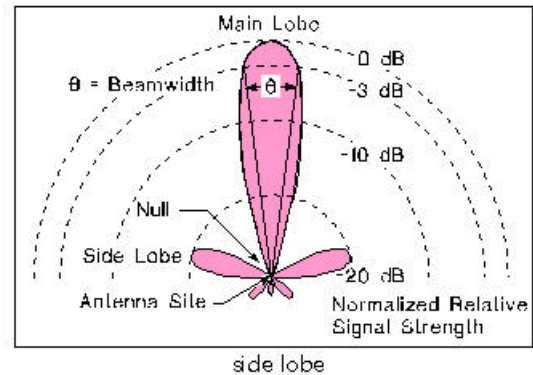
**SID:** Abbreviation for **sudden ionospheric disturbance**.

**sideband:** In amplitude modulation (AM), a band of frequencies higher than or lower than the carrier frequency, containing energy as a result of the modulation process. *Note:* Amplitude modulation results in two sidebands. The frequencies above the carrier frequency constitute what is referred to as the "upper sideband"; those below the carrier frequency, constitute the "lower sideband." In conventional AM transmission, both sidebands are present. Transmission in which one sideband is removed is called "single-sideband transmission."

**sideband transmission:** See **single-sideband transmission**.

**side circuit:** Either of the two circuits used to derive a phantom circuit.

**side lobe:** In a directional antenna radiation pattern, a lobe in any direction other than that of the main lobe.



**sidetone:** The sound of the speaker's own voice (and background noise) as heard in the speaker's telephone receiver. *Note:* Sidetone volume is usually suppressed relative to the transmitted volume. *Synonym* **telephone sidetone**.

**SIG:** Abbreviation for **special interest group**. **1.** Within a given technical discipline or area of knowledge, a circle of individuals or organizations having an intensified interest in a narrower facet of the general area. **2.** In networking, particularly involving Internet applications, a group of individuals or organizations that sponsor, e.g., IRC channels, mailing lists, or Web sites for the purpose of promoting interest in, or advancement of, a particular area of knowledge.

**SIGINT:** Acronym for **signals intelligence**.

**signal:** **1.** Detectable transmitted energy that can be used to carry information. **2.** A time-dependent variation of a characteristic of a physical phenomenon, used to convey information. **3.** As applied to electronics, any transmitted electrical impulse. [JP1] **4.** Operationally, a type of message, the text of which consists of one or more letters, words, characters, signal flags, visual displays, or special sounds, with prearranged meaning and which is conveyed or transmitted by visual, acoustical, or electrical means. [JP1]

**signal center:** A combination of signal communication facilities operated by the Army in the field and consisting of a communications center, telephone switching central and appropriate means of signal communications. [JP1]

**signal compression:** **1.** In analog (usually audio) systems, reduction of the dynamic range of a signal by controlling it as a function of the inverse relationship of its instantaneous value relative to a specified reference level. *Note 1:* Signal compression is usually expressed in dB. *Note 2:* Instantaneous values of the input signal that are low, relative to the reference level, are increased, and those that are high are decreased. *Note 3:* Signal compression is usually accomplished by separate devices called "compressors." It is used for many purposes, such as (a) improving signal-to-noise ratios prior to digitizing an analog signal for transmission over a digital carrier system, (b) preventing overload of succeeding elements of a system, or (c) matching the dynamic ranges of two devices. *Note 4:* Signal compression (in dB) may be a linear or nonlinear function of the signal level across the frequency band of interest and may be essentially instantaneous or have fixed or variable delay times. *Note 5:* Signal compression always introduces distortion, which is usually not objectionable, if the compression is limited to a few dB. *Note 6:* The original dynamic range of a compressed signal may be restored by a circuit called an "expander." **2.** In facsimile systems, a process in which the number of pels scanned on the original is larger than the number of encoded bits of picture information transmitted.

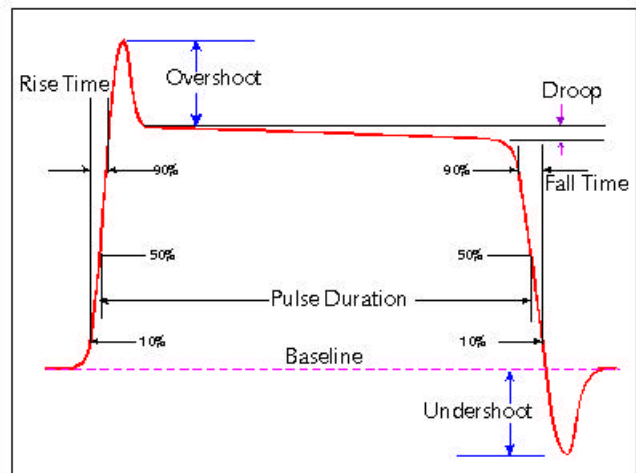
**signal contrast:** In facsimile, the ratio of the level of the white signal to the level of the black signal. *Note:* Signal contrast is usually expressed in dB.

**signal conversion equipment:** *Synonym* **modem**.

**signal distance:** **1.** A measure of the difference between a given signal and a reference signal. *Note:* For analog signals, the signal distance is the root mean square difference between the given signal and a reference signal over a symbol period. **2.** *Synonym* **Hamming distance**.

**signal distortion:** See **distortion**.

**signal droop:** In an otherwise essentially flat-topped rectangular pulse, distortion characterized by a decline of the pulse top.



representative pulse waveform

**signal duration:** A multifrequency (MF) or dual-tone multifrequency (DTMF) signal timing interval during which the signal is being transmitted. For MF signals the signal duration interval begins when the last tone of the MF tone pair exceeds 90% of its steady-state value and ends when either tone of the MF tone pair falls below 90% of its respective steady-state value. For DTMF signals the signal duration interval begins when either tone of the DTMF signal is within 1 dB of its eventual steady-state value and ends when either tone falls 1 dB below its steady-state value. [T1.414-1998]

**signal element:** A part of a signal, distinguished by its nature, magnitude, duration, transition, or relative position. *Note:* Examples of signal elements include signal transitions, significant conditions, significant instants, and binary digits (bits).

**signal expansion:** Restoration of the dynamic range of a compressed signal.

**signal frequency shift:** See **frequency shift**.

**signaling:** **1.** The use of signals for controlling communications. **2.** In a telecommunications network, the information exchange concerning the establishment and control of a connection and the management of the network, in contrast to user information transfer. **3.** The sending of a signal from the transmitting end of a circuit to inform a user at the receiving end that a message is to be sent.

**signaling channel:** A data channel in combination with its associated signaling terminal equipment. [T1.226-1992]

**signaling connection control part (SCCP):** **1.** A component part of SS7 protocol that provides additional functions to the message transfer part (MTP) to provide for Connectionless and Connection Oriented Network services to transfer signaling information between exchanges and specialized centers in telecommunication networks. The combination of the MTP and the SCCP is called Network Service part. [T1.235-1993] **2.** The part of SS7 that provides additional functions to the MTP to cater to both connectionless as well as connection-oriented network services and to achieve an OSI-compatible network service. [T1.110-1987]

**signaling data link:** A combination of two data channels operating together in a single signaling system. [T1.226-1992]

**signaling destination point:** A signaling point to which a message is destined. [T1.226-1992]

**signaling end point:** **1.** A signaling point that can send or receive SS7 messages, and has no message transfer function. [T1.235-1993] **2.** A signaling point with the ability to source or sink network service part user data and considered exclusively from the viewpoint of the source or sink. [T1.110-1987]

**signaling information field:** The bits of a message signal unit that carry information particular to a certain user transaction and always contain a label. [T1.110-1987] [T1.226-1992]

**signaling link:** A transmission facility that consists of a signaling data link and its transfer control functions, used for reliable transfer of a signaling message. [After T1.236-1993]

**signaling link activation:** The process of making a signaling link ready to carry signaling traffic.

**signaling link blocking:** An event that causes the unavailability of a signaling link, typically consisting in a "processor outage" condition at one end of that signaling link. [T1.110-1987] [T1.226-1992]

**signaling link code:** **1.** A field with certain signaling network management messages, which indicates the particular signaling link to which the message refers among those interconnecting the two involved signaling points. **2.** A field in signaling link test message as well as in some signaling network management messages that indicates the particular signaling link, interconnecting the two involved signaling points, to which the message refers. [T1.226-1992] [T1.110-1987]

**signaling link deactivation:** The procedure by which a signaling link is taken out of service. [T1.110-1987]

**signaling link failure:** An event that causes the unavailability of a signaling link, typically consisting of a failure in signaling terminal equipment or in the signaling data link. [T1.110-1987] [T1.226-1992]

**signaling link group:** A set of signaling links directly connecting two signaling points and having the same physical characteristic (bit rate, propagation delay, and the like). [T1.110-1987]

**signaling link management function:** One of a group of functions that control and take actions when required to preserve integrity of locally connected signaling link sets. [T1.226-1992]

**signaling link restoration:** An event characterizing the completion of the initial alignment procedure on a signaling link following the removal of the previous causes of failure; in the absence of any other causes of its unavailability, the signaling link once again becomes available. [T1.226-1992]

**signaling link selection field:** A field of the routing label that is typically used by the message routing function to perform load sharing among different signaling links or link sets. [T1.110-1987]

**signaling link selection (SLS):** A field of the routing label that is typically used by the message routing function to perform load sharing among different signaling links  $n$ , or link sets  $h$ . [T1.226-1992]

**signaling link set:** A set of signaling link(s) directly connecting two signaling points. [T1.110-1987]

**signaling message:** **1.** An assembly of signaling information pertaining to a call that includes, but is not limited to, management transactions, that is transferred (between signaling points) as an entity. [T1.226-1992] **2.** An assembly of signaling information that pertains to a call management transaction, and the like and that is transferred as an entity. [T1.110-1987]

**signaling message discrimination:** At a given signaling point, the process that decides, for each incoming message, whether the signaling point is destination point or if it should act as signaling transfer point for that message, and accordingly, whether the message should be handed to (signaling) message distribution or to (signaling) message routing functions. [After T1.110-1987] [After T1.226-1992]

**signaling message distribution:** The process of determining upon receipt of a signaling message at its destination point, to which user part the signaling message is to be delivered. [T1.110-1987]

**signaling message handling functions:** Functions that, at the actual transfer of a message, direct the message to the proper signaling link or user part. [T1.226-1992] *Note:* The message handling functions include functions for message distribution, message discrimination, and message routing.

**signaling message route:** The signaling link or consecutive links connected in tandem that are used to convey a signaling message from an originating point to its destination point. [T1.110-1987] [T1.226-1992]

**signaling message routing:** The process for selecting, for each signaling message to be sent, the signaling link to be used. [T1.110-1987]

**signaling network:** A network used for signaling by one or more users and consisting of signaling points and connecting signaling links. [T1.110-1987] [T1.226-1992]

**signaling network functions:** The functions that are performed by the message transfer part at level 3 and are common to, and independent of, the operation of individual signaling links. They include the signaling message handling functions and the signaling network management functions. *Note:* The message handling functions include functions for message distribution, message discrimination, and message routing. [T1.110-1987][T1.226-1992]

**signaling network management (SNM) functions:** Functions that control the current message routing and configuration of signaling network facilities based on predetermined data and current information about the status of the signaling network. [T1.226-1992]

**signaling originating point:** A signaling point that is the source of a message. [T1.226-1992]

**signaling path:** In a transmission system, a path used for system control, synchronization, checking, signaling, and service signals used in system management and operations rather than for the data, messages, or calls of the users.

**signaling point:** A node in a signaling network that either originates and receives signaling messages, or transfers signaling messages from one signaling link to another, or both. [After T1.110-1987] [After T1.234-1993]

**signaling point code:** A binary code uniquely identifying a signaling point in a signaling network. This code is used, according to its position in the label either as destination point code or as originating point code. [T1.110-1987] [T1.226-1992]

**signaling rate:** *See data signaling rate.*

**signaling route:** A predetermined path described by a succession of signaling points that may be traversed by signaling messages directly by a signaling point towards a specific destination point. [T1.110-1987]

**Signaling System No. 7 (SS7):** A common-channel signaling system defined by the CCITT in the 1988 Blue Book, in Recommendations Q.771 through Q.774. *Note:* SS7 is a prerequisite for implementation of an Integrated Services Digital Network (ISDN).

**signaling time slot:** In TDM carrier systems, a time slot starting at a particular phase or instant in each frame and allocated to the transmission of signaling (supervisory and control) data.

**signaling traffic flow control:** Actions and procedures intended to limit signaling traffic at its source in the case when the signaling network is not capable of transferring all signaling traffic offered by the user parts, because of network failures or overload situations. [T1.110-1987] [T1.226-1992]

**signaling traffic management functions:** Functions that control, and when necessary, modify, routing information used by message routing information to control the transfer of signaling traffic in a manner that avoids irregularities in message flow. [T1.226-1992]

**signaling transfer point (STP):** *See signal transfer point.*

**signaling transition:** *See signal transition.*

**signal intelligence:** *See signals intelligence.*

**signal level:** In a communications system, the signal power or intensity at a specified point and with respect to a specified reference level, *e.g.*, 1 mW.

**signal message:** In communications systems, a message, *i.e.*, an assembly of signaling information, that (a) includes associated message alignment and service indications, (b) pertains to a call, and (c) is transferred via the message transfer part.

**signal-plus-noise-plus-distortion to noise-plus-distortion ratio:** *See SINAD.*

**signal-plus-noise-to-noise ratio (( $S+N$ )/ $N$ ):** At a given point in a communications system, the ratio of (a) the power of the desired signal plus the noise to (b) the power of the noise. *Note:* The ( $S+N$ )/ $N$  ratio is usually expressed in dB.

**signal processing:** The processing--such as detection, shaping, converting, coding, and time positioning--of signals, that results in their transformation into other forms, such as other waveshapes, power levels, and coding arrangements.

**signal processing gain:** **1.** The ratio of (a) the signal-to-noise ratio of a processed signal to (b) the signal-to-noise ratio of the unprocessed signal. *Note:* Signal processing gain is usually expressed in dB. **2.** In a spread-spectrum communications system, the signal gain, signal-to-noise ratio, signal shape, or other signal improvement obtained by coherent band spreading, remapping, and reconstitution of the desired signal.

**signal reference subsystem:** The portion of a facility grounding system that (a) provides reference planes, such as ground-return circuits, for all of the signal paths in the facility and (b) is isolated from other circuits, especially isolated from circuits that carry fault, lightning discharge, and power distribution currents.

**signal regeneration:** Signal processing that restores a signal so that it conforms to its original characteristics.

**signal-return circuit:** A current-carrying return path from a load back to the signal source, *i.e.*, the low side of the closed loop energy transfer circuit between a source-load pair.

**signal sample:** The value of a particular characteristic of a signal at a chosen instant.

**signal sampling:** The process of obtaining a sequence of instantaneous values of a particular signal characteristic, usually at regular time intervals.

**signal security:** A generic term that includes both communications security and electronics security. [JP 1-02]

**signals intelligence (SIGINT):** **1.** A category of intelligence comprising, either individually or in combination, all communications intelligence, electronics intelligence, and foreign instrumentation signals intelligence, however transmitted. [JP 1-02] **2.** Intelligence derived from communications, electronics, and foreign instrumentation signals. [JP 1-02]

**signals security:** [A] generic term encompassing communications security and electronic security. [NIS]

**signal-to-crosstalk ratio:** At a specified point in a circuit, the ratio of the power of the wanted signal to the power of the unwanted signal from another channel. *Note 1:* The signals are adjusted in each channel so that they are of equal power at the zero transmission level point in their respective channels. *Note 2:* The signal-to-crosstalk ratio is usually expressed in dB.

**signal-to-noise ratio (SNR):** The ratio of the amplitude of the desired signal to the amplitude of noise signals at a given point in time. [JP1] *Note 1:* SNR is expressed as 20 times the logarithm of the amplitude ratio, or 10 times the logarithm of the power ratio. *Note 2:* SNR is usually expressed in dB and in terms of peak values for impulse noise and root-mean-square values for random noise. In defining or specifying the SNR, both the signal and noise should be characterized, *e.g.*, peak-signal-to-peak-noise ratio, in order to avoid ambiguity.

**signal-to-noise ratio per bit:** The ratio given by  $E_b/N_0$ , where  $E_b$  is the signal energy per bit and  $N_0$  is the noise energy per hertz of noise bandwidth.

**signal transfer point (STP):** **1.** In a common-channel signaling network, a switch that provides for the transfer from one signaling link to another. *Note:* In nonassociated common-channel signaling, the signal transfer point is not the point through which the call, which is associated with the signaling being switched, passes. **2.** A packet switching device that performs a message routing function in a CCS network. It receives, discriminates, and transfers CCS messages between the signaling points to which it is connected. The STP function in a network may be implemented by separate network elements or may be resident within switches. When provided on a separate network element basis, the STPs are generally duplexed for reasons of signaling availability. Besides the message routing function, an STP may provide functionality such as gateway screening and global title translation. [After T1.235-1993] **3.** A signaling point with the function of transferring signaling messages from one signaling link to another and considered exclusively from the viewpoint of the transfer. [After T1.110-1987]

**signal transition:** **1.** In the modulation of a carrier, a change from one significant condition to another. *Note 1:* Examples of signal transitions are a change from one electrical current, voltage, or power level to another; a change from one optical power level to another; a phase shift; or a change from one frequency or wavelength to another. *Note 2:* Signal transitions are used to create signals that represent information, such as "0" and "1" or "mark" and "space." **2.** For channel-associated signaling, a change in state of the A bit for 2-state signaling, A and/or B bit in 4-state signaling, or the A, B, C, and/or D bit for 16-state signaling. [After T1.312-1991]

**signal unit (SU):** A group of bits forming a separately transferable entity used to convey information on a signaling link. [T1.226-1992]

**signal unit alignment:** The alignment that exists when flags are received at intervals that correspond to integral numbers of octets and that fall within certain upper and lower limits. [T1.110-1987]

**signal unit error rate monitoring:** A procedure by which the error rate of an active signaling link is measured on the basis of a count of correctly checking and erroneous signal units. [T1.110-1987]

**signal unit sequence control:** Procedures used at Level 2 to ensure that message signal units are transported in sequence, without loss or duplication, over a particular signaling link. [T1.110-1987]

**signatory:** The entity that generates a digital signature on data. [After X9.31]

**signatory authority:** In secure communications, an agreed entity (usually a third party) that issues signatory certificates to organizations participating in this authorization system. [After X9.45]

**signatory certificate:** In encryption, a certificate, issued by a signatory authority, that identifies the authorized signatories of an organization. [After X9.45]

**signature:** **1.** The complete set of signals, usually electromagnetic or acoustic, received from a source such as an infrared object, a radio or radar transmitter, an aircraft, or a ship. *Note:* Signatures may consist of analog or digital signals, or both, and may be analyzed to indicate the nature of their source and assist in its recognition. **2.** The attributes of an electromagnetic or acoustic wave that has been reflected from or transmitted through an object and contains information indicating the attributes of the object. *Note:* In this context, "objects" may include man-made objects or natural ones, the latter including both those that are well defined, *e.g.*, terrain, and those that are not, *e.g.*, weather phenomena. *See also* digital signature.

**significant condition:** In the modulation of a carrier, one of the values of the signal parameter chosen to represent information. *Note 1:* Examples of significant conditions are an electrical current, voltage, or power level; an optical power level; a phase value; or a frequency or wavelength chosen to represent a "0" or a "1"; or a "mark" or a "space." *Note 2:* The duration of a significant condition is the time interval between successive significant instants. *Note 3:* A change from one significant condition to another is called a "signal transition." *Note 4:* Signal transitions are used to create signals that represent information, such as "0" and "1" or "mark" and "space." *Note 5:* Significant conditions are recognized by an appropriate device. Each significant instant is determined when the appropriate device assumes a condition or state usable for performing a specific function, such as recording, processing, or gating.

**significant digit:** In a representation of a number, a digit that is needed for a given purpose; in particular, a digit that must be kept to preserve a given accuracy or a given precision.

**significant instant:** In a signal, any instant at which a significant condition of a signal begins or ends. *Note:* Examples of significant instants include the instant at which a signal crosses the baseline or reaches 10% or 90% of its maximum value.

**significant interval:** The time interval between two consecutive significant instants.

**silence code:** In digital telephony, a code composed of a reserved binary number that is sent instead of an actual sound sample value from the CODEC when the incoming voice volume is below a certain level (*i.e.*, when there is no sound). Depending on the transmission system used, the silence code is used for two purposes: (a) to allow other (lower priority) users to use that time-slot and (b) to produce a standard presence noise for the receiver. [Mattila]



**silent interval:** Any portion of a ringing cycle during which the ringing signal is not being applied. [T1.401-1998]

**silent zone:** *Synonym skip zone.*

**silica:** Silicon dioxide (SiO<sub>2</sub>). *Note 1:* Silica may occur in crystalline or amorphous form, and occurs naturally in impure forms such as quartz and sand. *Note 2:* Silica is the basic material of which the most common communication-grade optical fibers are presently made. [After FAA]

**silicon dioxide (SiO<sub>2</sub>):** *See silica.*

**silicon photodiode:** A silicon-based PN- or PIN-junction photodiode. *Note 1:* Such photodiodes are useful for direct detection of optical wavelengths shorter than approximately 1  $\mu$ m. *Note 2:* Because of their greater bandgap, silicon-based photodiodes are quieter than germanium-based photodiodes, but germanium photodiodes must be used for wavelengths longer than approximately 1  $\mu$ m. [FAA]

**simple authentication:** Authentication by means of simple password arrangements. [After X.509]

**simple buffering:** The assigning of buffer storage for the duration of the execution of a computer program.

**Simple Mail Transfer Protocol:** *See SMTP.*

**Simple Network Management Protocol (SNMP):** The Transmission Control Protocol/Internet Protocol (TCP/IP) standard protocol that (a) is used to manage and control IP gateways and the networks to which they are attached, (b) uses IP directly, bypassing the masking effects of TCP error correction, (c) has direct access to IP datagrams on a network that may be operating abnormally, thus requiring management, (d) defines a set of variables that the gateway must store, and (e) specifies that all control operations on the gateway are a side-effect of fetching or storing those data variables, *i.e.*, operations that are analogous to writing commands and reading status.

**simple scanning:** In facsimile transmission, scanning using only one spot at a time.

**simple security property:** [The] Bell-La Padula security model rule allowing a subject read access to an object, only if the security level of the subject dominates the security level of the object. [INFOSEC-99]

**simplex circuit:** **1.** A circuit that provides transmission in one direction only. **2. *Deprecated definition:*** A circuit using ground return and affording communication in either direction, but in only one direction at a time. *Note:* The above two definitions are contradictory; however, both are in common use. The user is cautioned to verify the nature of the service specified by this term.

**simplex operation:** **1.** Operation in which transmission occurs in one and only one preassigned direction. *Synonym one-way operation.* *Note:* Duplex operation may be achieved by simplex operation of two or more simplex circuits or channels. **2.** Operating method in which transmission is made possible alternately in each direction of a telecommunication channel, for example by means of manual control. *Note:* In general, duplex operation and semiduplex operation require two frequencies in radiocommunication; simplex operation may use either one or two. [NTIA] [RR] *Note 2:* These two definitions are contradictory, however, both are in common use. The first one is used in telephony and the second one is used in radio. The user is cautioned to verify the nature of the service specified by this term.

**simplex protocol:** A communications protocol that is purely one-way, and where acknowledgments are not part of any application protocol. Error control is either not provided, or is accomplished via forward error correction. [T1.800.08-1995]

**simplex (SX) signaling:** Signaling in which two conductors are used for a single channel, and a center-tapped coil, or its equivalent, is used to split the signaling current equally between the two conductors. *Note:* SX signaling may be one-way, for intra-central-office use, or the simplex legs may be connected to form full duplex signaling circuits that function like composite (CX) signaling circuits with E & M lead control.

**simulate:** To represent certain features of the behavior of a physical or abstract system by the behavior of another system. *Note 1:* For example, delay lines may be used to simulate propagation delay and phase shift caused by an actual transmission line. *Note 2:* A simulator may imitate only a few of the operations and functions of the unit it simulates.

**SINAD:** *Abbreviation for signal-plus-noise-plus-distortion to noise-plus-distortion ratio.* **1.** The ratio of (a) total received power, *i.e.*, the received signal-plus-noise-plus-distortion power to (b) the received noise-plus-distortion power. **2.** The ratio of (a) the recovered audio power, *i.e.*, the original modulating audio signal plus noise plus distortion powers from a modulated radio frequency carrier to (b) the residual audio power, *i.e.*, noise-plus-distortion powers remaining after the original modulating audio signal is removed. *Note:* The SINAD is usually expressed in dB.

**singing:** An undesired self-sustained audio oscillation in a circuit. *Note:* Singing is usually caused by positive feedback, excessive gain, or unbalance of a hybrid termination, or by some combination of these.

**singing margin:** The difference in power levels between the singing point and the operating gain of a system or component.

**singing point:** The threshold point at which additional gain in the system will cause self-oscillation.

**single-current system:** *Synonym neutral direct-current telegraph system.*

**single-current transmission system:** *Synonym neutral direct-current telegraph system.*

**single-ended control:** *Synonym single-ended synchronization.*

**single-ended service feature:** A feature, *e.g.*, call/service attempt manipulation, that applies to only one of the parties that may be involved on a call/service attempt. [T1.667-1999]

**single-ended synchronization:** Synchronization between two locations, in which phase error signals used to control the clock at one location are derived by comparing the phase of the incoming signals to the phase of the internal clock at that location. *Synonym single-ended control.*

**single-frequency interference:** Interference caused by a single-frequency source. *Note 1:* An example of single-frequency interference is interference in a transmission channel induced by a 60-Hz source. *Note 2:* The interference caused by the single-frequency source may have other frequencies and may also appear in many channels.

**single-frequency (SF) signaling:** In telephony, signaling in which dial pulses or supervisory signals are conveyed by a single voice-frequency tone in each direction. *Note 1:* An SF signaling unit converts E & M signaling to a format (characterized by the presence or absence of a single voice-frequency tone), which is suitable for transmission over an ac path, *e.g.*, a carrier system. The SF tone is present in the idle state and absent during the seized state. In the seized state, dial pulses are conveyed by bursts of SF tone, corresponding to the interruptions in dc continuity created by a rotary dial or other dc dialing mechanism. *Note 2:* The SF tone may occupy a small portion of the user data channel spectrum, *e.g.*, 1600 Hz or 2600 Hz ("in-band" SF signaling), usually with a notch filter at the precise SF frequency, to prevent the user from inadvertently disconnecting a call if user data has a sufficiently strong spectral content at the SF frequency. The SF tone may also be just outside the user voice band, *e.g.*, 3600 Hz. *Note 3:* The Defense Data Network (DDN) transmits dc signaling pulses or supervisory signals, or both, over carrier channels or cable pairs on a 4-wire basis using a 2600-Hz signal tone. The conversion into tones, or vice versa, is done

by SF signal units.

**single-harmonic distortion:** Of a fundamental frequency, the ratio of the power of a specified harmonic to the power of the fundamental frequency. *Note:* Single-harmonic distortion is measured at the output of a device under specified conditions and is expressed in dB.

**single-level device:** **1.** A functional unit that can only process data of a single security level at a particular time. [2382-pt.8] **2.** [An] information system (IS) device not trusted to properly maintain and separate data to different security levels. [INFOSEC-99]

**single-mode fiber:** *Synonym* **single-mode optical fiber.**

**single-mode optical fiber:** An optical fiber in which only the lowest order bound mode can propagate at the wavelength of interest. *Note 1:* The lowest order bound mode is ascertained for the wavelength of interest by solving Maxwell's equations for the boundary conditions imposed by the fiber, *e.g.*, core (spot) size and the refractive indices of the core and cladding. *Note 2:* The solution of Maxwell's equations for the lowest order bound mode will permit a pair of orthogonally polarized fields in the fiber, and this is the usual case in a communication fiber. *Note 3:* In step-index guides, single-mode operation occurs when the normalized frequency,  $V$ , is less than 2.405. For power-law profiles, single-mode operation occurs for a normalized frequency,  $V$ , less than approximately

$$2.405 \sqrt{\frac{g+2}{g}}$$

where  $g$  is the profile parameter. *Note 4:* In practice, the orthogonal polarizations may not be associated with degenerate modes. *Synonyms* **monomode optical fiber, single-mode fiber, single-mode optical waveguide, unimode fiber.**

**single-mode optical waveguide:** *Synonym* **single-mode optical fiber.**

**single-Morse system:** *Synonym* **neutral direct-current telegraph system.**

**single point keying:** [A] means of distributing key to multiple, local crypto-equipment or devices from a single fill point. [INFOSEC-99]

**single point of control:** A control relationship where the same phase or aspect of a call/service attempt is influenced by one and only one service control function. [T1.667-1999]

**single-polarized antenna:** An antenna that radiates or receives radio waves with a specific polarization. *Note:* For a singly polarized antenna, the desired sense of polarization is usually maintained only for certain directions or within the major portion of the radiation pattern.

**single-sideband (SSB) emission:** An amplitude modulated emission with one sideband only. [NTIA] [RR]

**single-sideband (SSB) equipment reference level:** The power of one of two equal tones that, when used together to modulate a transmitter, cause it to develop its full rated peak power output.

**single-sideband suppressed carrier (SSB-SC) transmission:** Single-sideband transmission in which the carrier is suppressed. *Note:* In SSB-SC the carrier power level is suppressed to the point where it is insufficient to demodulate the signal.

**single-sideband (SSB) transmission:** Sideband transmission in which only one sideband is transmitted. *Note:* The carrier may be suppressed.

**single-tone interference:** An undesired discrete frequency appearing in a transmission channel. *Note:* The single-tone interference frequency is the frequency that appears in the channel regardless of the nature of the source.

**sink:** **1.** An absorber of energy. **2.** In communications, a device that receives information, control, or other signals from a source. **3.** A location at which a specified multiplex structure is terminated through connected equipment removing the frame alignment signal and disassembling the channel time slots. [T1.107-1988]

**S interface:** For basic rate access in an Integrated Services Digital Network (ISDN) environment, a user-to-network interface reference point that (a) is characterized by a 4-wire, 144-kb/s (2B+D) user rate, (b) serves as a universal interface between ISDN terminals or terminal adapters and the network channel termination, (c) allows a variety of terminal types and subscriber networks, such as PBXs, local area networks (LANs), and controllers, to be connected to the network, and (d) operates at 4000 48-bit frames per second, *i.e.*, 192 kb/s, with a user portion of 36 bits per frame, *i.e.*, 144 kb/s.

**site:** **1.** The totality of all of the Internet facilities—http, ftp, *etc.* —offered by an individual or an organization. [After Bahorsky] **2.** A Web location where Web pages are found. *Synonym (in this sense)* **Web site.** *Note:* A Web site describes only those resources available through the World Wide Web.

**six-bit byte:** *Synonym* **sextet.**

**skew:** **1.** In parallel transmission, the difference in arrival time of bits transmitted at the same time. **2.** For data recorded on multichannel magnetic tape, the difference between reading times of bits recorded in a single transverse line. *Note:* Skew is usually interpreted to mean the difference in reading times between bits recorded on the tracks at the extremities, *i.e.*, edges, of the tape. **3.** In facsimile systems, the angular deviation of the received frame from rectangularity caused by asynchronism between the scanner and the recorder. *Note:* Skew is expressed numerically as the tangent of the deviation angle. **4.** In facsimile, the angle between the scanning line, or recording line, and the perpendicular to the paper path.

**skew ray:** In a multimode optical fiber, a bound ray that travels in a helical path along the fiber and thus (a) is not parallel to the fiber axis, (b) does not lie in a meridional plane, and (c) does not intersect the fiber axis.

**skimming:** The act of producing unauthorized copy of an electronic security device while it is being used for its intended purpose. *Note:* Originally, *skimming* meant making an illegal copy of a credit card or a bank card when the original was being used correctly. Typical methods of skimming involve use of a modified reader that reads and stores all the information that the original card contains.

**skin effect:** The tendency of alternating current to flow near the surface of a conductor, thereby restricting the current to a small part of the total cross-sectional area and increasing the resistance to the flow of current. *Note:* The skin effect is caused by the self-inductance of the conductor, which causes an increase in the inductive reactance at high frequencies, thus forcing the carriers, *i.e.*, electrons, toward the surface of the conductor. At high frequencies, the circumference is the preferred criterion for predicting resistance than is the cross-sectional area. The depth of penetration of current can be very small compared to the diameter. [From Weik '89]

**skip distance:** At a given azimuth, the minimum distance between the transmitting station and the closest point of return to the Earth of a transmitted wave reflected from the ionosphere.

**skip zone:** An annular region within the transmission range of an antenna, within which signals from the transmitter are not received. *Note:* The skip zone is bounded by the locus of the farthest points at which the ground wave can be received and the nearest points at which reflected sky waves can be received. *Synonyms* **silent zone, zone of silence.**

**sky wave:** A radio wave that travels upward from the antenna. *Note:* A sky wave may be reflected to Earth by the ionosphere.

**slab-dielectric waveguide:** An electromagnetic waveguide (a) that consists solely of dielectric materials, (b) in which the dielectric propagation medium has a rectangular cross section, (c) that has a width, thickness, and refractive indices that determine the operating wavelength and the modes the guide will support beyond the equilibrium length, (d) that may be cladded, protected, distributed, and electronically controllable, and (e) that may be used in various applications, such as in integrated optical circuits (IOCs) in which their shape is geometrically more convenient than the optical fibers that are circular in cross section, that are used in fiber optic cables for long-distance transmission. *Note:* Their principle of operation is the same as that for optical fibers that are circular in cross section. [After 2196]. *Synonym* **planar waveguide.**

**slamming:** The action that occurs when a customer's long-distance telephone service (carrier selection) is switched from one long distance company to another without the customer's permission, and often, knowledge. [After FCC]

**slant range:** The line-of-sight distance between two points, not at the same level relative to a specific datum. [JP 1-02] *Note:* An example of slant range is the distance to an airborne radar target, *e.g.*, an airplane flying at high altitude with respect to that of the radar antenna. The slant range is the hypotenuse of the triangle represented by the altitude of the airplane and the distance between the radar antenna and the airplane's ground track (the point on the Earth at which it is directly overhead). In the absence of altitude information, the aircraft location would be plotted farther from the antenna than its actual ground track.

**slave clock:** A clock that is coordinated with a master clock. *Note 1:* Slave clock coordination is typically achieved by phase-locking the slave clock output signal to a signal **coherent with, or whose clocking source is traceable to,** the master clock. *Note 2:* **If it is necessary** to adjust for the transit time of the signal from the master clock to the slave clock, the phase of the slave clock may be adjusted with respect to the signal from the master clock so that both clocks are in phase. Thus, the time markers of both clocks, at the output of the clocks, occur simultaneously. [T1.X1]

**slave station: 1.** In a data network, a station that is selected and controlled by a master station. *Note:* Usually a slave station can only call, or be called by, a master station. **2.** In navigation systems using precise time dissemination, a station having a clock is synchronized by a remote master station. *Synonym* **subordinate station.**

**slewing: 1.** Rotating a directional antenna or transducer rapidly about one or more axes. **2.** Changing the frequency or pulse repetition rate of a signal source. **3.** Changing the tuning of a receiver, usually by sweeping through many or all frequencies. [From Weik '89] **4.** Redirecting the beam of a fixed antenna array by changing the relative phases of the signals feeding the antenna elements.

**sliding window:** A variable-duration window that allows a sender to transmit a specified number of data units before an acknowledgement is received or before a specified event occurs. *Note:* An example of a sliding window in packet transmission is one in which, after the sender fails to receive an acknowledgement for the first transmitted packet, the sender "slides" the window, *i.e.*, resets the window, and sends a second packet. This process is repeated for the specified number of times before the sender interrupts transmission. *Synonym* [loosely] **acknowledgement delay period.**

**slip: 1.** The repetition or deletion of a block of bits in a synchronous or perspicacious bitstream due to a discrepancy in the read and write rates at a buffer. [T1.101-1987] **2.** In a sequence of transmitted symbols, *e.g.*, digital bits, a signal phase shift, *i.e.*, a signal positional displacement, that causes the loss of one or more symbols or the insertion of one or more extraneous symbols. *Note:* Slips are usually caused by inadequate synchronization of the two clocks controlling the transmission and reception of the signals that represent the symbols.

**SLIP:** *Acronym for serial line Internet protocol.* A protocol that allows a computer to use the Internet protocol (IP) with a standard telephone line and a high-speed modem.

**slip-free operation:** Operation of a communications system with sufficient phase-locking to avoid overflowing or emptying buffers.

**slit source:** *Synonym* **line source.**

**slope:** In a transmission line, the rate of change of attenuation with respect to frequency over the frequency spectrum. *Note 1:* The slope is usually expressed in dB per hertz or dB per octave. *Note 2:* In metallic lines, the slope is usually greater at high frequencies than at low frequencies.

**slope equalizer:** A device or circuit used to achieve a specified slope in a metallic transmission line.

**slope-keypoint compaction:** Data compaction accomplished by stating (a) a specific keypoint of departure, (b) a direction or slope of departure, (c) the maximum deviation from a prescribed specific value, and (d) a new keypoint and a new slope. *Note:* An example of slope-keypoint compaction is the storage or transmission of a slope and one point on a straight line instead of storing and transmitting a large number of values, *i.e.*, of points, on the line. [From Weik '89]

**slot:** In a distributed-queue dual-bus (DQDB) network, a protocol data unit (PDU) that (a) consists of 53 octets used to transfer segments of user information, (b) has the capacity to contain a segment of 52 octets and a 1-octet access control field, and (c) may be either a pre-arbitrated (PA) slot or a queued arbitrated (QA) slot.

**slot antenna:** A radiating element formed by a slot in a conducting surface or in the wall of a waveguide.

**slotted-ring network:** A ring network that allows unidirectional data transmission between data stations by transferring data in predefined slots in the transmission stream over one transmission medium such that the data return to the originating station.

**slot time:** In networks using carrier sense multiple access with collision detection (CSMA/CD), the length of time that a transmitting station waits before attempting to retransmit following a collision. *Note:* Slot time varies from station to station.

**smart bot:** *Abbreviation for smart robot. See bot.*

**smart card:** A digitally encoded card, similar to a credit card, usually containing a variety of information about the individual(s) authorized to use it. *Note:* The information can be accessed by a card reader into which the card is inserted. The information may include access codes (for opening doors), account numbers (merchant account numbers as well as banking account numbers), and electronic cash (which is withdrawn from the card as a purchase is made).

**smart jack:** *Synonym* [loosely] **continuity check transponder.**

**smart robot:** *See bot.*

**SMDR:** *Abbreviation for station message-detail recording.*

**smearing:** In video displays, a localized distortion over a sub-region of the image, characterized by reduced sharpness of edges and spatial detail. For example, the portrayal of a fast moving object may exhibit smearing. [T1.801.02-1996]

**SMIL:** *Acronym for synchronized multimedia integration language.* A protocol for downloading digitized streams or audio/video data files in the absence of a browser. *Note:*

Pronounced "smile."

**smooth Earth:** Idealized surfaces, such as water surfaces or very level terrain, having radio horizons that are not formed by prominent ridges or mountains but are determined solely as a function of antenna height above ground and the effective Earth radius.

**SMTP:** *Abbreviation for simple mail transfer protocol.* A protocol used to transfer e-mail between or among servers. *Note:* End-users then employ Post Office Protocol to transfer messages to individual terminals.

**SNA:** *Abbreviation for systems network architecture.* A proprietary communications architecture.

**sneak current:** In a communications circuit, an anomalous current that presents no immediate danger, but may cause improper operation or damage.

**sneak current protection:** Application of a protective device that is intended to limit currents that are too small to operate fuse links, stub cables, or the fuse of a fused primary protector. [T1.318-2000]

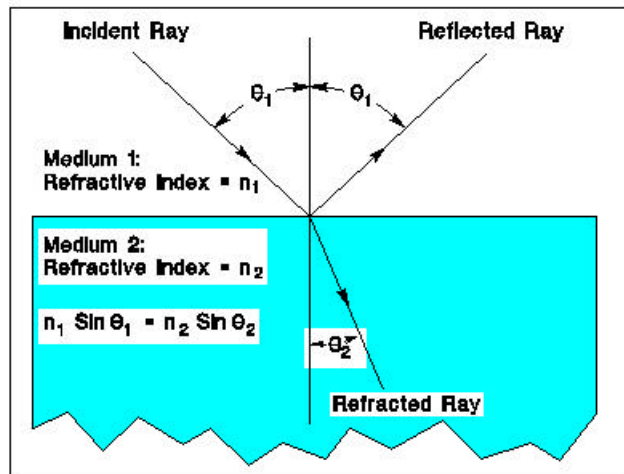
**Snell's law:** A law of geometric optics that defines the amount of bending that takes place when a light ray strikes a refractive boundary, e.g., an air-glass interface, at a non-normal angle. *Note 1:* Snell's law states that

$$n_1 \sin \theta_1 = n_2 \sin \theta_2 \quad ,$$

where  $n_1$  is the index of refraction of the medium in which the incident ray travels,  $\theta_1$  is the angle, with respect to the normal at the refractive boundary, at which the incident ray strikes the boundary,  $n_2$  is the index of refraction of the medium in which the refracted ray travels, and  $\theta_2$  is the angle, with respect to the normal at the refractive boundary, at which the refracted ray travels. The incident ray and refracted ray travel in the same plane, on opposite sides of the normal at the point of incidence. *Note 2:* If a ray travels from a medium of lower refractive index into a medium of higher refractive index, it is bent toward the normal; if it travels from a medium of higher refractive index to a medium of lower index, it is bent away from the normal. *Note 3:* If the incident ray travels in a medium of higher refractive index toward a medium of lower refractive index at such an angle that Snell's law would call for the sine of the refracted ray to be greater than unity (a mathematical impossibility); i.e.,

$$\sin \theta_2 = \frac{n_1}{n_2} \sin \theta_1 > 1 \quad ,$$

then the "refracted" ray in actuality becomes a reflected ray and is totally reflected back into the medium of higher refractive index, at an angle equal to the incident angle (and thus still "obeys" Snell's Law). This reflection occurs even in the absence of a metallic reflective coating (e.g., aluminum or silver). This phenomenon is called "total internal reflection." The smallest angle of incidence, with respect to the normal at the refractive boundary, which angle will support total internal reflection, is called the "critical angle." [After FAA]



Snell's law

**sniffer:** [A] software tool for auditing and identifying network traffic packets. [INFOSEC-99] *Note:* An example of a sniffer is a packet sniffer.

**SNMP:** *Abbreviation for Simple Network Management Protocol.*

**(S+N)/N:** *Abbreviation for signal-plus-noise-to-noise ratio.*

**snow:** In video display systems, noise that (a) is uniformly distributed on the display surface, such as that of a television or radar screen, (b) has the appearance of a uniform distribution of fixed or moving spots, mottling, or speckling, and (c) is usually caused by random noise on an intensity-modulated signal in a display device, such as a cathode-ray tube.

**SNR:** *Abbreviation for signal-to-noise ratio.*

**soft copy:** A nonpermanent display image, for example, a cathode ray tube display.

**soft limiting:** *See limiting.*

**soft sectoring:** On magnetic disks, magnetic drums, and optical disks, the identification of sector boundaries by using recorded information.

**software:** **1.** A set of computer programs, procedures, and associated documentation concerned with the operation of a data processing system; e.g., compilers, library routines, manuals, and circuit diagrams. **[JP 1-02]** **2.** Information (generally copyrightable) that may provide instructions for computers; data for documentation; and voice, video, and music

for entertainment or education.

**software defined radio:** A radio consisting of a receiver and/or a transmitter, where each has the following properties, respectively: (a) the received signal is digitized and then processed using software-programmable digital signal processing techniques (digitization may occur at the rf, IF, or baseband); (b) the modulated signal to be transmitted is generated as a digital signal using software-programmable digital signal processing techniques; the digital signal is then converted to an analog signal for transmission (the conversion to analog may occur at baseband, IF, or rf); and (c) a key element of these radios is that software programmability allows easy changes of the radio's fundamental characteristics such as modulation types, operating frequencies, bandwidths, multiple access schemes, source and channel coding/decoding methods, frequency spreading/despreading techniques and encryption/decryption algorithms.

**software engineering:** The discipline devoted to the design, development, and use of computer software. *Note:* Software engineering must address various aspects of data processing, including compatibility with the computer system which is to execute the software, and tradeoffs among maintainability, flexibility, efficiency, processing time, and costs. [From Weik '89]

**software package:** A package that consists of (a) one or more computer programs and possibly related material such as utility programs or tutorial programs, recorded on a medium suitable for delivery to the user, and from which the user can transfer the program(s) to a data-processing device, and (b) instructional materials such as handbooks and manuals, update information, and possibly support services information. *Note 1:* The computer programs may consist, for example, of application programs or operating systems, and are usually written in a high-level or low-level language, respectively. *Note 2:* The recording medium is usually a magnetic diskette or an optical compact disk.

**software piracy:** The unauthorized use, copying, or distribution of software products. [2382-pt.8]

**software tool:** Software, such as a computer program, routine, subroutine, program block, or program module, that can be used to develop, test, analyze, or maintain a computer program or its documentation. *Note:* Examples of software tools are automated software verification routines, compilers, program maintenance routines, bootstraps, program analyzers, and software monitors. [From Weik '89]

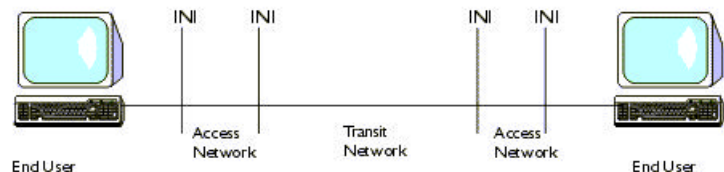
**SOH:** *Abbreviation for start-of-heading character.*

**solid-state scanning:** In facsimile, scanning in which all or a part of the scanning process is performed by electronic commutation of an array of solid-state photosensitive elements.

**soliton:** An optical pulse having a shape, spectral content, and power level designed to take advantage of nonlinear effects in an optical fiber waveguide, for the purpose of essentially negating dispersion over long distances.

**sonar:** *Acronym for sound navigation and ranging.* A device that is used primarily for the detection and location of underwater objects by reflecting acoustic waves from them, or by the interception of acoustic waves from an underwater, surface, or above-surface acoustic source. *Note:* Sonar operates with acoustic waves in the same way that radar and radio direction-finding equipment operate with electromagnetic waves, including use of the Doppler effect, radial component of velocity measurement, and triangulation. [From Weik '89]

**SONET:** *Acronym for synchronous optical network.* An interface standard for synchronous optical-fiber transmission, applicable to the Physical Layer of the OSI Reference Model. *Note:* SONET uses a basic bit rate of 51.840 Mb/s, called OC-1 (optical carrier 1). The SONET hierarchy consists of preset integral multiples of OC-1, *i.e.*, OC-3, OC-12, OC-48, *etc.* [T1.X1]



NI = Network Interface  
INI = Inter-Network Interface

Reference Model -- SONET dedicated digital interface.

**sonobuoy:** In sonar systems, a device (a) that is used to detect acoustic waves, such as those produced by ships and submarines, (b) that, when activated, relays information by radio, (c) that may be active or passive, and (d) that may be directional or nondirectional. [From Weik '89]

**souder prediction station:** A station equipped with an ionosphere souder for realtime monitoring of upper atmosphere phenomena or to obtain data for the prediction of propagation conditions. [NTIA]

**sounding:** In automated HF radio systems, the broadcasting of a very brief signal, containing the station address, station identifier, or call sign, to permit receiving stations to measure link quality.

**sound navigation and ranging:** *See sonar.*

**sound-powered telephone:** A telephone in which the operating power is derived from the speech input only.

**sound wave:** *See acoustic wave.*

**source:** In communications, that part of a system from which messages are considered to originate.

**source efficiency:** In optical systems, the ratio of emitted optical power of a source to the input electrical power.

**source language:** In computing, data processing, and communications systems, a language from which statements are translated. *Note:* Translators, assemblers, and compilers prepare target language programs, usually machine-language programs, from source language programs, usually high-level language programs written by programmers.

**source program:** **1.** A computer program written in a source language. *Note:* An example of a source program is a program that serves as the input to an assembler, compiler, or translator. **2.** A computer program that must be assembled, compiled, or translated before it can be executed by a computer. [From Weik '89]

**source quench:** A congestion-control technique in which a computer experiencing data traffic congestion sends a message back to the source of the messages or packets causing the congestion, requesting that the source stop transmitting.

**source user:** The user providing the information to be transferred to a destination user during a particular information transfer transaction. *Synonym information source.*



**space:** In telegraphy, one of the two significant conditions of encoding. *Note 1:* The complementary significant condition is called a "mark." *Note 2:* In modern digital communications, the two corresponding significant conditions of encoding are called "zero" and "one." *Synonyms* **spacing pulse, spacing signal.**

**spacecraft:** A man-made vehicle which is intended to go beyond the major portion of the Earth's atmosphere. [NTIA] [RR] [47CFR]

**space diversity:** A method of transmission or reception, or both, in which the effects of fading are minimized by the simultaneous use of two or more physically separated antennas, ideally separated by one or more wavelengths.

**space-division multiplexing:** *A misnomer.* *Note:* *Space-division multiplexing* has been improperly applied to the use of multiple physical transmission channels, e.g., twisted pairs or optical fibers, under one sheath.

**space-division switching:** In telephony, switching in which single transmission-path routing determination is accomplished in a switch by using a physically separated set of matrix contacts or cross-points.

**space operation service:** A radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry and space telecommand. These functions will normally be provided within the service in which the space station is operating. [NTIA] [RR] [47CFR]

**space radiocommunication:** Any radiocommunication involving the use of one or more space stations or the use of one or more reflecting satellites or other objects in space. [NTIA] [RR] [47CFR]

**space research service:** A radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes. [NTIA] [RR]

**space station:** A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere. [NTIA] [RR] [47CFR]

**space subsystem:** In satellite communications, that portion of the satellite link that is in orbit.

**space system:** Any group of cooperating Earth stations and/or space stations employing space radiocommunication for specific purposes. [NTIA] [RR] [47CFR]

**space telecommand:** **1.** The use of radiocommunication for the transmission of signals to a space station to initiate, modify or terminate functions of equipment on an associated space object, including the space station. [NTIA] [RR] **2.** The use of radiocommunication for the transmission of signals to a space station to initiate, modify or terminate function of the equipment on a space object, including the space station. [47CFR]

**space telemetry:** The use of telemetry for the transmission from a space station of results of measurements made in a spacecraft, including those relating to the functioning of spacecraft. [NTIA] [RR]

**space tracking:** Determination of the orbit, velocity or instantaneous position of an object in space by means of radiodetermination, excluding primary radar, for the purpose of following the movement of the object. [NTIA] [RR] [47CFR]

**spacing bias:** The uniform lengthening of all spacing signal pulses at the expense of the pulse width of all marking signal pulses.

**spacing end distortion:** *See end distortion.*

**spacing pulse:** *Synonym space.*

**spacing signal:** *Synonym space.*

**spam:** *Slang* **1.** Unwanted or unsolicited e-mail messages or mailing-list or newsgroup postings. **2.** To send an advertisement or solicitation to large numbers of unsolicited recipients, usually via mailing lists or newsgroups. [Bahorsky]

**spamming:** *Synonyms [in e-mail] flooding, mail bombing.*

**spare:** An individual part, subassembly, or assembly supplied for the maintenance or repair of systems or equipment.

**spatial application:** An application requiring high spatial resolution, possibly at the expense of reduced temporal positioning accuracy, i.e., increased jerkiness. *Note:* Examples of spatial applications include the requirement to display small characters and to resolve fine detail in still video, or in motion video that contains very limited motion.

**spatial coherence:** *See coherent.*

**spatial edge noise:** In a video display, that form of edge busyness that is characterized by spatially varying distortion that occurs in close proximity to the edges of objects.

**spatially coherent radiation:** *See coherent.*

**special grade access line:** In the Defense Switched Network, an access line specially conditioned, usually by providing amplitude and delay equalization, to give it characteristics suitable for handling special services, such as reducing data signaling rates (DSR) to a rate between 600 b/s and 2400 b/s.

**special grade of service:** In the Defense Switched Network, a network-provided service in which specially conditioned interswitch trunks and access lines are used to provide secure voice, data, and facsimile transmission.

**special information tone (SIT):** A tone that comprises three precise sequential frequencies used to identify recorded announcements. [After T1.207-1998]

**special interest group:** *See community of interest, interest group, forum, SIG.*

**specialized common carrier (SCC):** A common carrier offering a limited type of service or serving a limited market.

**special purpose computer:** A computer that is designed to operate on a restricted class of problems.

**special service:** A radiocommunication service, not otherwise defined in this Section [of the *Radio Regulations*], carried on exclusively for specific needs of general utility, and not open to public correspondence. [RR with editor's note in brackets]

**special services:** All services other than message telephones, e.g., teletypewriter exchange service (TWX), private line services. [47 CFR Pt.36-A]

**specification:** **1.** An essential technical requirement for items, materials, or services, including the procedures to be used to determine whether the requirement has been met. *Note:* Specifications may also include requirements for preservation, packaging, packing, and marking. **2.** An official document intended primarily for supporting procurement, which document clearly and accurately describes the essential technical requirements for items, materials, or services, including the procedures by which it will be determined that the



requirements have been met. *Note:* An example of a Federal specification is FIPS-PUB 159, *Detail Specification for 62.5- $\mu$ m Core Diameter/125- $\mu$ m Cladding Diameter Class Ia Multimode Optical Fibers*.

**specification point:** An industry agreed-upon location where a set of specifications would apply, for example, the node in the originating network where specification occurs. [After T1.118-1992]

**specific detectivity:** For a photodetector, a figure of merit used to characterize performance, equal to the reciprocal of noise equivalent power (*NEP*), normalized to unit area and unit bandwidth. *Note:* Specific detectivity,  $D^*$ , is given by

$$D^* = \frac{\sqrt{A \Delta f}}{NEP},$$

where  $A$  is the area of the photosensitive region of the detector and  $\Delta f$  is the effective noise bandwidth. *Synonym D-Star.*

**speckle noise:** *Synonym modal noise.*

**speckle pattern:** In optical systems, a field-intensity pattern produced by the mutual interference of partially coherent beams that are subject to minute temporal and spatial fluctuations. *Note:* In a multimode fiber, a speckle pattern results from a superposition of mode field patterns. If the relative modal group velocities change with time, the speckle pattern will also change with time. If differential mode attenuation occurs, modal noise results.

**spectral bandwidth:** *See spectral width.*

**spectral density:** For a specified bandwidth of radiation consisting of a continuous frequency spectrum, the total power in the specified bandwidth divided by the specified bandwidth. *Note:* Spectral density is usually expressed in watts per hertz.

**spectral irradiance:** Irradiance per unit wavelength interval at a given wavelength, usually expressed in watts per unit area per unit wavelength interval.

**spectral line:** A narrow range of emitted or absorbed wavelengths.

**spectral loss curve:** Of an optical fiber, a plot of attenuation as a function of wavelength. *Note:* Spectral loss curves must be normalized with respect to distance before meaningful comparison among fibers can be made.

**spectral purity:** The degree to which a signal is monochromatic.

**spectral radiance:** Radiance per unit wavelength interval at a given wavelength, expressed in watts per steradian per unit area per wavelength interval.

**spectral responsivity:** The ratio of an optical detector's electrical output to its optical input, as a function of optical wavelength.

**spectral width:** The wavelength interval over which the magnitude of all spectral components is equal to or greater than a specified fraction of the magnitude of the component having the maximum value. *Note 1:* In optical communications applications, the usual method of specifying spectral width is the full width at half maximum. This method may be difficult to apply when the spectrum has a complex shape. Another method of specifying spectral width is a special case of root-mean-square deviation where the independent variable is wavelength,  $\lambda$ , and  $f(\lambda)$  is a suitable radiometric quantity. *Note 2:* The *relative spectral width*,  $\Delta\lambda/\lambda$ , is frequently used where  $\Delta\lambda$  is obtained according to note 1, and  $\lambda$  is the center wavelength.

**spectral window:** *See window.*

**spectrum:** *See electromagnetic spectrum, optical spectrum.*

**spectrum designation of frequency:** *See electromagnetic spectrum.*

**spectrum signature:** The pattern of radio signal frequencies, amplitudes, and phases, which pattern characterizes the output of a particular device and tends to distinguish it from other devices.

**specular reflection:** Reflection from a smooth surface, such as a mirror, which maintains the integrity of the incident wavefront.

**speech digit signaling:** *Synonym bit robbing.*

**speech level:** The power in dBm of a speech signal measured using a technique equivalent to Method B of ITU-T Recommendation P.56. [T1.255-1997]

**speech-plus:** Pertaining to a circuit that was designed and used for speech transmission, but to which other uses, such as digital data transmission, facsimile transmission, telegraph, or signaling superimposed on the speech signals, have been added by means of multiplexing. [From Weik '89]

**speech-plus-duplex operation:** Operation in which speech and telegraphy (duplex or simplex) are transmitted simultaneously over the same circuit, and mutual interference is eliminated by the use of filters.

**speech-plus-signaling:** Pertaining to equipment that permits the use of part of a voice-frequency band for signaling.

**speech power:** *See volume unit.*

**speech privacy:** Techniques using fixed sequence permutations or voice/speech inversion to render speech unintelligible to the casual listener. [INFOSEC-99]

**speech synthesizer:** A device that is capable of accepting digital or analog data and developing intelligible speech sounds that correspond to the input data, without resorting to recorded sounds or without simply being a speech scrambler operating in reverse. [From Weik '89]

**speech-to-speech-correlated-noise ratio (Q):** The ratio of the speech power to the power of speech-correlated noise in a digital transmission system. [T1.501-1988]

**speed calling:** A service feature that enables a switch or station to store certain telephone numbers and dial them automatically when a short (1-, 2-, or 3-digit) code is entered.

**speed dialing:** 1. *Synonym abbreviated dialing.* 2. Dialing at a speed greater than the normal ten pulses per second.

**speed of light (c)** : The speed of an electromagnetic wave in free space, precisely 299,792,458 m/s. *Note 1*: The preceding figure is precise because by international agreement the meter is now defined in terms of the speed of light. *Note 2*: The speed of an electromagnetic wave, e.g., light, is equal to the product of the wavelength and the frequency. *Note 3*: In any physical medium, the velocity of propagation of light is lower than the speed of light in free space. Since the frequency is not changed, in any physical medium, the wavelength is also decreased. [After FAA]

**speed of service**: **1.** The time between release of a message by the originator to receipt of the message by the addressee, as perceived by the end user. *Synonym* **originator-to-recipient speed of service**. **2.** The time between entry of a message into a communications system and receipt of the message at the terminating communications facility, i.e., the communications facility serving the addressee, as measured by the system.

**speed-up tone**: *Synonym* **camp-on busy signal**.

**spider**: *See* **bot, droid**.

**spike**: An extremely short pulse of relatively high amplitude.

**spike file**: *See* **last-in first-out**.

**spill forward**: In automatic switching, the transfer of full control on a call to the succeeding office by sending forward the complete telephone address of the called party.

**spill-forward feature**: A service feature, in the operation of an intermediate office, that, acting on incoming trunk service treatment indications, assumes routing control of the call from the originating office. *Note*: This increases the chances of completion by offering the call to more trunk groups than are available in the originating office.

**spillover**: In an antenna, the part of the radiated energy from the feed that does not impinge on the reflectors.

**spiral-four cable**: A quadded cable with four conductors. *Synonym* **star quadded cable**.

**spiral track**: A track with a spiral shape written on a diskette, as part of a method of copy protection. [2382-pt.8]

**spiral wrap**: A molded, insulated plastic product in the form of a helix, used to contain or dress electrical wiring, e.g., to create a wiring harness from a number of insulated wires.

**splice**: **1.** To join, permanently, physical media that conduct or transmit power or a communication signal. **2.** A device that so joins conducting or transmitting media. **3.** The completed joint.

**splice closure**: A usually weatherproof encasement, commonly made of tough plastic, that envelops the exposed area between spliced cables, i.e., where the jackets have been removed to expose the individual transmission media, optical or metallic, to be joined. *Note 1*: The closure usually contains some device or means to maintain continuity of the tensile strength members of the cables involved, and also may maintain electrical continuity of metallic armor, and/or provide external connectivity to such armor for electrical grounding. *Note 2*: In the case of fiber optic cables, it also contains a splice organizer to facilitate the splicing process and protect the exposed fibers from mechanical damage. *Note 3*: In addition to the seals at its seams and points of cable entry, the splice closure may be filled with an encapsulant to further retard the entry of water. [After FAA] *Synonym* **closure**.

**splice loss**: In fiber optic systems, any loss of optical power at a splice. *Note*: A practical splice, of physically realizable fibers, has losses attributable to a number of mechanisms, some of which are intrinsic to the fibers, and some of which are intrinsic to the method or device being used to join them. [After FAA]

**splice organizer**: In optical communication, a device that facilitates the splicing or breaking out of fiber optic cables. *Note*: The organizer provides means to separate and secure individual buffer tubes, fibers, and/or pigtails. It also provides means to secure mechanical splices or protective sleeves used in connection with fusion splices, and has means to contain the slack fiber that remains after the splicing process is completed. [After FAA]

**split**: **1.** With respect to a signal, to divert a portion of it, or divide it, into usually predetermined or specified proportions. **2.** In INFOSEC, a secret random number that is a component of the final working key. [After X9.69] **3.** An action that creates a private communication between the served user and a conferee. The private communication is a normal "two-party" call. [T1.647-1995]

**split homing**: The connection of a terminal facility to more than one switching center by separate access lines, each of which has a separate directory number.

**split knowledge**: **1.** In secure communications, a condition under which two or more entities separately have key components that, individually, convey no knowledge of the resultant cryptographic key. [After X9.24] **2.** Separation of data or information into two or more parts, each part constantly kept under control of separate authorized individuals or teams so that no one individual or team will know the whole data. [INFOSEC-99]

**split screen**: On a display device, display space that has been divided into two or more areas, so that each area can display different portions of the same file or portions of different files. *Note 1*: The split screen excludes the data lying between the portions of the file or files being displayed and includes the desired data in the two or more windows afforded by the split screen. *Note 2*: Examples of split screens are screens in which different portions of a spreadsheet, database, graph, or picture that are too far apart in storage to be viewed or displayed simultaneously as a single image, are viewed adjacently on a single screen. [From Weik '89]

**splitter**: *See* **directional coupler, T-coupler, tee coupler**.

**sponsor certificate**: A certificate that indicates the restrictions on those documents and transactions that an entity may authorize. [After X9.45]

**spontaneous emission**: Radiation emitted when the internal energy of a quantum mechanical system drops from an excited level to a lower level without regard to the simultaneous presence of similar radiation. *Note*: Examples of spontaneous emission include radiation from an LED, and radiation from an injection laser below the lasing threshold.

**spoofing**: **1.** (COMSEC) [The] interception, alteration, and retransmission of a cipher signal or data in such a way as to mislead the recipient. [NIS] **2.** (AIS) [An] attempt to gain access to an AIS by posing as an authorized user. [NIS] **3.** Unauthorized use of legitimate Identification and Authentication (I&A) data, however it was obtained, to mimic a subject different from the attacker. Impersonating, masquerading, piggybacking, and mimicking are forms of spoofing. [INFOSEC-99]

**spooling**: The use of auxiliary storage as buffer storage to reduce processing delays when transferring data between peripheral equipment and the processors of a computer. *Note*: The term is derived from the expression "simultaneous peripheral operation on line."

**sporadic E**: Irregular scattered patches of relatively dense ionization that develop seasonally within the E region and that reflect and scatter frequencies up to 150 MHz. *Note 1*: The sporadic E is a regular daytime occurrence over the equatorial regions and is common in the temperate latitudes in late spring, early summer and, to a lesser degree, in early winter. *Note 2*: At high, i.e., polar, latitudes, sporadic E can accompany auroras and associated disturbed magnetic conditions. *Note 3*: The sporadic E can sometimes support reflections for distances up to 2,400 km at frequencies up to 150 MHz. *Synonym* **sporadic E propagation**.

**sporadic E propagation**: *Synonym* **sporadic E**.

**spot beam**: In satellite communications systems, a narrow beam from a satellite station antenna that illuminates, with high irradiance, a limited area of the Earth by using beam

(directive) antennas rather than Earth-coverage antennas.

**spot jamming:** The jamming of a specific channel or frequency. [JP 1-02]

**spot projection:** In facsimile systems, optical scanning in which a scanning spot is moved across the object and the scanning spot size is determined by the illuminated area of the spot.

**spot size:** **1.** The size of the electron spot on the face of a cathode ray tube. *Note:* The spot size is larger than the diameter of the electron beam because of the spillover of electrons into adjacent areas of the screen near the spot. The spot size is a function of the ability of the tube to focus the electron beam, as well as of the electron gun aperture. [From Weik '89] **2.** In facsimile systems, the diameter of the scanning spot or the recording spot. [From Weik '89] **3.** In single-mode optical fibers, the effective core diameter.

**spot speed:** In facsimile systems, the speed of the scanning or recording spot along the available line. *Note:* The spot speed is usually measured on the object or on the recorded copy.

**spread spectrum:** **1.** Telecommunications techniques in which a signal is transmitted in a bandwidth considerably greater than the frequency content of the original information. *Note:* Frequency hopping, direct sequence spreading, time scrambling, and combinations of these techniques are forms of spread spectrum. [INFOSEC-99] **2.** A signal structuring technique that employs direct sequence, frequency hopping or a hybrid of these, which can be used for multiple access and/or multiple functions. This technique decreases the potential interference to other receivers while achieving privacy and increasing the immunity of spread spectrum receivers to noise and interference. Spread spectrum generally makes use of a sequential noise-like signal structure to spread the normally narrowband information signal over a relatively wide band of frequencies. The receiver correlates the signals to retrieve the original information signal. [NTIA]

**spur:** A secondary route having a junction to the primary route in a network.

**spurious emission:** Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions. [NTIA] [RR]

**spurious noise:** Circuit noise or interference that is like a signal. [T1.401-1988]

**spurious radiation:** Any unintentional emission.

**spurious response:** In radio reception, a response in the receiver intermediate frequency (IF) stage produced by an undesired emission in which the fundamental frequency (or harmonics above the fundamental frequency) of the undesired emission mixes with the fundamental or harmonic of the receiver local oscillator.

**spurious tones:** Any tone that (a) is other than a fundamental tone or its harmonics, and (b) is generated within the back-to-back connected transmit and receive terminal or channel units, when the fundamental, *i.e.*, a test sine wave, is applied to the transmit terminal or channel unit input. [After T1.305-1990]

**SQL:** *Abbreviation for structured query language.* The international standard language for defining and accessing relational databases. [Bahorsky]

**square pixel:** A pixel of equal width and height; *i.e.*, having an aspect ratio of 1:1 *Note:* Pixels created by computer graphics usually have an aspect ratio of 1:1. Television technology was not always concerned with pixel aspect ratio. However, modern dependence upon digital electronic post-production (*e.g.*, image distortion, rotation, or size changes) has underscored the advantages of square pixels, which facilitate simplified programs and pose less risk of artifacts than do pixels that are not square.

**square wave:** A wave that has two significant conditions, *i.e.*, two levels of amplitude, that change from one condition to the other in a relatively short time compared to the wavelength. *Note:* When the instantaneous amplitude is plotted versus time or distance, the waveform has a rectangular shape. [From Weik '89]

**squatting:** *See cybersquatting.*

**squelch:** A circuit function that acts to suppress the audio output of a receiver. [NTIA] *Note:* The squelch function is activated in the absence of a sufficiently strong desired input signal, in order to exclude undesired lower-power input signals that may be present at or near the frequency of the desired signal.

**sr:** *Abbreviation for steradian.*

**S reference point:** The conceptual reference point dividing the TE1 (terminal endpoint identifier) and the NT2 (network termination 2) in a particular ISDN access arrangement. [T1.615-1992]

**SSB:** *Abbreviation for single sideband. See single-sideband emission.*

**SSB-SC:** *Abbreviation for single-sideband suppressed carrier. See single-sideband suppressed carrier transmission.*

**SS7:** *Abbreviation for Signaling System No. 7.*

**stability:** The invariability of a specified property of a substance, device, or apparatus with time, or under the influence of typically extrinsic factors.

**stagger:** In facsimile systems, periodic error in the position of the recorded spot along the recorded line.

**standard:** **1.** Guideline documentation that reflects agreements on products, practices, or operations by nationally or internationally recognized industrial, professional, trade associations or governmental bodies. *Note:* This concept applies to formal, approved standards, as contrasted to de facto standards and proprietary standards, which are exceptions to this concept. **2.** An exact value, a physical entity, or an abstract concept, established and defined by authority, custom, or common consent to serve as a reference, model, or rule in measuring quantities or qualities, establishing practices or procedures, or evaluating results. A fixed quantity or quality. [JP 1-02]

**standard frequency and time signal-satellite service:** A radiocommunication service using space stations on Earth satellites for the same purpose as those of the standard frequency and time signal service. This service may also include feeder links necessary for its operation. [NTIA] [RR]

**standard frequency and time signal service:** A radiocommunication service for scientific, technical and other purposes, providing the transmission of specified frequencies, time signals, or both, of stated high precision, intended for general reception. [NTIA] [RR]

**standard frequency and time signal station:** A station in the standard frequency and time signal service. [NTIA] [RR]

**Standard Generalized Mark-up Language:** *See SGML.*

**standardized profile:** A profile that specifies one or more interoperable open systems interconnection stacks that are intended to cover one or more specific functional areas. *Note:* Examples of standardized profiles are the ISO standardized profiles and the NATO standardized profiles.

**standard operating conditions:** The set of conditions (*e.g.*, voltage, temperature, humidity, and the like) over which the specified parameters maintain their stated performance rating. [T1.106-1988]

**standard optical source:** A reference optical source to which emitting and detecting devices are compared for calibration purposes. *Note:* In the United States, recognized standard optical sources must be traceable to the National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS).

**standard telegraph level (STL):** The power per individual telegraph channel required to yield the standard composite data level. *Note:* For example, for a composite data level of -13 dBm at 0-dBm transmission level point (OTLP), the STL would be approximately -25 dBm for a 16-channel VFCT terminal computed from  $STL = -(13 + 10 \log_{10} n)$ , where  $n$  is the number of telegraph channels and the STL is in dBm.

**standard test signal:** A single-frequency signal with standardized level used for testing the peak power transmission capability and for measuring the total harmonic distortion of circuits or parts of a circuit. *Note:* Standardized test signal levels and frequencies are listed in MIL-STD-188-100 and in the *Code of Federal Regulations*, Title 47, part 68.

**standard test tone:** A single-frequency signal with a standardized level generally used for level alignment of single links and of links in tandem. *Note:* For standardized test signal levels and frequencies, see MIL-STD-188-100 for DOD use, and the *Code of Federal Regulations*, Title 47, part 68 for other Government agencies.

**standard time and frequency signal (STFS) service:** In the United States, standard time and frequency signals, broadcast on very precise carrier frequencies by the U.S. Naval Observatory and the National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS). *Note:* The *Radio Regulations* (RR) define an identical international service as **standard frequency and time signal service**.

**standby: 1.** In computer and communications systems operations, pertaining to a power-saving condition or status of operation of equipment that is ready for use but not in use. *Note:* An example of a standby condition is a radio station operating condition in which the operator can receive but is not transmitting. **2.** Pertaining to a dormant operating condition or state of a system or equipment that permits complete resumption of operation in a stable state within a short time. **3.** Pertaining to spare equipment that is placed in operation only when other, in-use equipment becomes inoperative. *Note:* Standby equipment is usually classified as (a) *hot* standby equipment, which is warmed up, *i.e.*, powered and ready for immediate service, and which may be switched into service automatically upon detection of a failure in the regular equipment, or (b) *cold* standby equipment, which is turned off or not connected to a primary power source, and which must be placed into service manually.

**standing wave:** In a transmission line, a wave in which the distribution of current, voltage, or field strength is formed by the superposition of two waves propagating in opposite directions, and which wave is characterized by a series of nodes (maxima) and anti-nodes (minima) at fixed points along the transmission line. *Note:* A standing wave may be formed when a wave is transmitted into one end of a transmission line and is reflected from the other end by an impedance mismatch, *i.e.*, discontinuity, such as an open or a short. *Synonym* **stationary wave**.

**standing wave ratio (SWR):** The ratio of the amplitude of a standing wave at an anti-node (minimum) to the amplitude at an adjacent node (maximum). *Note 1:* The standing wave ratio (SWR) in a uniform transmission line is given by

$$SWR = \frac{1 + \rho}{1 - \rho},$$

where  $\rho$  is the reflection coefficient. *Note 2:* Reflections occur as a result of discontinuities, such as an imperfection in an otherwise uniform transmission line, or when a transmission line is terminated with other than its characteristic impedance.

**star coupler:** A passive optical coupler having a number of input and output ports, used in network applications. *Note:* An optical signal introduced into any input port is distributed to all output ports. Because of the nature of the construction of a passive star coupler, the number of ports is usually a power of 2; *i.e.*, two input ports and two output ports (a "two-port" coupler, customarily called a "*directional coupler*," or "*splitter*"); four input ports and four output ports (a "four-port" coupler); eight input ports and eight output ports (an "eight-port" coupler); *etc.* [FAA]

**star network:** *See* **network topology**.

**star (\*) property:** [The] Bell-La Padula security model rule allowing a subject write access to an object only if the security level of the object dominates the security level of the subject. [INFOSEC-99]

**star quadded cable:** *Synonym* **spiral-four cable**.

**start-dial signal:** An on-hook signal indicating customer installation (CI) readiness to receive network outpulsing that is used in conjunction with controlled outpulsing. The on-hook signal that ends the wink-start signal or delay-dial signal is the start-dial signal. [T1.405-1989]

**starting frame delimiter:** A specified bit pattern that indicates the start of a transmission frame.

**start message:** *Synonym* **go-ahead notice**.

**start notice:** *Synonym* **go-ahead notice**.

**start-of-heading character (SOH):** A transmission control character used as the first character of a message heading.

**start-of-text character (STX):** A transmission control character that precedes a text and may be used to terminate the message heading.

**star topology:** *See* **network topology**.

**start pulse:** *See* **A-condition, start signal**.

**start-record signal:** In facsimile systems, a signal used for starting the process of converting the electrical signal to an image on the record medium.

**start signal: 1.** A signal that prepares a device to receive data or to perform a function. **2.** In start-stop transmission, a signal at the beginning of a character that prepares the receiving device for the reception of the code elements. *Note:* A start signal is limited to one signal element usually having the duration of a unit interval.

**start-stop character:** A character that includes one start signal at the beginning and one or two stop signals at the end.

**start-stop distortion:** In start-stop modulation, the ratio of (a) the maximum absolute difference between the actual and the theoretical intervals that separate any significant instant of modulation or demodulation from the significant instant of the start signal element immediately preceding it to (b) the unit interval.

**start-stop margin:** In start-stop modulation, the maximum amount of overall start-stop distortion that is compatible with correct translation by the start-stop equipment of all the character signals that appear singly, that appear at the maximum allowable speed, or that appear at the standard modulation rate.

**start-stop modulation:** A method of modulation in which the time of occurrence of the bits within each character, or block of characters, relates to a fixed time frame, but the start of each character, or block of characters, is not related to this fixed time frame.

**start-stop system:** *Synonym asynchronous communications system.*

**start-stop transmission:** **1.** Asynchronous transmission in which a start pulse and a stop pulse are used for each symbol. **2.** Signaling in which each group of code elements corresponding to an alphanumeric character is (a) preceded by a start signal that serves to prepare the receiving mechanism for the reception and registration of a character and (b) followed by a stop signal that serves to bring the receiving mechanism to rest in preparation for the reception of the next character.

**start-stop TTY distortion:** *Synonym teletypewriter signal distortion.*

**start-up KEK:** Key-encryption-key held in common by a group of potential communicating entities and used to establish ad hoc tactical networks. [INFOSEC-99]

**statement:** **1.** In programming languages, a language construct that represents a set of declarations or a step in a sequence of actions. **2.** In computer programming, a symbol string or other arrangement of symbols. **3.** In computer programming, a meaningful expression or generalized instruction, represented in a source language.

**static data:** Data that are relatively long-lived in comparison to ephemeral data, and which have a longer period of validity. *Note:* Static data may include static domain parameters and static public or private keys. Both static and ephemeral data are valuable ingredients for building robust key agreement protocols. [After X9.42]

**staticizer:** *See serial-to-parallel conversion.*

**station:** One or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radio astronomy service. Each station shall be classified by the service in which it operates permanently or temporarily. [NTIA] [RR]

**stationary satellite:** *See geostationary orbit.*

**stationary wave:** *Synonym standing wave.*

**station battery:** Within a facility, a separate battery power source that satisfies all significant requirements for dc input power associated with the facility. *Note:* Station batteries are usually centrally located. The batteries may power radio and telephone equipment as well as provide emergency lighting and controls for the equipment.

**station clock:** In a station, the principal clock, or alternate clock, that provides the timing reference at the station.

**station equipment:** *See customer premises equipment.*

**station load:** The total power requirements of the integrated station facilities.

**station message-detail recording (SMDR):** A record of all calls originated or received by a switching system. *Note:* SMDRs are usually generated by a computer.

**station-to-station basis:** The term applied to the basis of toll rate making which contemplates that the message toll service charge (telephone or TWX) covers the use made of all facilities between the originating station and the terminating station, including the stations, and the services rendered in connection therewith. [47 CFR Pt.36-A]

**statistically unique:** A characteristic of a quantity such that, for an  $n$ -bit quantity, the probability of two values' repeating is less likely than or equal to the probability of two  $n$ -bit quantities' repeating at random. [After X9.62]

**statistical multiplexing:** Multiplexing in which channels are established on a statistical basis; *i.e.*, connections are made according to probability of need.

**statistical time-division multiplexing:** Time-division multiplexing in which connections to communication circuits are made on a statistical basis.

**status field (SF):** The bits of a link status signal unit that indicate one of the major signaling link states. [T1.226-1992]

**statute mile:** A unit of distance equal to 1.609 km (0.869 nmi, 5280 ft.).

**STDM:** *Abbreviation for statistical time-division multiplexing.*

**steady-state condition:** **1.** In a communications circuit, a condition in which some specified characteristic of a condition, such as a value, rate, periodicity, or amplitude, exhibits only negligible change over an arbitrarily long period. **2.** In an electrical circuit, the condition that exists after all initial transients or fluctuating conditions have damped out, and all currents, voltages, or fields remain essentially constant, or oscillate uniformly. **3.** In fiber optics, *synonym for equilibrium mode distribution.*

**steady-state throughput:** The value to which a throughput measurement converges, as the duration of the observation period increases with statistically constant load on the virtual connection. [After T1.504-1989]

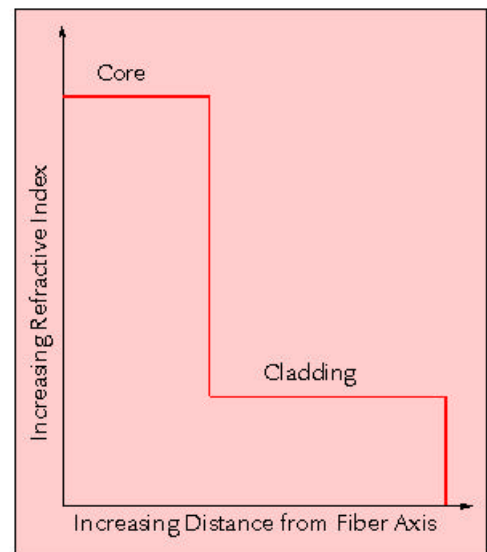
**steganography:** A variety of encryption that completely hides text or graphics, usually unencrypted, within other text or graphics that are electronically transmitted.

**step-by-step (SXS) switching system:** An automatic dial telephone system in which calls are switched by a succession of switches that move a step at a time, from stage to stage, each step being made in response to the dialing of a number.

**step-index fiber:** An optical fiber with a core having a uniform refractive index.

**step-index profile:** For an optical fiber, a refractive index profile characterized by a uniform refractive index within the core and a sharp decrease in refractive index at the core-cladding interface. *Note 1:* The step-index profile corresponds to a power-law index profile with the profile parameter approaching infinity. *Note 2:* The step-index profile is used in most single-mode fibers and some multimode fibers.





refractive index profile, multimode step-index fiber

**steradian (sr):** The metric unit of solid angle. *See International System of Units.*

**stereophonic crosstalk:** An undesired signal occurring in the main channel from modulation of the stereophonic channel or that occurring in the stereophonic channel from modulation of the main channel. [47CFR]

**stereophonic sound subcarrier:** A subcarrier within the FM broadcast baseband used for transmitting signals for stereophonic sound reception of the main broadcast program service. [47CFR]

**STFS:** *Abbreviation for standard time and frequency signal. See standard time and frequency signal service.*

**still image:** Nonmoving visual information, *i.e.*, fixed images, such as graphs, drawings, and pictures.

**still video:** Video imagery that is not intended to convey the appearance of movement.

**stimulated emission:** In a quantum mechanical system, the radiation emitted when the internal energy of the system drops from an excited level (induced by the presence of radiant energy at the same frequency) to a lower level. *Note:* An example of stimulated emission is the radiation from an injection laser diode operated above the lasing threshold.

**STL:** *Abbreviation for standard telegraph level, studio-to-transmitter link.*

**stopband:** A band of frequencies, between specified limits, that a circuit, such as a filter or telephone circuit, does not transmit. *Note 1:* Frequencies above the lower limit and below the upper limit are not transmitted, *i.e.*, are not allowed to pass. *Note 2:* The limiting frequencies are those at which the transmitted power level increases to a specified level, usually 3 dB below the maximum level, as the frequency is decreased or increased from that at which the transmitted power is a minimum. *Note 3:* The difference between the limits is the stopband bandwidth, usually expressed in hertz.

**stop element:** *See stop signal.*

**stop-record signal:** In facsimile systems, a signal used for stopping the process of converting the electrical signal to an image on the record medium.

**stop signal: 1.** In start-stop transmission, a signal at the end of a character that prepares the receiving device for the reception of a subsequent character. A stop signal is usually limited to one signal element having any duration equal to or greater than a specified minimum value. **2.** A signal to a receiving mechanism to wait for the next signal.

**storage: 1.** The retention of data in any form, usually for the purpose of orderly retrieval and documentation. [JP 1-02] **2.** A device consisting of electronic, electrostatic, electrical, hardware, or other elements into which data may be entered, and from which data may be obtained, as desired. [JP 1-02]

**storage cell: 1.** An addressable storage unit. **2.** The smallest subdivision of storage into which a unit of data can be entered, stored, and retrieved. *Synonym storage element.*

**storage element:** *Synonym storage cell.*

**storage object:** An object supporting both read and write accesses to an information system (IS). [INFOSEC-99]

**storage register:** *See register.*

**store-and-forward (S-F):** Pertaining to communications systems in which messages are received at intermediate routing points and recorded *i.e.*, stored, and then transmitted, *i.e.*, forwarded, to the next routing point or to the ultimate recipient.

**store-and-forward switching center:** A message switching center in which a message is accepted from the originating user, *i.e.*, sender, when it is offered, held in a physical storage, and forwarded to the destination user, *i.e.*, receiver, in accordance with the priority placed upon the message by the originating user and the availability of an outgoing channel.

**stored-program computer:** A computer that (a) is controlled by internally stored instructions, (b) can synthesize and store instructions, and (c) can subsequently execute those instructions.

**STP:** *Abbreviation for signal transfer point.*

**strap:** *See cross-connection.*

**stratum:** The number of a clock (in a hierarchical synchronization distribution system) that defines the quality of the clock by specifying parameters such as frequency accuracy, pull-in range, and noise performance. The formal specifications are given in T1.101-1999 and T1.105.09-1997. *Note:* Only stratum 1 clocks may operate independently; other clocks are slaved directly or indirectly to a stratum 1 clock. [T1.X1]

**stray current:** Electrical current through a path other than the intended path.

**streamer:** *Synonym streaming tape drive.*

**streaming:** A technique for transferring data (usually over the Internet) in a continuous flow to allow large multimedia files to be viewed before the entire file has been downloaded to a client's computer. [After Bahorsky]

**streaming media:** Transmitted video or audio data that are viewed (or listened to) in real time, *i.e.*, as the information is received. Streaming media may be user-controlled (as in on-demand, pay-per-view movies) or server-controlled (as in Webcasting).

**streaming tape drive:** A magnetic tape unit capable of recording from, and dumping to, another storage medium without stopping at interblock gaps. *Note:* Streaming tape drives are often used for bulk transfer of data between tape and disk storage. *Synonym streamer.*

**streaming tape recording:** A method of recording on magnetic tape, which method maintains continuous tape motion without the requirement to start and stop within the interrecord gap.

**strength member:** Any component of a communication cable, metallic or optical, the function of which is to protect the transport medium, *i.e.*, conductor or fiber, from excessive tensile and bending stresses during installation and while in service. [After FAA]

**stressed environment:** In radiocommunications, an environment that is under the influence of extrinsic factors that degrade communications integrity, such as when (a) the benign communications medium is disturbed by natural or man-made events (such as an intentional nuclear burst), (b) the received signal is degraded by natural or man-made interference (such as jamming signals or co-channel interference), (c) an interfering signal can reconfigure the network, and/or (d) an adversary threatens successful communications, in which case radio signals may be encrypted in order to deny the adversary an intelligible message, traffic flow information, network information, or automatic link establishment (ALE) control information.

**string:** A sequence of data elements, such as bits or characters, considered as a whole.

**stroke:** A straight line or arc that is used as a segment of a graphic character.

**stroke edge:** In character recognition, the line of discontinuity between a side of a stroke and the background, obtained by averaging, over the length of the stroke, the irregularities resulting from the printing and detecting processes.

**stroke speed:** In facsimile systems, the rate at which a fixed line perpendicular to the direction of scanning is crossed in one direction by a scanning or recording spot. *Note 1:* Stroke speed is usually expressed as a number of strokes per minute. When the system scans in both directions, the stroke speed is twice this number. *Note 2:* In most conventional mechanical systems, the stroke speed is equivalent to drum speed.

**stroke width:** In character recognition, the distance between the two edges of a stroke, measured perpendicular to the stroke centerline.

**strong authentication:** Authentication by means of cryptographically derived credentials. [After X.509]

**structured programming:** A technique for organizing and coding computer programs in which a hierarchy of modules is used, each having a single entry and a single exit point, and in which control is passed downward through the structure without unconditional branches to higher levels of the structure. Three types of control flow are used: sequential, test, and iteration.

**STU:** *Acronym for secure telephone unit.* A U.S. Government-approved telecommunications terminal that protects the transmission of sensitive or classified information in voice, data, and facsimile systems.

**stub network:** A network that conveys data only among local hosts. *Note:* Even if the local hosts are connected to more than one other network, these hosts do not carry traffic between these other networks. [2382-pt.35]

**studio-to-transmitter link (STL):** A communications link used for the transmission of broadcast material from a studio to the transmitter. *Note:* The STL may be a microwave, radio, or landline link.

**stuffing:** *See bit stuffing, de-stuffing.*

**stunt box:** A device that controls the nonprinting functions of a printer at a terminal.

**STX:** *Abbreviation for start-of-text character.*

**SUB:** *Acronym for substitute character.*

**subassembly:** [A] major subdivision of an assembly consisting of a package of parts, elements, and circuits that perform a specific function. [INFOSEC-99]

**sub-band adaptive differential pulse code modulation (SB-ADPCM):** Modulation in which (a) an audio frequency band is split into two sub-bands, *i.e.*, a higher and a lower band, and (b) the signals in each sub-band are encoded using ADPCM.

**subcarrier:** A carrier used to modulate another carrier. *Note:* The modulated carrier can be used to modulate another carrier, and so on, so that there can be several levels of subcarriers, *i.e.*, several intermediate carriers.

**subclass:** A class derived from another class by specialization. [T1.260-1998]

**subject: 1.** In cryptography, an entity whose public key is certified in a public key certificate. **2.** Generally, a person, process, or device, causing information to flow among objects or change to the system state. [INFOSEC-99]

**subject security level:** Sensitivity label(s) of the objects to which the subject has both read and write access. Security level of a subject must always be dominated by the clearance level of the user associated with the subject. [INFOSEC-99]

**sublayer: 1.** In a layered open communications system, a specified subset of the services, functions, and protocols included in a given layer. **2.** In the Open Systems Interconnection--Reference Model, a subdivision of a given layer, *e.g.*, a conceptually complete group of the services, functions, and protocols included in the given layer.

**subnet address:** In an Internet Protocol (IP) address, an extension that allows users in a network to use a single IP network address for multiple physical subnetworks. *Note:* The IP address contains three parts: the network, the subnet, and host addresses. Inside the subnetwork, gateways and hosts divide the local portion of the IP address into a subnet address and a host address. Outside of the subnetwork, routing continues as usual by dividing the destination address into a network portion and a local portion.

**subnet mask:** A number that is used to identify a subnetwork so that IP addresses can be shared on a local area network.

**subnetwork:** **1.** A collection of equipment and physical transmission media that forms an autonomous whole and that can be used to interconnect systems for purposes of communication. **2.** Specifically, a collection of open system interconnection (OSI) end systems and intermediate systems under the control of a single administrative domain and using a single network access protocol. *Note:* Examples of subnetworks are private X.25 networks and collections of bridged local area networks. [After Bahorsky]

**subordinate station:** *Synonym slave station.*

**sub-registration authority (SRA):** [An] Individual with primary responsibility for managing the distinguished name process. [INFOSEC-99]

**subroutine:** A set of computer instructions (or pieces of code) that run within a program (or are called within a program) to carry out a predefined function or computation. *Note:* "Open" subroutines are integrated into the main program. "Closed" subroutines are arranged so that program control is shifted to them for execution of their task(s) and then returned to the main program.

**subscribe:** In computer conferencing, to add one's address to a distribution list, or to join a forum. [2382-pt.35]

**subscriber:** **1.** In a public switched telecommunications network, the ultimate user, *i.e.*, customer, of a communications service. *Note 1:* Subscribers include individuals, activities, organizations, *etc.* *Note 2:* Subscribers use end instruments, such as telephones, modems, facsimile machines, computers, and remote terminals, that are connected to a central office. *Note 3:* Subscribers are usually subject to tariff. *Note 4:* Subscribers do not include communications systems operating personnel except for their personal terminals. **2.** In cryptography, a party that has a keying relationship with a center or an entity that has a certificate from a certification authority. [After X9.17]

**subscriber data key:** *See subscriber key.*

**subscriber key:** A key encrypting key or data key transported in a multiple center CSM for eventual distribution to a pair of subscribers. [After X9.28]

**subscriber line:** **1.** *Synonym loop.* **2.** A communication channel between a telephone station, PBX or TWX station and the central office which serves it. *Synonym exchange line.* [47 CFR Pt.36-A]

**substitute character (SUB):** A control character that is used in the place of a character that is recognized to be invalid or in error or that cannot be represented on a given device.

**substitution method:** In optical fiber technology, a method of measuring the transmission loss by (a) using a stable optical source, at the wavelength of interest, to drive a mode scrambler, the output of which overfills (drives) a 1-meter to 2-meter reference fiber having physical and optical characteristics matching those of the fiber under test, (b) measuring the power level at the output of the reference fiber, (c) repeating the procedure, substituting the fiber under test for the reference fiber, and (d) subtracting the power level obtained at the output of the fiber under test from the power level obtained at the output of the reference fiber, to get the transmission loss of the fiber under test. *Note 1:* The substitution method has certain shortcomings with regard to its accuracy, but its simplicity makes it a popular field test method. It is conservative, in that if it were used to measure the individual losses of several long fibers, and the long fibers were concatenated, the total loss obtained (excluding splice losses) would be expected to be lower than the sum of the individual fiber losses. *Note 2:* Some modern optical power meters have the capability to set to zero the reference level measured at the output of the reference fiber, so that the transmission loss of the fiber under test may be read out directly.

**subtributary office:** A class of tributary office which does not have direct access to its toll center, but which is connected to its toll center office by means of circuits which are switched through to the toll center at another tributary office. [47 CFR Pt.36-A]

**subvoice-grade channel:** A channel with a bandwidth narrower than that of a voice-grade channel. *Note:* A subvoice-grade channel is usually a subchannel of a voice-grade line.

**successful block delivery:** The transfer of a nonduplicate user information block between the source user and intended destination user. *Note:* Successful block delivery includes the delivery of correct and incorrect blocks.

**successful block transfer:** The transfer of a correct, nonduplicate, user information block between the source user and intended destination user. *Note:* Successful block transfer occurs when the last bit of the transferred block crosses the functional interface between the telecommunications system and the intended destination user. Successful block transfer can only occur within a defined maximum block transfer time after initiation of a block transfer attempt.

**successful disengagement:** The termination of user information transfer between a source user and a destination user in response to a disengagement request. *Note:* Successful disengagement occurs at the earliest moment at which either user is able to initiate a new information transfer transaction.

**sudden ionospheric disturbance (SID):** An abnormally high ionization density in the D region caused by an occasional sudden solar flare, *i.e.*, outburst of ultraviolet light from the Sun. *Note:* The SID results in a sudden increase in radio-wave absorption that is most severe in the upper medium-frequency (MF) and lower high-frequency (HF) ranges.

**sum check:** *Synonym summation check.*

**summation check:** **1.** A check based on the formation of the sum of the digits of a numeral. *Note:* The sum of the individual digits is usually compared with a previously computed value. **2.** A comparison of checksums on the same data on different occasions or on different representations of the data in order to verify data integrity. *Synonym sum check.*

**sunspot:** In the photosphere, *i.e.*, visible disk of the Sun, a dark marking that manifests a magnetic anomaly that is associated with interference with radio communications on Earth. *Note:* Sunspot activity, *i.e.*, the number of sunspots occurring at a given time or on a given day, is cyclic. The period of a cycle, from maximum through minimum and back to maximum sunspot count, is approximately 11 years.

**superclass:** A class used in deriving another class by specialization. [T1.260-1998]

**superencryption:** [The] process of encrypting encrypted information. *Note:* [This process] occurs when a message, encrypted off-line, is transmitted over a secured, on-line circuit, or when information encrypted by the originator is multiplexed into a communications trunk, which is then bulk encrypted. [INFOSEC-99]

**superframe (SF):** **1.** In T-carrier, a synchronization frame that delineates 12 DS1 frames. [J. Beaty, FAA] **2.** A DS1 framing format that assembles 12 individual DS1 frames into a single superframe with a 12-bit fixed frame pattern. [T1.Rpt25-1993]

**supergroup:** *See group, multiplex hierarchy.*

**supergroup distribution frame (SGDF):** In frequency-division multiplexing (FDM), the distribution frame that provides terminating and interconnecting facilities for group modulator output, group demodulator input, supergroup modulator input, and supergroup demodulator output circuits of the basic supergroup spectrum of 312 kHz to 552 kHz.

**super high frequency (SHF):** *See electromagnetic spectrum.*

**superhighway:** See **National Information Infrastructure**.

**superluminescent LED:** A light-emitting diode in which there is stimulated emission with amplification but insufficient feedback for oscillations to build up to achieve lasing action.

**superradiance:** In a gain medium, amplification of spontaneously emitted radiation characterized by moderate spectral line narrowing and moderate directionality. *Note:* Superradiance is usually distinguished from lasing action by the absence of positive feedback, and hence the absence of well-defined modes of oscillation.

**supersector:** An oversized sector written on a diskette, as part of a method of copy protection. [2382-pt.8]

**supersession:** [In security,] scheduled or unscheduled replacement of a COMSEC aid with a different edition. [INFOSEC-99]

**superuser:** [A] special user who can perform control of processes, devices, networks, and file systems. [INFOSEC-99]

**supervisor:** *Synonym* **supervisory program**.

**supervisor state:** *Synonym* **executive state**.

**supervisory control:** The use of characters or signals for the automatic actuation of equipment or indicators.

**supervisory program:** **1.** A program, usually part of an operating system, that controls the execution of other routines and regulates work scheduling, input-output operations, error actions, and similar functions. **2.** A program that allocates computer component space and schedules computer events by task queuing and system interrupts. *Note:* Control of the system is returned to the supervisory program frequently enough to ensure that demands on the system are met. *Synonym* **supervisory routine**. **3.** A computer program, usually part of an operating system, that controls the execution of other computer programs and regulates the flow of work in a data processing system. *Synonyms* **executive program, supervisor**.

**supervisory routine:** *Synonym* **supervisory program**.

**supervisory signaling:** Specific electrical conditions (called "on-hook" and "off-hook") at the NI (network interface) that are used to control call states and processes. [T1.414-1998]

**supervisory signals:** Signals used to indicate, or to indicate and control, the various operating states of the circuits or circuit combinations involved in a particular connection.

**suppressed carrier single-sideband emission:** A single-sideband emission in which the carrier is virtually suppressed and not intended to be used for demodulation. [NTIA] [RR]

**suppressed carrier transmission:** Amplitude modulation (AM) transmission in which the carrier level is reduced below that required for demodulation. *Note 1:* Reduction of the carrier level permits higher power levels in the sidebands than would be possible with conventional AM transmission. *Note 2:* Carrier power must be restored by the receiving station to permit demodulation. *Note 3:* Suppressed carrier transmission is a special case of reduced carrier transmission.

**suppression measure:** [An] Action, procedure, modification, or device that reduces the level of, or inhibits the generation of, compromising emanations in an information system (IS). [INFOSEC-99]

**surf:** *Slang*. To search the Web, by navigating in a nonlinear and seemingly random way, often without a specific objective.

**surface refractivity:** The refractive index of the Earth's atmosphere, calculated from observations of pressure, temperature, and humidity at the surface of the Earth. *Note:* The surface refractivity gradient is the difference in refractive index between the surface and a given altitude, such as between the surface and 1000 m.

**surface wave:** A wave that is guided along the interface between two different media or by a refractive index gradient. *Note 1:* The field components of the wave diminish with distance from the interface. *Note 2:* Optical energy is not converted from the surface wave field to another form of energy and the wave does not have a component directed normal to the interface surface. *Note 3:* In optical fiber transmission, evanescent waves are surface waves. *Note 4:* In radio transmission, ground waves are surface waves that propagate close to the surface of the Earth, the Earth having one refractive index and the atmosphere another, thus constituting an interface surface.

**surge:** *Synonym* **impulse**.

**surge protective device (SPD):** An assembly of one or more components intended to limit or divert surges; the device contains at least one nonlinear component. [T1.321-1995] *Synonyms* **arrester, surge protector**.

**surge suppressor:** *Synonyms* **arrester, surge protective device, surge protector**.

**surrogate access:** See **discretionary access control**.

**surveillance:** **1.** The use of (usually) electronic means, passive or active, to obtain information about the nature, position, or movement of, *e.g.*, aircraft (cooperative or non-cooperative, friendly or unfriendly), sources of electromagnetic emissions, *etc.* **2.** Nonintrusive monitoring of digital signals in real time to recognize performance degradations and failures and system intrusion attempts. [After T1.231-1997]

**survey:** See **path survey**.

**survivability:** A property of a system, subsystem, equipment, process, or procedure that provides a defined degree of assurance that the named entity will continue to function during and after a natural or man-made disturbance; *e.g.*, nuclear burst. *Note:* For a given application, survivability must be qualified by specifying the range of conditions over which the entity will survive, the minimum acceptable level or post-disturbance functionality, and the maximum acceptable outage duration.

**survivable operation:** See **survivability**.

**survival craft station:** A mobile station in the maritime mobile service or the aeronautical mobile service intended solely for survival purposes and located on any lifeboat, life-raft or other survival equipment. [NTIA] [RR]

**susceptibility:** In electronic warfare, the degree to which electronic equipment is affected by electromagnetic energy radiated by an enemy's equipment, such as jamming transmitters.

**susceptibility threshold:** **1.** The amount of undesired signal power required at the input terminals of a receiver to cause barely perceptible interference at the receiver output terminals. **2.** In cryptology, the level above which a system has the ability to continue to process critical applications in spite of the fact that it has suffered disruptive or damaging effects (such as contamination with dust, an earthquake, a bomb, *etc.*) [INFOSEC, 1994]

**susceptiveness:** In telephone systems, the extent to which circuits pick up noise and low-frequency energy by induction from power systems. *Note:* Susceptiveness depends on telephone circuit balance, wire and connection transpositions, wire spacing, and isolation from ground.

**sweep acquisition:** A technique whereby the frequency of the local oscillator is slowly swept past the reference in order to assure that the pull-in range is reached.

**sweep jamming:** Jamming in which (a) a narrow frequency band of jamming energy is repeatedly swept over a relatively wide frequency band, (b) the sweep rate is such as to be on any given frequency only long enough to accomplish its jamming task, returning to that frequency again before the expiration of the jammed circuit recovery time. *Note 1:* Sweep jamming combines the advantages of both spot- and barrage-jamming by rapid electronic sweeping of a narrow band of jamming signals over a broad frequency spectrum. *Note 2:* The disadvantage of sweep-jamming is its high susceptibility to electronic counter-countermeasures. [From Weik '89]

**swim:** Slow, graceful, undesired movements of display elements, groups, or images about their mean position on a display surface, such as that of a monitor. *Note 1:* Swim can be followed by the human eye, whereas jitter usually appears as a blur. *Note 2:* Jitter, swim, wander, and drift have increasing periods of variation in that order.

**switch:** **1.** In communications systems, a mechanical, electro-mechanical, or electronic device for making, breaking, or changing the connections in or among circuits. **2.** *Deprecated synonym for central office, switching center.* **3.** In communications systems, to transfer a connection from one circuit to another. **4.** In a computer program, a conditional instruction and a flag that is interrogated by the instruction. **5.** In a computer program, a parameter that controls branching and that is bound, prior to the branch point being reached. *Synonym switchpoint.* **6.** In computer programming, a programming technique or statement for making a selection, such as a conditional jump. **7.** In computer software applications, a functional unit, such as a toggle button, used to make selections.

**switchboard:** Equipment used for manual switching operations.

**switch busy hour:** In telephony, the busy hour for a single switch.

**switched access line:** A communication path between local exchange and a customer interface (CI). [T1.401-1988]

**switched circuit:** In a communications network, a circuit that may be temporarily established at the request of one or more of the connected stations.

**switched connection:** *See switched circuit.*

**switched exchange access network:** The network of switching systems, interconnecting facilities, and equipment provided by an exchange carrier (EC) to provide telecommunications services between the exchange office (EO) and interexchange carrier point of termination (IC-POT). [T1.508-1998]

**switched loop:** In telephony, a circuit that automatically releases a connection from a console or switchboard, once the connection has been made to the appropriate terminal. *Note:* Loop buttons or jacks are used to answer incoming listed directory number calls, dial "0" internal calls, transfer requests, and intercepted calls. The attendant can handle only one call at a time. *Synonym released loop.*

**switched multimegabit data services (SMDS):** A connectionless, broadband, packet-switched data service that provides LAN-like performance and features in metropolitan or wide areas. *Note:* Currently SMDS operates at 1.544 Mb/s (megabits per second) or 44.736 Mb/s. These are the T1 and T3 rates, respectively, over switched fiber optic networks.

**switched network:** **1.** A communications network, such as the public switched telephone network, in which any user may be connected to any other user through the use of message, circuit, or packet switching and control devices. **2.** Any network providing switched communications service.

**switching:** The controlling or routing of signals in circuits to execute logical or arithmetic operations or to transmit data between specific points in a network. *Note:* Switching may be performed by electronic, optical, or electromechanical devices. [From Weik '89]

**switching center:** In communications systems, a facility in which switches are used to interconnect communications circuits on a circuit-, message-, or packet-switching basis. *Synonyms, in telephony, central office, switching exchange, switching facility. Deprecated synonym switch.*

**switching exchange:** *Synonym switching center.*

**switching facility:** *Synonym switching center.*

**switching system:** **1.** A communications system consisting of switching centers and their interconnecting media. **2.** Part of a communication system organized to temporarily associate functional units, transmission channels or telecommunication circuits for the purpose of providing a desired telecommunication facility. *Note:* Examples of NATO-owned switching systems are IVSN and TARE.

**switchpoint:** *Synonym switch.*

**SWR:** *Abbreviation for standing wave ratio.*

**SX:** *Abbreviation for simplex signaling.*

**SXS:** *Abbreviation for step-by-step switching system.*

**syllabary:** [A] list of individual letters, combination of letters, or syllables, with their equivalent code groups, used for spelling out words or proper names not present in the vocabulary of a code. A syllabary may also be a spelling table. [INFOSEC-99]

**syllable:** A character string or a bit string in a word.

**symbolic language:** A computer programming language used to express addresses and instructions with symbols convenient to humans rather than to machines.

**symbolic logic:** The discipline in which valid arguments and operations are dealt with using an artificial language designed to avoid the ambiguities and logical inadequacies of natural languages.

**symmetrical channel:** A channel in which the send and receive circuits have the same data signaling rate.

**symmetrical pair:** A balanced transmission line, in a multipair cable, having equal conductor resistances per unit length, equal impedances from each conductor to earth, and equal impedances to other lines.

**symmetric cryptography:** Cryptography in which the same key is used for encryption and decryption. [2382-pt.8]

**symmetry:** The attribute describing the relationship of information flow between two (or more) access points or reference points involved in a communication. Symmetry characterizes the structure associated with a telecommunication service or a connection. Values associated with this attribute are unidirectional, bidirectional symmetric, and bidirectional asymmetric. [After T1.603-1990] [After T1.604-1990]

**SYN:** *Acronym for synchronous idle character.*



**synchronism:** **1.** The state of being synchronous. **2.** For repetitive events with the same, multiple, or submultiple repetition rates, a relationship among the events such that a significant instant of one event bears a fixed time relationship to a corresponding instant in another event. *Note:* Synchronism is maintained when there is a fixed, *i.e.*, constant, phase relationship among the group of repetitive events. **3.** The simultaneous occurrence of two or more events at the same instant on the same coordinated time scale.

**synchronization:** **1.** The attaining of synchronism **between the frequencies or between the frequencies and phases of two or more signals.** [T1.X1] **2.** The obtaining of a desired fixed relationship among corresponding significant instants of two or more signals. [T1.X1] **3.** A state of simultaneous occurrences of significant instants among two or more signals. [T1.X1]

**synchronization bit:** A bit used to achieve or maintain synchronism. *Note:* The term "*synchronization bit*" is usually applied to digital data streams, whereas the term "*synchronization pulse*" is usually applied to analog signals.

**synchronization code:** In digital systems, a sequence of bits introduced into a transmitted signal to achieve or maintain synchronism.

**synchronization pulse:** A pulse used to achieve or maintain synchronism. *Note:* The term "*synchronization pulse*" is usually applied to analog signals, whereas the term "*synchronization bit*" is usually applied to digital data streams. *Synonym sync pulse.*

**synchronizing:** **1.** Achieving and maintaining synchronism. **2.** In facsimile, achieving and maintaining predetermined speed relations between the scanning spot and the recording spot within each scanning line. *Note:* In the civilian community, the noun "*synchronization*" is preferred to "*synchronizing*."

**synchronizing pilot:** In FDM, a reference frequency used for achieving and maintaining syntonization of the oscillators of a carrier system or for comparing the frequencies or phases of the signals generated by those oscillators.

**synchronizing signal:** In facsimile systems, the signal that maintains predetermined speed relations between the scanning spot and recording spot within each facsimile scanning line.

**synchronous:** **1.** Pertaining to the relationship of two or more repetitive signals that have simultaneous occurrences of significant instants. *Note:* "*Isochronous*" and "*anisochronous*" pertain to characteristics. "*Synchronous*" and "*asynchronous*" pertain to relationships. **2.** Pertaining to synchronism.

**synchronous crypto-operation:** [A] method of on-line crypto-operation in which crypto-equipment and associated terminals have timing systems to keep them in step. [INFOSEC-99]

**synchronous data link control (SDLC):** In a data network, a bit-oriented protocol for the control of synchronous transmission over data links.

**synchronous data network:** A data network in which synchronism is achieved and maintained between data circuit-terminating equipment (DCE) and the data switching exchange (DSE), and between DSEs. *Note:* The data signaling rates are controlled by timing equipment within the network.

**synchronous height:** *See synchronous orbit.*

**synchronous idle character (SYN):** A transmission control character used in synchronous transmission systems to provide a signal from which synchronism or synchronous correction may be achieved between data terminal equipment, particularly when no other character is being transmitted.

**synchronous network:** **1.** A network in which clocks are controlled to run, ideally, at identical rates, or at the same mean rate with a fixed relative phase displacement, within a specified limited range. *Note:* Ideally, the clocks are synchronous, but they may be mesochronous in practice. By common usage, such mesochronous networks are frequently described as "*synchronous*." **2.** A network in which all clocks are normally (*i.e.*, no-fault conditions) traceable to one or more primary reference sources, the difference in frequencies between them being negligible by definition. [T1.X1]

**synchronous optical network:** *See SONET.*

**synchronous orbit:** Any orbit in which an orbiting object has a period equal to the average rotational period of the body being orbited, and in the same direction of rotation as that body. *Note 1:* A synchronous orbit need not be equatorial, but it usually is, ideally. A body in a nonequatorial synchronous orbit will, when observed from a fixed point on the orbited body, appear to move up and down, *i.e.*, northward and southward. If the synchronous orbit is not perfectly circular, the orbiting body will appear to move back and forth, eastward and westward. The combination of these two motions will produce a figure-8 pattern as seen from the orbited body. *Note 2:* A synchronous orbit about the Earth that is circular and lies in the equatorial plane is called a geostationary orbit.

**synchronous payloads:** Payloads derivable from a network transmission signal by removing integral numbers of bits in every frame, *i.e.*, there are no variable bit stuffing rate adjustments required to fit the payload in the transmission signal. [T1.105-1988]

**synchronous satellite:** A satellite in a synchronous orbit.

**synchronous system:** A system in which events, such as signals, occur in synchronism. *Note 1:* An example of a synchronous system is one in which a transmitter and receiver operate with a fixed time relationship. *Note 2:* A second example is SONET, which may accommodate payload signals in channels that are clocked at submultiples of the carrier clocking rate. [T1.X1]

**synchronous tandem encoding:** A transcoding of the form ADPCM-PCM-ADPCM (adaptive differential pulse code modulation-pulse code modulation-adaptive differential pulse code modulation) when there are no transmission errors and the integrity of the bit stream is preserved. [T1.310-1991]

**synchronous TDM:** A multiplexing scheme in which timing is obtained from a clock that controls both the multiplexer and the channel source.

**synchronous transfer mode:** In a Broadband Integrated Services Digital Network (B-ISDN), a proposed transport level technique in which time-division multiplexing and switching is to be used across the user's network interface.

**synchronous transmission:** Digital transmission in which the time interval between any two similar significant instants in the overall bit stream is always an integral number of unit intervals. *Note:* "*Isochronous*" and "*anisochronous*" are characteristics, while "*synchronous*" and "*asynchronous*" pertain to relationships.

**synchronous transport signal level 1 (STS-1):** The basic logical building block signal of synchronous optical networks (SONET). The STS-1 signal has a bit rate of 51.840 Mb/s. [T1.X1] [After T1.105-1988]

**sync pulse:** *Synonym synchronization pulse.*

**syntax:** **1.** In a language, the relationships among characters or groups of characters, independent of their meanings or the manner of their interpretation and use. **2.** The structure of expressions in a language. **3.** The rules governing the structure of a language. **4.** In a language, the relationship among symbols. *Note:* In computer languages, as in all artificial languages, syntax is developed, and usually described, before their use begins. In natural languages, syntax is developed, and sometimes never described, after use has begun.

**syntonization:** The process of setting the frequency of one oscillator equal to that of another. *Note:* The term "*synchronization*" is commonly used in place of "*syntonization*" to

mean the same thing. [T1.X1]

**SYSGEN:** *Acronym for system generation.*

**SYSOP:** *Acronym for system(s) operator.* **1.** The person responsible for performing the day-to-day and periodic maintenance of a computer forum. **2.** An individual responsible for the physical operations of a network or of a computer system. [After Bahorsky]

**system:** **1.** Any organized assembly of resources and procedures united and regulated by interaction or interdependence to accomplish a set of specific functions. [JP 1-02] **2.** A combination of two or more interrelated equipment (sets) arranged in a functional package to perform an operational function or to satisfy a requirement. [JP 1-02] **3.** A collection of personnel, equipment, and methods organized to accomplish a set of specific functions.

**system administration:** In computer technology, a set of functions that provides support services, ensures reliable operations, promotes efficient use of the system, and ensures that prescribed service-quality objectives are met. *Synonym system management.*

**system analysis:** A systematic investigation of a real or planned system to determine the functions of the system and how they relate to each other and to any other system. *Synonym systems analysis.*

**system blocking:** *Synonym access denial.*

**system blocking signal:** A control message generated within a telecommunications system to indicate temporary unavailability of system resources required to complete a requested access. *Note:* The system blocking signal is part of system overhead information.

**system budget:** *See power budget.*

**system documentation:** The collection of documents that describes the requirements, capabilities, limitations, design, operation, and maintenance of a system, such as a communications, computing, or information processing system.

**system failure transfer:** In the event of a catastrophic failure, the ability to transfer central office trunks or interoffice trunking to predetermined stations to allow incoming and outgoing calls to be completed.

**system follow-up:** The study of the effects of a system after it has reached a stabilized state of operational use. *Synonyms post-development review, post-implementation review.*

**system generation (SYSGEN):** The process of selecting optional parts of an operating system and of creating a particular operating system tailored to the requirements of a data processing installation.

**system high mode:** [An] information system (IS) security mode of operation wherein each user, with direct or indirect access to the information system (IS), its peripherals, remote terminals, or remote hosts, has all of the following: (a) valid security clearance for all information within an IS; (b) formal access approval and signed nondisclosure agreements for all the information stored and/or processed (including all compartments, subcompartments and/or special access programs); and (c) valid need-to-know for some of the information contained within the IS. [INFOSEC-99]

**system indicator:** [A] symbol or group of symbols in an off-line encrypted message identifying the specific cryptosystem or key used in the encryption. [INFOSEC-99]

**system integration:** The progressive linking and testing of system components to merge their functional and technical characteristics into a comprehensive, interoperable system. *Note:* Integration of data systems allows data existing on disparate systems to be shared or accessed across functional or system boundaries.

**system integrity:** **1.** That condition of a system wherein its mandated operational and technical parameters are within the prescribed limits. **2.** [The] Attribute of an information system (IS) when it performs its intended function in an unimpaired manner, free from deliberate or inadvertent unauthorized manipulation of the system. [INFOSEC-99]

**system key:** A key used to provide privacy to an encrypted object as it transits a communications network. [After X9.69]

**system life cycle:** The course of developmental changes through which a system passes from its conception to the termination of its use and subsequent salvage. *Note:* For example, a system life cycle might include the phases and activities associated with the analysis, acquisition, design, development, test, integration, operation, maintenance, and modification of the system.

**system loading:** In a frequency-division multiplexed (FDM) transmission system, the absolute power level of the composite signal transmitted in one direction. *Note 1:* The absolute power level is referred to a zero transmission level point (OTLP). *Note 2:* The composite signal contains signaling, speech, and digital signals.

**system management:** **1.** Network management functions extended to include subscriber elements or user end instruments. **2.** In computer systems, *synonym system administration.*

**system operational threshold:** For a supported performance parameter of a system, the value that establishes the minimum operational service performance level for the parameter. *Note:* A measured parameter value worse than the system operational threshold indicates that the system is in an outage state.

**system overhead information:** *See overhead information.*

**system power margin:** *Synonym power margin.*

**system profile:** [In INFOSEC, the] detailed security description of the physical structure, equipment component, location, relationships, and general operating environment of an information system (IS). [INFOSEC-99]

**system reliability:** The probability that a system, including all hardware, firmware, and software, will satisfactorily perform the task for which it was designed or intended, for a specified time and in a specified environment. [From Weik '89]

**system robustness:** The measure or extent of the ability of a system, such as a computer, communications, data processing, or weapons system, to continue to function despite the existence of faults in its component subsystems or parts. *Note:* System performance may be diminished or otherwise altered until the faults are corrected.

**systems analysis:** *Synonym system analysis.*

**systems control:** In a communications system, the control and implementation of a set of functions that (a) prevent or eliminate degradation of any part of the system, (b) initiate immediate response to demands that are placed on the system, (c) respond to changes in the system to meet long range requirements, and (d) may include various subfunctions, such as (i) immediate circuit utilization actions, (ii) continuous control of circuit quality, (iii) continuous control of equipment performance, (iv) development of procedures for immediate repair, restoration, or replacement of facilities and equipment, (v) continuous liaison with system users and with representatives of other systems, and (vi) the provision of advice and assistance in system use.

**systems design:** **1.** A process of defining the hardware and software architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. **2.** The

preparation of an assembly of methods, procedures, or techniques united by regulated interaction to form an organized whole. [JP1]

**system security:** [In INFOSEC, the] degree of security as determined by evaluation of the totality of all system elements and INFOSEC countermeasures. [INFOSEC-99]

**system security engineering:** The effort to achieve and maintain optimal security and survivability of a system throughout its life cycle. [INFOSEC-99]

**system security evaluation:** Risk assessment of a system, considering its vulnerabilities and perceived security threat. [INFOSEC-99]

**systems engineering:** *See systems design.*

**system signaling and supervision:** In transmission systems, any scheme used to provide such functions as system control, addressing, routing, error detection and correction, level control, priority, traffic control, message accountability, and/or other required overhead information.

**system software:** Application-independent software that supports the running of application software.

**system standard:** In the military community, the system-specific characteristics, not dictated by the individual components' electrical performance characteristics, but necessary in order to permit internal and external interoperability.

**system supervision:** In telephone systems, the use of signals and techniques to perform system management functions, such as system control, addressing, routing, error detection and correction, level control, priority, traffic control, message accountability, and other overhead functions that may be described in system overhead portions of messages. [From Weik '89]

**system support:** The continued provision of services and material necessary for the use and improvement of a system during its life cycle.

**system test time:** The part of operating time during which a functional unit is tested for proper operation. *Note:* In a computer, the system test time may include the time for testing programs belonging to the operating system.

**T:** *Abbreviation for tera (10<sup>12</sup>).* *See International System of Units.*

**Tactical Automatic Digital Switching System (TADSS):** A transportable store-and-forward message-switching system used for rapid deployment in support of tactical forces.

**tactical command and control (C<sup>2</sup>) systems:** The equipment, communications, procedures, and personnel essential to a commander for planning, directing, coordinating, and controlling tactical operations of assigned forces pursuant to assigned missions.

**tactical communications:** Communications in which information of any kind, especially orders and decisions, are conveyed from one command, person, or place to another within the tactical forces, usually by means of electronic equipment, including communications security equipment, organic to the tactical forces. *Note:* Tactical communications do not include communications provided to tactical forces by the Defense Communications System (DCS), to nontactical military commands, and to tactical forces by civil organizations.

**tactical communications system:** A communications system that (a) is used within, or in direct support of, tactical forces, (b) is designed to meet the requirements of changing tactical situations and varying environmental conditions, (c) provides securable communications, such as voice, data, and video, among mobile users to facilitate command and control within, and in support of, tactical forces, and (d) usually requires extremely short installation times, usually on the order of hours, in order to meet the requirements of frequent relocation.

**tactical data information link (TADIL):** A standardized communications link, approved by the Joint Staff, that is suitable for transmission of digital information, and is characterized by standardized message formats and transmission characteristics.

**tactical data information link--A (TADIL--A):** A netted link in which one unit acts as a net control station and interrogates each unit by roll call. *Note:* Once interrogated, that unit transmits its data to the net. This means that each unit receives all the information transmitted. This is a direct transfer of data and no relaying is involved.

**tactical data information link--B (TADIL--B):** A point-to-point data link between two units which provides for simultaneous transmission and reception of data (duplex).

**tactical load:** For the host service tactical forces, the total power requirements for communications, including the requirements for weapons, detection, command and control systems, and related support functions. *Note:* The tactical load is a part of the operational load.

**TADIL:** *Acronym for tactical data information link.*

**TADSS:** *Acronym for Tactical Automatic Digital Switching System.*

**tag:** *See flag, label.*

**tag image file format (TIFF):** A file format used to store an image using the particular data structure of the file.

**TAI:** *Abbreviation for International Atomic Time.*

**tail circuit:** A communications line from the end of a major transmission link, such as a microwave link, satellite link, or LAN, to the end-user location. *Note:* A tail circuit is a part of a user-to-user connection.

**tailgate:** To gain unauthorized physical access by following an authorized person through a controlled door. [2382-pt.8]

**tailgating:** In facsimile systems, the excessive prolongation of the decay of the signal. *Synonym hangover.*

**take:** *See clip.*

**takeoff angle:** *Synonym departure angle.*

**tampering:** **1.** In INFOSEC, penetration or modification of internal operations, or the insertion of active or passive tapping mechanisms, to determine the nature of, or monitor or record, *e.g.*, secret data. [After X9.24] **2.** Unauthorized modification altering the proper functioning of INFOSEC equipment. [INFOSEC-99] **3.** Unauthorized modification of sensitive systems or sensitive information.

**tandem:** **1.** Pertaining to an arrangement or sequencing of networks, circuits, or links, in which the output terminals of one network, circuit, or link are connected directly to the input terminals of another network, circuit, or link. *Note:* For example, concatenated microwave links constitute a tandem connection. **2.** A switching system in the message network that establishes trunk-to-trunk connections. Tandems may be further identified as local tandems, LATA tandems, or access tandems.

**tandem area:** The general areas served by the local offices having direct trunks to or from the tandem office. This area may consist of one or more communities or may include only a portion of a relatively large city. [47 CFR Pt.36-A]

**tandem center:** In a switched public telecommunications network, a facility that connects trunks to trunks and does not connect any local loops.

**tandem circuit:** A general classification of circuits or trunks between a tandem central office unit and any other central office or switchboard. *Synonym tandem trunk.* [47 CFR Pt.36-A]

**tandem connection:** A call switched at a tandem office. [47 CFR Pt.36-A]

**tandem office:** A central office unit used primarily as an intermediate switching point for traffic between local central offices within the tandem area. Where qualified by a modifying expression, or other explanation, this term may be applied to an office employed for both the interconnection of local central offices within the tandem area and for the interconnection of these local offices with other central offices, *e.g.*, long haul tandem office. [47 CFR Pt.36-A]

**tandem tie trunk network (TTTN):** An arrangement that permits sequential connection of tie trunks between PBX and Centrex® locations by using tandem operation. *Note:* Tandem operation permits two or more dial tie trunks to be connected at a tandem center to form a through connection.

**tandem trunk:** *Synonym tandem circuit.*

**tap: 1.** To draw energy from a circuit. **2.** To monitor, with or without authorization, the information that is being transmitted via a communications circuit. **3.** To extract a portion of the signal from an optical fiber or communications link. *Note:* One method of tapping an optical fiber is to bend it to a relatively short radius, thus promoting radiation of a portion of the optical signal. [After FAA]

**tapered fiber:** An optical fiber in which the cross section, *i.e.*, cross-sectional diameter or area, varies, *i.e.*, increases or decreases, monotonically with length.

**tape relay:** A method of retransmitting TTY traffic from one channel to another, in which messages arriving on an incoming channel are recorded in the form of perforated tape, this tape then being either fed directly and automatically into an outgoing channel, or manually transferred to an automatic transmitter for transmission on an outgoing channel.

**target language:** In computing, data processing, and communications systems, a language into which statements are translated. *Note:* Translators, assemblers, and compilers prepare target language programs, usually machine-language programs, from source language programs, usually high-level language programs written by programmers.

**tariff:** The published schedule of rates or charges for a specific unit of equipment, facility, or type of service such as might be provided by a telecommunications common carrier.

**TASI:** *Acronym for time-assignment speech interpolation.*

**tasking:** *See multitasking.*

**TAT:** *Abbreviation for transatlantic telecommunications (cable).* *Note:* TAT formerly stood for *transatlantic telephone (cable).*

**T-carrier:** The generic designator for any of several digitally multiplexed telecommunications carrier systems. *Note 1:* The designators for T-carrier in the North American digital hierarchy correspond to the designators for the digital signal (DS) level hierarchy. *See the associated table below.* *Note 2:* T-carrier systems were originally designed to transmit digitized voice signals. Current applications also include digital data transmission. *Note 3:* If an "F" precedes the "T", a fiber optic cable system is indicated at the same rates. *Note 4:* The table below lists the designators and rates for current T-Carrier systems. *Note 5:* The North American and Japanese hierarchies are based on multiplexing 24 voice-frequency channels and multiples thereof, whereas the European hierarchy is based on multiplexing 30 voice-frequency channels and multiples thereof. *See table below.*

T-Carrier Systems	North American	Japanese	European (CEPT)
Level zero (Channel data rate)	64 kb/s (DS0)	64 kb/s	64 kb/s
First level	1.544 Mb/s (DS1) (24 user channels)	1.544 Mb/s (24 user channels)	2.048 Mb/s (30 user channels)
(Intermediate level, North American Hierarchy only)	3.152 Mb/s (DS1C) (48 Ch.)	-	-
Second level	6.312 Mb/s (DS2) (96 Ch.)	6.312 Mb/s (96 Ch.), or 7.786 Mb/s (120 Ch.)	8.448 Mb/s (120 Ch.)
Third level	44.736 Mb/s (DS3) (672 Ch.)	32.064 Mb/s (480 Ch.)	34.368 Mb/s (480 Ch.)
Fourth level	274.176 Mb/s (DS4) (4032 Ch.)	97.728 Mb/s (1440 Ch.)	139.268 Mb/s (1920 Ch.)
Fifth level	400.352 Mb/s (5760 Ch.)	565.148 Mb/s (7680 Ch.)	565.148 Mb/s (7680 Ch.)

*Note 1:* The DS designations are used in connection with the North American hierarchy only. *Note 2:* There are other data rates in use, *e.g.*, military systems that operate at six and eight times the DS1 rate. At least one manufacturer has a commercial system that operates at 90 Mb/s, twice the DS3 rate. New systems, which take advantage of the high data rates offered by optical communications links, are also deployed or are under development.

**TCB:** *Abbreviation for trusted computing base.*

**TCF:** *Abbreviation for technical control facility.*

**T-coupler:** A passive optical coupler having three ports (three fibers). *Note 1:* Two isolated inputs may be combined into one output; or one input, into two isolated outputs. *Note 2:* The amount of coupling loss, usually expressed in dB, between ports is determined by the design and construction of the coupler. [After FAA] *Synonyms directional coupler, splitter, tee coupler.*

**TCP:** *Abbreviation for Transmission Control Protocol.* In the Internet Protocol suite, a standard, connection-oriented, full-duplex, host-to-host protocol used over packet-switched computer communications networks. *Note 1:* TCP corresponds closely to the ISO Open Systems Interconnection--Reference Model (OSI--RM) Layer 4 (Transport Layer). *Note 2:* The OSI--RM uses TP-0 or TP-4 protocols for transmission control.

**TCP/IP:** *Abbreviation for Transmission Control Protocol/Internet Protocol.* Two interrelated protocols that are part of the Internet protocol suite. *Note 1:* TCP operates on the OSI Transport Layer and breaks data into packets. IP operates on the OSI Network Layer and routes packets. *Note 2:* TCP/IP was originally developed by the U.S. Department of Defense.

**TCP/IP Suite:** The suite of interrelated protocols associated with Transmission Control Protocol/Internet Protocol. *Note 1:* The TCP/IP Suite includes, but is not limited to, protocols such as TCP, IP, UDP, ICMP, FTP, and SMTP. *Note 2:* Additional application and management protocols are sometimes considered part of the TCP/IP Suite. This includes protocols such as SNMP.

**TCS:** *Abbreviation for trusted computer system.*

**TCU:** *Abbreviation for teletypewriter control unit.*

**TDD:** *Abbreviation for Telecommunications Device for the Deaf.*

**TDM:** *Abbreviation for time-division multiplexing.*

**TDMA:** *Abbreviation for time-division multiple access.*

**TE:** *Abbreviation for transverse electric. See transverse electric mode.*

**technical area:** In the military community, an area in which temperature, humidity, or access is controlled because it contains equipment, such as communications, computing, control, or support equipment, that requires such controls.

**technical control facility (TCF):** A physical plant, or a designated and specially configured part thereof, that (a) contains the equipment necessary for ensuring fast, reliable, and secure exchange of information, (b) typically includes distribution frames and associated panels, jacks, and switches and monitoring, test, conditioning, and orderwire equipment, and (c) allows telecommunications systems control personnel to exercise operational control of communications paths and facilities, make quality analyses of communications and communications channels, monitor operations and maintenance functions, recognize and correct deteriorating conditions, restore disrupted communications, provide requested on-call circuits, and take or direct such actions as may be required and practical to provide effective telecommunications services.

**technical control hubbing repeater:** *Synonym data conferencing repeater.*

**technical load:** The portion of the operational load required for communications, tactical operations, and ancillary equipment including necessary lighting, air-conditioning, or ventilation required for full continuity of communications.

**technical vulnerability:** In information handling, a hardware, software, or firmware weakness, or design deficiency, that leaves a system open to assault, harm, or unauthorized exploitation, either externally or internally, thereby resulting in unacceptable risk of information compromise, information alteration, or service denial.

**TED:** *Abbreviation for trunk encryption device.*

**tee coupler:** A passive coupler that has three ports. *Synonyms directional coupler, splitter, T-coupler.*

**TEK:** *Abbreviation for traffic encryption key.*

**teleaction service:** In Integrated Services Digital Network (ISDN) applications, a telecommunications service that uses very short messages with very low data transmission rates between the user and the network.

**telecommand:** The use of telecommunication for the transmission of signals to initiate, modify or terminate functions of equipment at a distance. [NTIA] [RR]

**telecommunication: 1.** Any transmission, emission, or reception of signs, signals, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems. [NTIA] [RR] **2.** Any transmission, emission, or reception of signs, signals, writings, images, sounds, or information of any nature by wire, radio, visual, or other electromagnetic systems. [JP 1-02]

**telecommunication administration:** An administration, or the part of a combined postal and telecommunication administration, concerned with the provision of telecommunication service. [T1.226-1992]

**telecommunication architecture:** *See network architecture.*

**telecommunications center:** *See communications center.*

**Telecommunications Device for the Deaf (TDD):** A machine that uses typed input and output, usually with a visual text display, to enable individuals with hearing or speech impairments to communicate over a telecommunications network.

**telecommunication sector:** The sector that includes the telecommunications service providers, network operators, regulators, manufacturers, subscribers, and users. [After T1.Rpt30-1994]

**telecommunications facilities:** The aggregate of equipment, such as radios, telephones, teletypewriters, facsimile equipment, data equipment, cables, and switches, used for providing telecommunications services.

**telecommunications infrastructure:** The organizations, personnel, procedures, facilities, and networks employed to transmit and receive information by electrical or electronic means. *Note 1:* Telecommunications facilities include, but are not necessarily limited to, terrestrial radio, metallic and optical fiber cables, artificial Earth satellite communications, radio and television stations (traditional broadcast as well as cable and satellite broadcast), public switched telephone network(s), etc. *Note 2:* Examples of advanced telecommunications infrastructure facilities are direct broadcast satellite (DBS), digital audio broadcasting (DAB), Advanced Digital Television, and the Global Positioning System (GPS), which is used extensively for precise navigation and timing.

**telecommunications link:** A communications facility or channel, including feeder and local distribution plant, having a termination in a center in the telecommunications network. Examples of such a link include (but are not necessarily restricted to): optical-fiber cable, coaxial cable, metallic cables, transmitting and receiving antenna. [After T1.328-1995]

**telecommunications load equipment:** Equipment powered from a primary or secondary distribution of a centralized dc power system owned or operated by exchange and interexchange carriers. [After T1.330-1997]

**telecommunications management network (TMN):** A network that interfaces with a telecommunications network at several points in order to receive information from, and to control the operation of, the telecommunications network. *Note:* A TMN may use parts of the managed telecommunications network to provide for the TMN communications.

**telecommunications security:** *See communications security.*

**telecommunications service: 1.** Any service provided by a telecommunication provider. **2.** A specified set of user-information transfer capabilities provided to a group of users by a telecommunications system. *Note:* The telecommunications service user is responsible for the information content of the message. The telecommunications service provider has the responsibility for the acceptance, transmission, and delivery of the message.

**Telecommunications Service Priority (TSP) service:** A regulated service provided by a telecommunications provider, such as an operating telephone company or a carrier, for NS/EP telecommunications. *Note:* The TSP service replaced Restoration Priority (RP) service effective September 1990.

**Telecommunications Service Priority (TSP) system:** A system that provides a means for telecommunications users to obtain priority treatment from service providers for the NS/EP telecommunications requirements. *Note:* The TSP system replaced the Restoration Priority (RP) system effective September 1990.



**Telecommunications Service Priority (TSP) system user:** Any individual, organization, or activity that interacts with the NS/EP TSP System.

**telecommunications system:** *See communications system.*

**telecommunications system operator:** The organization responsible for providing telecommunications services to users.

**teleconference:** The live exchange of information among persons and machines remote from one another but linked by a telecommunications system. *Note:* The telecommunications system may support the teleconference by providing audio, video, and data services by one or more means, such as telephone, telegraph, teletype, radio, and television.

**telegram:** Written matter intended to be transmitted by telegraphy for delivery to the addressee. This term also includes radiotelegrams unless otherwise specified. In this definition the term telegraphy has the same general meaning as defined in the [1979 General Worldwide Administrative Radio Conference] Convention. [RR with editor's note in brackets]

**telegraph:** *See telegraphy.*

**telegraphy:** A form of telecommunication which is concerned in any process providing transmission and reproduction at a distance of documentary matter, such as written or printed matter or fixed images, or the reproduction at a distance of any kind of information in such a form. For the purposes of the *Radio Regulations*, unless otherwise specified therein, telegraphy shall mean a form of telecommunication for the transmission of written matter by the use of a signal code. [NTIA] [RR]

**telemetry:** **1.** The use of telecommunication for automatically indicating or recording measurements at a distance from the measuring instrument. [RR] **2.** The transmission of nonvoice signals for the purpose of automatically indicating or recording measurements at a distance from the measuring instrument. [47 CFR 90.7]

**telephone exchange:** *Synonym central office.*

**telephone frequency:** *See audio frequency, voice frequency.*

**telephone number:** The unique network address that is assigned to a telephone user, *i.e.*, subscriber, for routing telephone calls.

**telephone sidetone:** *Synonym sidetone.*

**telephony:** **1.** The branch of science devoted to the transmission, reception, and reproduction of sounds, such as speech and tones that represent digits for signaling. *Note 1:* Transmission may be via various media, such as wire, optical fibers, or radio. *Note 2:* Analog representations of sounds may be digitized, transmitted, and, on reception, converted back to analog form. *Note 3: "Telephony"* originally entailed only the transmission of voice and voice-frequency data. Currently, it includes new services, such as the transmission of graphics information. **2.** A form of telecommunication set up for the transmission of speech or, in some cases, other sounds. [NTIA] [RR]

**telephoto:** Pertaining to pictures transmitted via a telecommunications system.

**teletypewriter:** A teletypewriter that can only receive data and does not have a keyboard for transmission.

**teleprocessing:** The combining of telecommunications and computer operations interacting in the automatic processing, reception, and transmission of data and/or information. [JP 1-02] *Note:* Teleprocessing includes human-machine interface equipment.

**teleseminar:** *See teletraining.*

**teleservice:** *See telecommunications service.*

**teletex:** An international store-and-forward essentially error-free communications service that is defined by the CCITT (now the ITU-T), has a data signaling rate (DSR) of 2400 b/s over switched telephone networks, and has a communications protocol that supports the CCITT Group 4 facsimile service.

**teletext:** A type of one-way information service in which a subscriber can receive data on a video display. *Note:* The information is transmitted to the subscriber's video display over a common carrier channel. A proprietary video adapter unit is required for reception. *Contrast with viewdata.*

**teletraining:** Training that (a) in which usually live instruction is conveyed in real time via telecommunications facilities, (b) that may be accomplished on a point-to-point basis or on a point-to-multipoint basis, and (c) may assume many forms, such as a teleseminar, a teleconference, or an electronic classroom, usually including both audio and video. *Synonyms distance learning, distance training, electronic classroom, virtual instruction.*

**teletypewriter (TTY):** A printing telegraph instrument that has a signal-actuated mechanism for automatically printing received messages. *Note 1:* A TTY may have a keyboard similar to that of a typewriter for sending messages. *Note 2:* Radio circuits carrying TTY traffic are called "RTTY circuits" or "RATT circuits."

**teletypewriter control unit (TCU):** A device that controls and coordinates operations between teletypewriters and message switching centers.

**teletypewriter exchange service (TWX):** A switched teletypewriter service in which suitably arranged teletypewriter stations are provided with lines to a central office for access to other such stations.

**teletypewriter signal distortion:** The shifting of signal pulse transitions from their proper positions relative to the beginning of the start pulse. *Note:* The magnitude of the distortion is expressed in percent of a perfect unit pulse length. *Synonym start-stop TTY distortion.*

**television (TV):** A form of telecommunication for the transmission of transient images of fixed or moving objects. [NTIA] [RR] [47CFR] *Note 1:* The picture signal is usually accompanied by the sound signal. *Note 2:* In North America, TV signals are generated, transmitted, received, and displayed in accordance with the NTSC standard.

**television broadcast translator:** *See translator.*

**Telex@:** A communication service involving teletypewriters connected through automatic exchanges.

**Telnet:** The TCP/IP standard network virtual terminal protocol that is used for remote terminal connection service and that allows a user at one site to interact with systems at other sites as if that user terminal were directly connected to computers at those sites.

**TEM:** *Abbreviation for transverse electric and magnetic mode.*

**TEMPEST:** **1.** [A] Short name referring to investigation, study, and control of compromising emanations from information systems (IS) equipment. [INFOSEC-99] **2.** To shield against compromising emanations.

**temporal application:** A video application requiring high temporal resolution, *i.e.*, reduced jerkiness, possibly at the expense of reduced spatial resolution. *Note:* An example of temporal applications is the ability to accurately discern moving image features such as facial expressions and lip movements.



**temporal coherence:** *See coherent.*

**temporal edge noise:** In a video display, that form of edge busyness that is characterized by time-varying sharpness at the edges of objects.

**temporally coherent radiation:** *See coherence time.*

**terahertz (THz):** A unit denoting one trillion ( $10^{12}$ ) hertz.

**terminal:** A device capable of sending, receiving, or sending and receiving information over a communications channel.

**terminal access controller (TAC):** A host computer that accepts terminal connections, usually from dial-up lines, and that allows the user to invoke Internet remote log-on procedures, such as Telnet.

**terminal adapter:** An interfacing device employed at the "R" reference point in an ISDN environment that allows connection of a non-ISDN terminal at the physical layer to communicate with an ISDN network. *Note:* Typically, a terminal adapter will support standard RJ-11 telephone connection plugs for voice and RS-232C, V.35 and RS-449 interfaces for data.

**terminal data:** Data maintained for each terminal including the current terminal location (and capabilities). [T1.244-1995]

**terminal deregistration:** The process by which a wireless terminal's previous location registration is canceled. [T1.702-1995] [T1.Rpt34-1994]

**terminal endpoint (TE) functional group:** A functional group that includes functions broadly belonging to Layer 1 and higher layers of the ITU-T Recommendation X.200 Reference Model. *Note 1:* The functions of a TE functional group are performed on various types of equipment, or combinations of equipment, such as digital telephones, data terminal equipment, and/or integrated work stations. *Note 2:* Examples of TE functions are protocol-handling, maintenance, interface, and connection functions.

**terminal equipment:** **1.** Communications equipment at either end of a communications link, used to permit the stations involved to accomplish the mission for which the link was established. **2.** In radio-relay systems, equipment used at points where data are inserted or derived, as distinct from equipment used only to relay a reconstituted signal. **3.** Telephone and telegraph switchboards and other centrally located equipment at which communications circuits are terminated. **4.** Equipment that originates or terminates signals at the specified rate. [T1.403-1989]

**terminal identifier:** A code identifying a specific terminal. [T1.Rpt34-1994]

**terminal impedance:** **1.** The impedance as measured at the unloaded output terminals of transmission equipment or a line that is otherwise in normal operating condition. **2.** The ratio of voltage to current at the output terminals of a device, including the connected load.

**terminal mobility:** In commercial wireless networks, the ability of a terminal, while in motion, to access telecommunication services from different locations, and the capability of the network to identify and locate that terminal.

**terminal mobility controller:** A device that provides the control logic for terminal authentication, location management, alerting, and routing to radio personal terminal / radio terminations (RPT/RTs). [After T1.244-1995]

**terminal mobility management:** In personal communications service (PCS), (a) providing authentication of terminal information, (b) maintaining terminal location and capability information for each terminal, and (c) providing translation between terminal identification and location (routing address) for the completion of calls to terminals.

**terminal registration:** The process of associating a terminal with a terminal registration area. [T1.Rpt34-1994]

**terminal registration area:** A territory in which a wireless terminal is registered for terminal mobility. *Note:* For T1 Technical Report 34, the alerting area may or may not be identical to the terminal registration area. [T1.Rpt34-1994]

**terminal service profile (TSP):** Information that the service provider maintains for a given user to characterize the services offered by the network to that user. A TSP may be allocated to an interface or to a particular user equipment or a group of user equipment. [T1.653-1996]

**terminal type:** The variety of terminal or the originator (*e.g.*, dual-tone multifrequency (DTMF) phone, ISDN terminal). [After T1.667-1999]

**terminating endpoint:** In a wideband packet node, the part of the node that receives packetized traffic, depacketizes it, and then plays it back as channelized traffic. [T1.509-1995]

**terminating network function:** Of a UPT call, any network function associated with the termination of the call to the destination terminal. [After T1.Rpt41-1995]

**termination:** **1.** The load connected to a transmission line, circuit, or device. *Note:* For a uniform transmission line, if the termination impedance is equal to the characteristic impedance of the line, wave reflections from the end of the line will be avoided. [From Weik '89] **2.** In hollow metallic waveguides, the point at which energy propagating in the waveguide continues in a nonwaveguide propagation mode into a load. [From Weik '89] **3.** An impedance, often resistive, that is connected to a transmission line or piece of equipment as a dummy load, for test purposes.

**terminus:** A device used to terminate, position, and hold an optical fiber within a connector.

**ternary signal:** A signal that can assume, at any given instant, one of three significant conditions, such as power level, phase position, pulse duration, or frequency. *Note:* Examples of ternary signals are (a) a pulse that can have a positive, zero, or negative voltage value at any given instant, (b) a sine wave that can assume phases of  $0^\circ$ ,  $120^\circ$ , or  $240^\circ$  relative to a clock pulse, and (c) a carrier wave that can assume any one of three different frequencies depending on three different modulation signal significant conditions.

**terrestrial radiocommunication:** Any radiocommunication other than space radiocommunication or radio astronomy. [NTIA] [RR] [47CFR]

**terrestrial station:** A station effecting terrestrial radiocommunication. [47CFR] In these *[Radio] Regulations*, unless otherwise stated, any station is a terrestrial station. [NTIA] [RR]

**test and validation:** Physical measurements taken (a) to verify conclusions obtained from mathematical modeling and analysis or (b) for the purpose of developing mathematical models.

**test antenna:** An antenna of known performance characteristics used in determining transmission characteristics of equipment and associated propagation paths.

**test center:** *See patch and test facility, technical control facility.*

**test key:** Key intended for testing of COMSEC equipment or systems. [INFOSEC-99]

**test point:** A point within a piece of equipment or an equipment string that provides access to signals for the purpose of fault isolation.

**test tone:** A tone sent at a predetermined level and frequency through a transmission system for test purposes, such as for facilitating measurements and for aligning gains and losses in the system.

**text processing:** *Synonym word processing.*

**T4 (carrier):** *See T-carrier.*

**T5 (carrier):** *See T-carrier.*

**TG:** *Abbreviation for telegraph. See telegraphy.*

**TGM:** *Abbreviation for trunk group multiplexer.*

**THD:** *Abbreviation for total harmonic distortion.*

**thermal noise:** The noise generated by thermal agitation of electrons in a conductor. The noise power,  $P$ , in watts, is given by  $P = kT \Delta f$ , where  $k$  is Boltzmann's constant in joules per kelvin,  $T$  is the conductor temperature in kelvins, and  $\Delta f$  is the bandwidth in hertz. *Note 1:* Thermal noise power, per hertz, is equal throughout the frequency spectrum, depending only on  $k$  and  $T$ . *Note 2:* For the general case, the above definition may be held to apply to charge carriers in any type of conducting medium. *Synonym Johnson noise.*

**thermal radiation:** **1.** Electromagnetic radiations emitted from a heat or light source as a consequence of its temperature; it consists essentially of ultraviolet, visible, and infrared radiations. [JP1] **2.** The heat and light produced by a nuclear explosion. [JP1]

**thermodynamic temperature:** A measure, in kelvins (K), proportional to the thermal energy of a given body at equilibrium. *Note 1:* A temperature of 0 K is called "absolute zero," and coincides with the minimum molecular activity (*i.e.*, thermal energy) of matter. *Note 2:* Thermodynamic temperature was formerly called "absolute temperature." *Note 3:* In practice, the International Temperature Scale of 1990 (ITS-90) serves as the basis for high-accuracy temperature measurements in science and technology.

**THF:** *Abbreviation for tremendously high frequency. See electromagnetic spectrum.*

**thin client (computing):** A server-centric computing model in which the application software, data, and CPU power resides on a network server rather than on the client computer(s). *Note 1:* This computing philosophy allows administrators to purchase one relatively powerful and expensive server and be confident that any external terminal, regardless of its power or sophistication, can run applications on the server. Most "shopping" Web pages, for example, are thin-client applications (*i.e.*, the client needs nothing more than a browser and a connection to the network to be able to search the "shopping" page and to order products). Local area networks can use thin-client modeling to install only one copy of necessary programs onto the main server for many clients on the network to use. *Note 2:* Server software is required to interface clients with the software on the server. *Synonyms Internet appliance (computing), Internet box (computing), network computer.*

**thin-client software:** Computer programs that reside on a server and react to external requests from a client. *Note:* This is in contrast to software that is installed on each client computer in a network. Software that resides only on a single server can be maintained and updated with minimal effort.

**thin-film laser:** A laser that is constructed by thin-film deposition techniques on a substrate for use as a light source, is usually used to drive thin-film optical waveguides, and may be used in integrated optical circuits.

**thin-film optical modulator:** A modulator that consists of multilayered films of material of different optical characteristics, is capable of modulating transmitted light by using electro-optic, electro-acoustic, or magneto-optic effects to obtain signal modulation, and may be used as a component in integrated optical circuits. [From Weik '89]

**thin-film optical multiplexer:** A multiplexer that consists of multilayered films of material of different optical characteristics, is capable of multiplexing transmitted light by using electro-optic, electro-acoustic, or magneto-optic effects to obtain signal multiplexing, and may be used as a component in integrated optical circuits. [From Weik '89]

**thin-film optical switch:** A switch that consists of multilayered films of material of different optical characteristics, that is capable of switching transmitted light by using electro-optic, electro-acoustic, or magneto-optic effects to obtain signal switching, and is usually used as a component in integrated optical circuits. *Note:* Thin-film optical switches may support only one propagation mode. [From Weik '89]

**thin-film optical waveguide:** A slab-dielectric waveguide that consists of multilayered films of material of different optical characteristics, is capable of guiding an optical signal, and may be used as a component in integrated optical circuits. [From Weik '89]

**third-order intercept point:** A point (a) that is an extrapolated convergence--not directly measurable--of intermodulation distortion products in the desired output and (b) that indicates how well a receiver performs in the presence of strong nearby signals. *Note:* Determination of a third-order intercept point is accomplished by using two test frequencies that fall within the first intermediate frequency mixer passband. Usually, the test frequencies are about 20 to 30 kHz apart.

**third window:** Of silica-based optical fibers, the transmission window at approximately 1.55  $\mu$ m. *Note:* The third window is the minimum-loss window in silica-based fibers. [After FAA]

**thread:** In computer conferencing, a set of sequential messages containing closely related information. [After 2382-pt.35] *Synonyms discussion thread, followup.*

**threat:** **1.** Capabilities, intentions, and attack methods of adversaries to exploit, or any circumstance or event with the potential to cause harm to, information or an information system. [NIS] **2.** Any circumstance or event with the potential to harm an information system (IS) through unauthorized access, destruction, disclosure, modification of data, and/or denial of service. [INFOSEC-99]

**threat analysis:** Examination of information to identify the elements comprising a threat. [INFOSEC-99]

**threat assessment :** [A] formal description and evaluation of threat to an information system (IS). [INFOSEC-99]

**three-bit byte:** *Synonym triplet.*

**three-way calling:** A switching system service feature that permits users to add a third party at a different number during a call, without the assistance of an attendant.

**threshold:** **1.** The minimum value of a signal that can be detected by the system or sensor under consideration. **2.** A value used to denote predetermined levels, such as those pertaining to volume of message storage, *i.e.*, in-transit storage or queue storage, used in a message switching center. **3.** The minimum value of the parameter used to activate a device. **4.** The minimum value a stimulus may have to create a desired effect.

**threshold current:** In a laser, the driving current corresponding to lasing threshold.

**threshold extension:** *See* FM threshold extension.

**threshold frequency:** In opto-electronics, the frequency of incident radiant energy below which there is no photo-emissive effect.

**through group:** A group of 12 voice-frequency channels transmitted as a unit through a carrier system.

**through-group equipment:** In carrier telephone transmission, equipment that accepts the signal from a group receiver output and attenuates it to the proper signal level for insertion, without frequency translation, at the input of a group transmitter.

**throughput:** **1.** The number of bits, characters, or blocks passing through a data communication system, or portion of that system. *Note 1:* Throughput may vary greatly from its theoretical maximum. *Note 2:* Throughput is expressed in data units per period of time; e.g., in the DDN, as blocks per second. **2.** The maximum capacity of a communications channel or system. **3.** A measure of the amount of work performed by a system over a period of time, e.g., the number of jobs per day.

**through supergroup:** An aggregate of 60 voice-frequency channels, i.e., five groups, transmitted as a unit through a carrier system.

**through-supergroup equipment:** In carrier telephone transmission, equipment that accepts the multiplexed signal from a supergroup receiver output, amplifies it without frequency translation, and provides the proper signal level to the input of a supergroup transmitter equipment.

**THz:** *Abbreviation for terahertz. See electromagnetic spectrum.*

**TIA:** *Abbreviation for Telecommunications Industry Association. See EIA interface.*

**ticket:** In computer security, a representation of one or more access rights that a possessor has to an object. *Note:* The ticket represents an access permission. [2382-pt.8]

**ticketed call:** A call for which a record is made of certain facts concerning the call, such as the time it was placed, the duration, the call originator, call destination numbers, and, where applicable, the attendant's name or initials. [From Weik '89]

**ticket-oriented:** [In security, a] computer protection system in which each subject maintains a list of unforgeable bit patterns called tickets, one for each object a subject is authorized to access. [INFOSEC-99]

**TIE:** *Acronym for time interval error.*

**tie line:** *See* tie trunk.

**tie trunk:** A telephone line that directly connects two private branch exchanges (PBXs).

**TIFF:** *Acronym for tag image file format.*

**tight buffer:** *See* buffer.

**tiling:** *See* block distortion.

**time:** **1.** An epoch, i.e., the designation of an instant on a selected time scale, astronomical or atomic. It is used in the sense of time of day [JP1] **2.** On a time scale, the interval between two events, or the duration of an event. **3.** An apparently irreversible continuum of ordered events. **4.** That which characterizes, or is characterized by, the observed and apparently irreversible continuum of ordered events.

**time ambiguity:** A situation in which more than one different time or time measurement can be obtained under the stated conditions.

**time-assignment speech interpolation (TASI):** An analog technique used on certain long transmission links to increase voice-transmission capacity. *Note:* TASI works by switching additional users onto any channel temporarily idled because an original user has stopped speaking. When the original user resumes speaking, that user will, in turn, be switched to any channel that happens to be idle.

**time availability:** *Synonym* circuit reliability.

**time block:** An arbitrary grouping of several consecutive hours of a day, usually for a particular season, during which it is assumed that propagation data are statistically homogeneous.

**time bomb:** **1.** In COMSEC, a logic bomb to be activated at a predetermined time. [2382-pt.8] **2.** [A] resident computer program that triggers an unauthorized act at a predefined time. [INFOSEC-99]

**time code:** A code used for the transmission and identification of time signals. *Note:* In telecommunications systems, the format of the time code must be specified.

**time code ambiguity:** The shortest interval between successive repetitions of the same time code value. *Note:* For example, in a time code in which year-of-century is the most slowly changing field, the time code ambiguity would be 100 years; for a digital clock in which hours and minutes up to a maximum of 11:59 are displayed, the time code ambiguity would be 12 hours.

**time code resolution:** The interval between two successive time code states. *Note:* Time code resolution is determined by the most rapidly changing symbol position within the time code. For example, for a digital clock that displays hours and minutes, the time code resolution would be 1 minute.

**time-consistent busy hour (TCBH):** The identical hour each day during which, over a number of days, the highest average traffic is measured. [T1.Rpt 11-1991]

**time constant:** The interval required for a system or circuit to change a specified fraction from one state or condition to another. *Note 1:* The time constant is used in the expression

$$A(t) = A(0) e^{-\frac{t}{a}},$$

where  $A(t)$  is the value of the state at time  $t$ ,  $A(0)$  is the value of the state at time  $t = 0$ ,  $a$  is the time constant, and  $t$  is the time that has elapsed from the start of the exponential decay. *Note 2:* When  $t = a$ ,  $A(t)/A(0) = 1/e$ , or approximately 0.37, and the system has changed about 63% toward its new value in one time constant. A system is considered to have changed its state after the elapse of three time constants, which corresponds to a 95% change in state. For example, if an electrical capacitor, having a capacitance of  $C$  farads, is discharged through a resistor, having a resistance of  $R$  ohms, the capacitor will be approximately 95% discharged after the elapse of  $3RC$  seconds. *Note 3:* Time constants are

expressed in seconds, such as  $3.5 \times 10^{-6}$  seconds, *i.e.*, 3.5  $\mu$ s. [From Weik '89]

**time-delay distortion:** *Synonym* delay distortion.

**time-derived channel:** *See* time-division multiplexing.

**time diversity:** Transmission in which signals representing the same information are sent over the same channel at different times. *Note:* Time diversity is often used over systems subject to burst error conditions, and at intervals adjusted to be longer than an error burst.

**time division:** *See* time-division multiplexing.

**time-division multiple access (TDMA):** **1.** A communications technique that uses a common channel (multipoint or broadcast) for communications among multiple users by allocating unique time slots to different users. *Note:* TDMA is used extensively in satellite systems, local area networks, physical security systems, and combat-net radio systems. **2.** A multiple access technique whereby users share a transmission medium by being assigned and using (one at a time) for a limited number of time division multiplexed channels; implies that several transmitters use one channel for sending several bit streams. [47CFR]

**time-division multiplexing (TDM):** **1.** Digital multiplexing in which two or more apparently simultaneous channels are derived from a given frequency spectrum, *i.e.*, bit stream, by interleaving pulses representing bits from different channels. *Note:* Successive pulses represent bits from successive channels, *e.g.*, voice channels in a T1 system. **2.** A multiplexing technique whereby two or more channels are derived from a transmission medium by dividing access to the medium into sequential intervals. Each channel has access to the entire bandwidth of the medium during its interval. This implies that one transmitter uses one channel to send several bit streams of information. [47CFR]

**time-division switching:** Switching of time-division multiplexed (TDM) channels by shifting bits between time slots in a TDM frame.

**time-domain reflectometer (TDR):** An electronic instrument used to characterize and locate faults in metallic cables (*e.g.*, twisted pair, coax). *Note 1:* A TDR transmits a fast rise time pulse along the conductor. The resulting reflected pulse is measured at the input as a function of time and displayed on the instrument or plotted, as a function of cable length. *Note 2:* A TDR may be used to verify cable impedance characteristics, splice and connector location and associated losses, and estimate cable lengths.

**time-gated direct-sequence spread spectrum:** Direct-sequence spread spectrum where the transmitter is on only for a short fraction of a time interval. The on-time can be periodic or random within a time interval. [NTIA]

**time guard band:** A time interval left vacant on a channel to provide a margin of safety against intersymbol interference in the time domain between sequential operations, such as detection, integration, differentiation, transmission, encoding, decoding, or switching.

**time instability:** The fluctuation of the time interval error caused by the instability of a real clock.

**time interval error (TIE):** **1.** The time difference between a real clock and an ideal uniform time scale, after a time interval following perfect synchronization between the clock and the scale. **2.** The variation in time delay of a given timing signal with respect to an ideal timing signal over a particular time period. [T1.101-1987]

**time jitter:** Short-term variation or instability in the duration of a specified time interval.

**timeliness:** *See* responsiveness.

**time marker:** A reference signal, often repeated periodically, enabling the correlation of specific events with a time scale, such as for establishing synchronization.

**time of occurrence:** The date of an event, *i.e.*, the instant an event occurs, with reference to a specified time scale.

**time-out:** **1.** A network parameter related to an enforced event designed to occur at the conclusion of a predetermined elapsed time. **2.** A specified period of time that will be allowed to elapse in a system before a specified event is to take place, unless another specified event occurs first; in either case, the period is terminated when either event takes place. *Note:* A time-out condition can be canceled by the receipt of an appropriate time-out cancellation signal. **3.** An event that occurs at the end of a predetermined period of time that began at the occurrence of another specified event. The time-out can be prevented by an appropriate signal.

**time scale:** **1.** A time measuring system defined to relate the passage of temporal events since a selected epoch. *Note:* The internationally recognized time interval is the second. Time scales are graduated in intervals such as seconds, minutes, hours, days, and years, and in fractions of a second, such as milliseconds, nanoseconds, and picoseconds. **2.** Time coordinates placed on the abscissa (x-axis) of Cartesian-coordinate graphs used for depicting waveforms and similar phenomena.

**time scale factor:** A multiplier used to transform the real time of occurrence of an event or a problem into system time, such as that of a telecommunications system or a computer.

**time server:** The server maintaining and distributing the correct date and time over a computer network. *Note:* There is usually a special time-distribution protocol. [2382-pt.35]

**time-sharing:** **1.** The interleaving of two or more independent processes on one functional unit. **2.** Pertaining to the interleaved use of computer time that enables two or more users to execute programs concurrently.

**time slot:** **1.** Period of time during which certain activities are governed by specific regulations. [JP1] **2.** A time interval that can be recognized and uniquely defined.

**time stamp (TS):** **1.** A data field in which is recorded (typically with a resolution of 1 millisecond) the cumulative variable queuing delay experienced by a packet in traversing the network. [After T1.509-1995] **2.** With respect to a recorded network event, a data field in which is recorded the time (time of day or other instant of elapsed time) at which the event took place. [After T1.226-1992]

**time standard:** A stable device that emits signals at equal intervals such that their count may be used as a clock.

**time tick:** A time mark output of a clock system.

**time-variant value:** In cryptography, a value that changes with each transaction or with each message value. [After X9.19]

**timing extraction:** *Synonym* timing recovery.

**timing jitter:** The short-term variations of the significant instants of a digital signal from their ideal positions in time. Here short term implies phase oscillations of frequency greater than or equal to 10 Hz. Timing jitter may lead to crosstalk and/or distortion of the original analog signal and is a potential source of slips at the input ports of digital switches. It may also cause slips and resultant errors in asynchronous digital multiplexes. [T1.101-1999]

**timing recovery:** The derivation of a timing signal from a received signal. *Synonym* timing extraction.

**timing signal:** **1.** The output of a clock. **2.** A signal used to synchronize interconnected equipment.

**timing tracking accuracy:** A measure of the ability of a timing synchronization system to minimize the clock difference between a master clock and any slaved clock.

**T-interface:** For basic rate access in an Integrated Services Digital Network (ISDN) environment, a user-to-network interface reference point that (a) is characterized by a four-wire, 144-kb/s (2B+D) user rate, (b) accommodates the link access and transport layer function in the ISDN architecture, (c) is located at the user premises, (d) is distance sensitive to the servicing network terminating equipment, and (e) functions in a manner analogous to that of the Channel Service Units (CSUs) and the Data Service Units (DSUs).

**T junction:** See series T junction.

**TLM:** Abbreviation for **telemetry**.

**TLP:** Abbreviation for **transmission level point**.

**TM:** Abbreviation for **transverse magnetic**. See **transverse magnetic mode**.

**TOD:** Abbreviation for **time of day**. See **time of occurrence**.

**token:** In certain local-area-network protocols, a group of bits that serves as a symbol of authority, is passed among data stations, and is used to indicate the station that is temporarily in control of the transmission medium.

**token-bus network:** A bus network in which a token passing procedure is used.

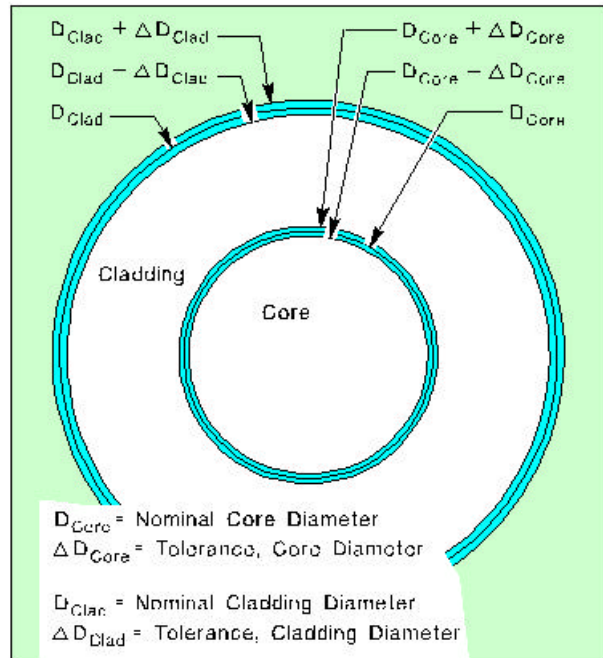
**token passing:** A network access procedure in which a token passes from station to station and the only station allowed to transmit information is the station with the token.

**token ring adapter:** A network interface card (NIC) designed to attach a client workstation to a token ring computer network and operate as a token-passing interface.

**token-ring network:** See **network topology**.

**tolerance:** The permissible range of variation of some characteristic from its nominal value.

**tolerance field:** **1.** The region between two curves, such as circles or rectangles, used to specify the tolerance on component size and geometry. **2.** Pertaining to the cross section of an optical fiber, when used to specify the respective diameters and ovalities of, and concentricity error between, the core and cladding; two concentric annular regions which define the core-cladding boundary and the cladding outer boundary. *Note:* Dimensions are usually expressed in micrometers ( $\mu\text{m}$ ). The larger annular region is defined by concentric circles of diameter  $[D_c + \Delta D_c]$  and  $[D_c - \Delta D_c]$ , where  $D_c$  is the nominal diameter of the cladding and  $\Delta D_c$  is the cladding diameter tolerance. The smaller annular region is defined by concentric circles of diameter  $[D_c + \Delta D_c]$  and  $[D_c - \Delta D_c]$ , where  $D_c$  is the nominal diameter of the core and  $\Delta D_c$  is the core diameter tolerance. When the core and cladding boundaries of the cross section of the fiber in question fall entirely within their respective defined areas, the fiber meets the specification. [After FAA] **3.** Of the cross section of a given optical fiber, when used to characterize the respective diameters and ovalities of the core and cladding, and the concentricity error between the core and cladding; two such pairs of concentric circles, the concentric pairs not necessarily being concentric with one another. *Note 1:* One pair of concentric circles characterizes the core, and the other pair, the cladding. The cladding *ovality* is characterized by the smallest circle that circumscribes its cross section, and the largest circle that fits within its cross section. (The cross section is assumed, to a first approximation, to be elliptical in shape, so these defining circles will be concentric.) The core cross section is characterized by an analogous pair of circles, also concentric with one another, but not necessarily with those defining the cladding cross section. *Note 2:* The distance between the centers of the two concentric pairs (core pair and cladding pair) defines the offset between the core and cladding (the "core-cladding offset," also called the "concentricity error"). The width of the annulus defined by the cladding circles determines the ovality of the cladding, and the width of the annulus defined by the core determines the ovality of the core. [After FAA]



tolerance field

**T1 line:** A full-duplex digital transmission facility that is composed of transmission media (optical or metallic) and regenerators that carry one DS1 signal. [After T1.408-1990]

**toll call:** See **long-distance call**.

**toll center:** An office (or group of offices) within a city which generally handles the originating and incoming toll traffic for that city to or from other toll center areas and which handles through switched traffic. The toll center normally handles the inward toll traffic for its tributary exchanges and, in general, either handles the outward traffic originating at its

tributaries or serves as the outlet to interexchange circuits for outward traffic ticketed and timed at its tributaries. Toll centers are listed as such in the Toll Rate and Route Guide. [47 CFR Pt.36-A]

**toll center area:** The areas served by a toll center, including the toll center city and the communities served by tributaries of the toll center. [47 CFR Pt.36-A]

**toll center toll office:** A toll office (as contrasted to a local office) in a toll center city. [47 CFR Pt.36-A]

**toll circuit:** A general term applied to interexchange trunks used primarily for toll traffic. [47 CFR Pt.36-A]

**toll connecting trunk:** A general classification of trunks carrying toll traffic and ordinarily extending between a local office and a toll office, except trunks classified as tributary circuits. Examples of toll connecting trunks include toll switching trunks, recording trunks, and recording-completing trunks. [47 CFR Pt.36-A]

**toll diversion:** A system service feature by which users are denied the ability to place toll calls without the assistance of an attendant.

**toll office:** A central office used primarily for supervising and switching toll traffic. [47 CFR Pt.36-A]

**toll quality:** The voice quality resulting from the use of a nominal 4-kHz telephone channel. *Note:* Toll quality may be quantized in terms of a specified bit error ratio.

**toll restriction:** *See classmark.*

**toll switching trunk:** A trunk connecting one or more end offices to a toll center as the first stage of concentration for intertoll traffic. *Note:* Operator assistance or participation may be an optional function. In U.S. common carrier telephony service, a toll center designated "*Class 4C*" is an office where assistance in completing incoming calls is provided in addition to other traffic; a toll center designated "*Class 4P*" is an office where operators handle only outbound calls, or where switching is performed without operator assistance.

**T1 (carrier):** *See T-carrier.*

**T1C (carrier):** *See T-carrier.*

**tone:** An electrically generated single-frequency sinusoidal oscillation. [T1.305-1990]

**top-level domain name:** In Internet addressing, a domain name identifying the highest hierarchical level in the geographical or organizational structure of the addressing system in Internet. *Note:* In Internet, the top-level domain name is either an ISO country name, or an English abbreviation such as "com," "edu," "gov," "mil," "net," or "org." [After 2382-pt.35]

**tone diversity:** In a voice frequency telegraph (VFTG) transmission system, the use of two channels to carry the same information. *Note:* Tone diversity is usually achieved by twinning the channels of a 16-channel VFTG to obtain 8 channels with dual diversity.

**tone signaling:** *See dual-tone multifrequency signaling.*

**tool:** *Synonym utility program.*

**topography:** The specification and arrangement in physical locations of actual communication and information system components which implement the topology.

**topology:** *See network topology.*

**torn-tape relay:** An antiquated tape relay system in which the perforated tape is manually transferred by an operator to the appropriate outgoing transmitter.

**total channel noise:** The sum of random noise, intermodulation noise, and crosstalk. *Note:* Total channel noise does not include impulse noise because different techniques are required for its measurement.

**total harmonic distortion (THD):** Of a signal, the ratio of (a) the sum of the powers of all harmonic frequencies above the fundamental frequency to (b) the power of the fundamental frequency. *Note 1:* The THD is usually expressed in dB. *Note 2:* Measurements for calculating the THD are made at the output of a device under specified conditions.

**total internal reflection:** The reflection that occurs when light, in a higher refractive-index medium, strikes an interface, with a medium with a lower refractive index, at an angle of incidence (with respect to the normal) greater than the critical angle. *See Snell's law* (Note 3).

**total line length:** In facsimile, the spot speed divided by the scanning line frequency. *Note:* The total line length may be greater than the length of the available line.

**touch panel:** *See touch-sensitive.*

**touch screen:** *See touch-sensitive.*

**touch-sensitive:** Pertaining to a device that allows a user to interact with a computer system by touching an area on the surface of the device with a finger, pencil, or other object; for example, a touch-sensitive keypad or screen.

**touch tone dialing:** *See dual-tone multifrequency (DTMF) signaling.*

**trace packet:** In a packet-switching network, a unique packet that causes a report of each stage of its progress to be sent to the network control center from each visited system element.

**trace program:** A computer program that performs a check on another computer program by exhibiting the sequence in which the instructions are executed and usually the results of executing the instructions.

**track:** On a data medium, a path associated with a single read/write head position as data move past the head.

**trackball:** A ball that can be rotated about its center and that is used as an input device, *e.g.*, to position a cursor. *Synonym control ball.*

**track density:** The number of tracks per unit length, measured in a direction perpendicular to the direction in which the tracks are read.

**tracking error:** The deviation of a dependent variable with respect to a reference function.

**tracking mode:** An operational mode during which a system is operating within specified movement limits relative to a reference.

**tracking phase:** *See tracking mode.*



**traffic:** **1.** The information moved over a communication channel. **2.** A quantitative measurement of the total messages and their length, expressed in CCS or other units, during a specified period of time.

**traffic analysis:** **1.** In a communications system, the analysis of traffic rates, volumes, densities, capacities, and patterns specifically for system performance improvement. [From Weik '89] **2.** [The] study of communications characteristics external to the text. [NIS] **3.** The analysis of the communications-electronic environment for use in the design, development, and operation of new communications systems. [From Weik '89] **4.** In cryptology, the inference of information from observation and analysis of the presence, absence, amount, direction, and frequency of the traffic flow. [After 2382-pt. 8] **5.** [The] Study of communications patterns. [INFOSEC-99]

**traffic capacity:** The maximum traffic per unit of time that a given telecommunications system, subsystem, or device can carry under specified conditions.

**traffic encryption key (TEK):** [A] key used to encrypt plain text or to superencrypt previously encrypted text and/or to decrypt cipher text. [INFOSEC-99]

**traffic engineering:** The determination of the numbers and kinds of circuits and quantities of related terminating and switching equipment required to meet anticipated traffic loads throughout a communications system.

**traffic-flow security:** **1.** The protection resulting from features, inherent in some crypto-equipment, that conceal the presence of valid messages on a communications circuit; normally achieved by causing the circuit to appear busy at all times. [After JP1] **2.** Measures used to conceal the presence of valid messages in an on-line cryptosystem or secure communications system. [INFOSEC-99] *Note:* Encryption of sending and receiving addresses and causing the circuit to appear busy at all times by sending dummy traffic are two methods of traffic-flow security. A more common method is to send a continuous encrypted signal, whether or not traffic is being transmitted.

**traffic intensity:** A measure of the average occupancy of a facility during a specified period of time, normally a busy hour, measured in traffic units (erlangs) and defined as the ratio of the time during which a facility is occupied (continuously or cumulatively) to the time this facility is available for occupancy. *Note:* A traffic intensity of one traffic unit (one erlang) means continuous occupancy of a facility during the time period under consideration, regardless of whether or not information is transmitted. *Synonym call intensity.*

**traffic load:** The total traffic carried by a trunk or trunk group during a specified time interval.

**traffic monitor:** In a communications network, a service feature that provides basic data on the amount and type of traffic handled by the network.

**traffic over first routes:** A term applied to the routing of traffic and denoting routing via principal route for traffic between any two points as distinguished from alternate routes for such traffic. [47 CFR Pt.36-A]

**traffic overflow:** **1.** That condition wherein the traffic offered to a portion of a communication system exceeds its capacity and the excess may be blocked or may be provided with alternate routing. **2.** The excess traffic itself.

**traffic padding:** **1.** In COMSEC, a countermeasure that generates spurious data in transmission media to make traffic analysis or decryption more difficult. [2382-pt.8] **2.** In reliability techniques, *see* **pilot-make-busy circuit**. **3.** Generation of spurious communications or data units to disguise the amount of real data units being sent. [INFOSEC-99]

**traffic register:** *See* **register**.

**traffic service position system (TSPS):** A stored program electronic system associated with one or more toll switching systems which provides centralized traffic service position functions for several local offices at one location. [47CFR part 67, Appendix.]

**traffic unit:** *Synonym* **erlang**.

**traffic usage recorder:** A device for measuring and recording the amount of telephone traffic carried by a group, or several groups, of switches or trunks.

**trailer:** Protocol control information located at the end of a protocol data unit (PDU).

**tranquility:** [The] property whereby the security level of an object cannot change while the object is being processed by an information system (IS). [INFOSEC-99]

**transaction capabilities (TC):** **1.** A means based upon the OSI-Reference Model to support applications in telecommunications networks. [T1.667-1999] **2.** Protocol functions and procedures that control non-circuit related information exchange among signaling points in SS7 networks. It provides a general purpose approach to the introduction of new services within a network as well as a framework for service architecture for providing internetwork services. Transaction capabilities includes the application layer protocol called transaction capabilities application part (TCAP) as well as the supporting Presentation, Session, and Transport layers called the application service part (ASP). [T1.226-1992]

**transaction integrity:** The degree to which a transaction flowing through a network reaches its intended destination without impairment of its function, content or meaning. [After X9.19]

**transaction-oriented application:** Applications that exchange messages that are time-critical, bursty, and often limited in length, to perform an indivisible or elemental unit of work for OAM&P (operations, administration, maintenance, and provisioning) applications. [After T1.210-1993]

**transceiver:** **1.** A device that performs, within one chassis, both transmitting and receiving functions. **2.** In military communications, the combination of transmitting and receiving equipment that (a) is in a common housing, (b) usually is designed for portable or mobile use, (c) uses common circuit components for both transmitting and receiving, and (d) provides half-duplex operation.

**transcoding:** The direct digital-to-digital conversion from one encoding scheme, such as voice LPC-10, to a different encoding scheme without returning the signals to analog form. *Note:* The transcoded signals, *i.e.*, the digital representations of analog signals may be any digital representation of any analog signal, such as voice, facsimile, or quasi-analog signals.

**transcoding gain:** The factor by which the bit rate of a 64-kb/s channel is reduced when transcoding is used, *e.g.*, when a transcoder conforming to ANSI T1.303 (*i.e.*, ADPCM 32-kb/s) is used, the transcoding gain will equal 2. Transcoding gain equals 1 when no transcoding is used. [T1.309-1990]

**transducer:** A device for converting energy from one form to another for the purpose of measurement of a physical quantity or for information transfer.

**TRANSEC:** *Abbreviation for* **transmission security**. *See* **communications security**.

**transfer:** To send information from one location and to receive it at another.

**transfer allowed (TFA):** A procedure included in the signaling route management (functionality) that is used to inform a signaling point that a signaling route to a specific destination has become available. [T1.234-1993]

**transfer capacity:** The maximum sustainable rate of information transfer. [T1.627-1993]

**transfer characteristics:** Those intrinsic parameters of a system, subsystem, or equipment which, when applied to the input of the system, subsystem, or equipment, will fully

describe its output.

**transfer controlled (TFC):** A procedure included in the signaling route management (functionality) that is used to inform a signaling point of congestion status of a signaling route. [T1.234-1993]

**transfer function: 1.** A mathematical statement that describes the transfer characteristics of a system, subsystem, or equipment. **2.** The relationship between the input and the output of a system, subsystem, or equipment in terms of the transfer characteristics. *Note 1:* When the transfer function operates on the input, the output is obtained. Given any two of these three entities, the third can be obtained. *Note 2:* Examples of simple transfer functions are voltage gains, reflection coefficients, transmission coefficients, and efficiency ratios. An example of a complex transfer function is envelope delay distortion. *Note 3:* For a negative feedback circuit, the transfer function,  $T$ , is given by

$$T = \frac{e_o}{e_i} = \frac{G}{1 + GH},$$

where  $e_o$  is the output,  $e_i$  is the input,  $G$  is the forward gain, and  $H$  is the backward gain, *i.e.*, the fraction of the output that is fed back and combined with the input in a subtracter.

**3.** Of an optical fiber, the complex mathematical function that expresses the ratio of the variation, as a function of modulation frequency, of the instantaneous power of the optical signal at the output of the fiber, to the instantaneous power of the optical signal that is launched into the fiber. *Note:* The optical detectors used in communication applications are square-law devices. Their output current is proportional to the input optical power. Because electrical power is proportional to current, when the optical power input drops by one-half (3 dB), the electrical power at the output of the detector drops by three-quarters (6 dB). [FAA]

**transfer mode:** In an integrated services digital network, (ISDN), a method of transmitting, multiplexing, and switching.

**transfer prohibited (TFP):** A procedure included in the signaling route management (functionality) that is used to inform a signaling point of the unavailability of a signaling route. [T1.234-1993]

**transfer rate:** See data transfer rate.

**transfer restricted (TFR):** A procedure included in the signaling route management (functionality) that is used to inform a signaling point of the restriction of a signaling route. [T1.234-1993]

**transfer syntax:** That concrete syntax used in the transfer of data between open systems. [T1.208-1989]

**transient:** See dynamic variation.

**transit delay:** Between two given points in an integrated services digital network (ISDN), the time between the moment that the first bit of a data unit, such as a frame or block, passes the first given point and the moment that bit passes the second given point, plus the transmission time of the data unit. *Note:* Transit delay is defined only between pairs of boundaries. Transit delay of a FPDU starts at the time  $t_1$  at which the first bit of the FPDU crosses the first boundary, and ends at the time  $t_2$  at which the last bit of the FPDU crosses the second boundary. Transit delay =  $t_2 - t_1$ . [T1.606-1990]

**transition:** In a signal, the changing from one significant condition to another. *Note:* Examples of transitions are the changing from one voltage level to another in a data stream, the shifting from one phase position to another in phase-shift keying, and the translation from one frequency to another in frequency-shift keying. [From Weik '89]

**transition frequency:** The frequency associated with the difference between two discrete energy levels in an atomic system, given by

$$f_{2,1} = \frac{E_2 - E_1}{h},$$

where  $f_{2,1}$  is the frequency associated with the difference between two energy levels,  $E_2$  and  $E_1$  ( $E_2 > E_1$ ), and is Planck's constant. *Note:* If a transition from  $E_2$  to  $E_1$  occurs, a photon with frequency  $f_{2,1}$  is likely to be emitted. If the atomic system is at energy level  $E_1$ , and a photon of frequency  $f_{2,1}$  is absorbed, the energy level will be raised to  $E_2$ . [From Weik '89]

**transition zone:** *Synonym intermediate-field region.*

**transit network identification:** A network service feature that specifies the sequence of networks used to establish or partially establish a virtual circuit.

**transit network section:** A network section between two internet circuit sections. [T1.504-1989]

**transit node:** A node that interfaces with other nodes, and does not directly interface with customer equipment. [T1.101-1999]

**transit time:** *Synonym phase delay.*

**translate:** In cryptography, the process of offset decrypting a key or set of keys using a transportation key shared with one center and then offset encrypting the same key or keys under a transportation key shared with a different center. [After X9.28]

**translating program:** *Synonym translator.*

**translation signaling point (TSP):** A signaling point that performs SCCP (signal connection control part) global title translation. It is also known as SCCP Relay Node. The translation performed may be intermediate, in which case the TSP is referred to as "intermediate translation signaling point" (ITSP), or final, in which case the TSP is referred to as "final translation signaling point" (FTSP). [T1.226-1992]

**translator: 1.** A device that converts information from one system of representation into equivalent information in another system of representation. *Note:* An example of a translator in telephony is the device that converts dialed digits into call-routing information. **2.** A computer program that translates from one language into another language and in particular from one programming language into another programming language. *Synonym translating program.* **3.** In FM and TV broadcasting, a repeater station that receives a primary station's signal, amplifies it, shifts it in frequency, and rebroadcasts it. **4.** A device that converts one frequency to another.

**transliterate:** To convert the characters of one alphabet to the corresponding characters of another alphabet.

**transmission:** **1.** The dispatching, for reception elsewhere, of a signal, message, or other form of information. **2.** The propagation of a signal, message, or other form of information by any means, such as by telegraph, telephone, radio, television, or facsimile via any medium, such as wire, coaxial cable, microwave, optical fiber, or radio frequency. **3.** In communications systems, a series of data units, such as blocks, messages, or frames. **4.** The transfer of electrical power from one location to another via conductors.

**transmission block:** **1.** A group of bits or characters transmitted as a unit and usually containing an encoding procedure for error control purposes. **2.** In data transmission, a group of records sent, processed, or recorded as a unit. *Note:* A transmission block is usually terminated by an end-of-block character (EOB), end-of-transmission-block character (ETB), or end-of-text character (EOT or ETX).

**transmission buffer:** Storage (*viz.*, buffer storage) in the signaling link control for signal units not yet transmitted. [After T1.110-1987]

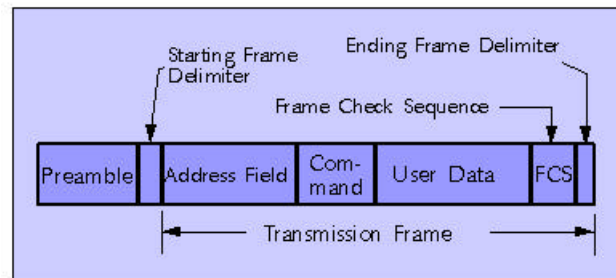
**transmission channel:** *See* channel.

**transmission coefficient:** **1.** The ratio of the transmitted field strength to the incident field strength of an electromagnetic wave when it is incident upon an interface surface between media with two different refractive indices. **2.** In a transmission line, the ratio of the amplitude of the complex transmitted wave to that of the incident wave at a discontinuity in the line. **3.** The probability that a portion of a communications system, such as a line, circuit, channel or trunk, will meet specified performance criteria. *Note:* The value of the transmission coefficient is inversely related to the quality of the line, circuit, channel or trunk.

**transmission control character:** *See* control character.

**transmission control protocol:** A network protocol that controls host-to-host transmissions over packet-switched communication networks.

**transmission frame:** A data structure, beginning and ending with delimiters, that consists of fields predetermined by a protocol for the transmission of user data and control data.



transmission frame

**transmission level:** At a specified point in a telecommunications system, the power that is measured when a standard test signal, *e.g.*, 0 dBm or -16 dBm at 1000 Hz, is transmitted from a corresponding reference point. *Note:* The transmission level is usually expressed in dBm.

**transmission level point (TLP):** In a telecommunications system, a test point, *i.e.*, a point where a signal may be inserted or measured, and for which the nominal power of a test signal is specified. *Note 1:* In practice, the abbreviation, TLP, is usually used, and it is modified by the nominal level for the point in question. For example, where the nominal level is 0 dBm, the expression 0 dBm TLP, or simply, 0TLP, is used. Where the nominal level is -16 dBm, the expression -16 dBm TLP, or -16TLP, is used. *Note 2:* The nominal transmission level at a specified TLP is a function of system design and is an expression of the design gain or loss. *Note 3:* Voice-channel transmission levels, *i.e.*, TLPs, are usually specified for a frequency of approximately 1000 Hz. *Note 4:* The TLP at a point at which an end instrument, *e.g.*, a telephone set, is connected is usually specified as 0 dBm.

**transmission line:** The material medium or structure that forms all or part of a path from one place to another for directing the transmission of energy, such as electric currents, magnetic fields, acoustic waves, or electromagnetic waves. *Note:* Examples of transmission lines include wires, optical fibers, coaxial cables, rectangular closed waveguides, and dielectric slabs.

**transmission loss:** The decrease in power that occurs during transmission from one point to another. *Note:* Transmission loss is usually expressed in dB.

**transmission medium:** Any material substance, such as fiber-optic cable, twisted-wire pair, coaxial cable, dielectric-slab waveguide, water, and air, that can be used for the propagation of signals, usually in the form of modulated radio, light, or acoustic waves, from one point to another. *Note:* By extension, free space can also be considered a transmission medium for electromagnetic waves, although it is not a material medium.

**transmission security (TRANSEC):** **1.** *See* communications security. **2.** [A] Component of COMSEC resulting from the application of measures designed to protect transmissions from interception and exploitation by means other than cryptanalysis. [INFOSEC-99]

**transmission security key (TSK):** [A] key that is used in the control of TRANSEC (transmission security) processes, such as frequency hopping and spread spectrum. [INFOSEC-99]

**transmission service channel:** In video systems, the one-way transmission path between two designated points.

**transmission system:** Part of a communication system organized to accomplish the transfer of information from one point to one or more other points by means of signals. *Note:* Examples of NATO-owned transmission systems are SATCOM, ACE HIGH and CIP-67. [NATO]

**transmission time:** In facsimile, the interval between the start of picture signals and the detection of the end-of-message signal by the receiver for a single document.

**transmission window:** *Synonym* spectral window. *See* window.

**transmissivity:** *Obsolete.* *See* transmittance.

**transmit-after-receive time delay:** The time interval from removal of rf energy at the local receiver input until the local transmitter is automatically keyed on and the transmitted rf signal amplitude has increased to 90% of its steady-state value. *An Exception:* High-frequency (HF) transceiver equipment is normally not designed with an interlock between receiver squelch and transmitter on-off key. The transmitter can be keyed on at any time, independent of whether or not a signal is being received at the receiver input.

**transmit flow control:** In data communications systems, control of the rate at which data are transmitted from a terminal so that the data can be received by another terminal. *Note 1:* Transmit flow control may occur between data terminal equipment (DTE) and a switching center, via data circuit-terminating equipment (DCE), or between two DTEs. The transmission rate may be controlled because of network or DTE requirements. *Note 2:* Transmit flow control can occur independently in the two directions of data transfer, thus permitting the transfer rates in one direction to be different from the transfer rates in the other direction.

**transmit objective loudness rating (TOLR):** The ratio in dB of the sound pressure produced by a speaker to the voltage produced by a telephone and loop as defined by ANSI/IEEE 661-1997. [T1.255-1997]

**transmit signal:** The signal sent across an interface  $I_a$  or  $I_b$  from the associated equipment. [T1.408-1990]

**transmittance:** The ratio of the transmitted power to the incident power. *Note 1:* In optics, transmittance is usually expressed as optical density or in percent. *Note 2:* Transmittance was formerly called "transmission."

**transmitter:** The source or generator of any signal on a transmission medium. [T1.408-1990]

**transmitter attack-time delay:** The interval from the instant a transmitter is keyed-on to the instant the transmitted radio frequency (rf) signal amplitude has increased to a specified level, usually 90% of its key-on steady-state value. *Note:* The transmitter attack-time delay excludes the time required for automatic antenna tuning.

**transmitter central wavelength range ( $\lambda_{tmax} - \lambda_{tmin}$ ):** In optical communication, the total allowed range of transmitter central wavelengths caused by the combined worst-case variations due to manufacturing, temperature, aging, and any other significant factors.

**transmitter power output rating:** The power output of a radio transmitter under stated conditions of operation and measurement. *Note:* Power output ratings may be made against a number of criteria, e.g., peak envelope power, peak power, mean power, carrier power, noise power, or stated intermodulation level.

**transmitter-receiver pair:** A one-way 15-kHz program system comprised of a transmitting terminal connected via a DS1 digital link to a receiving terminal. [T1.305-1990]

**transmitter release-time delay:** The interval from the instant a transmitter is keyed-off to the instant the transmitted radio frequency (rf) signal amplitude has decreased to a specified level, usually 10% of its key-on steady-state value.

**transmultiplexer:** Equipment that transforms signals derived from frequency-division multiplex equipment, such as group or supergroups, to time-division-multiplexed signals having the same structure as those derived from PCM multiplex equipment, such as primary or secondary PCM multiplex signals, and vice versa.

**transparency:** **1.** The property of an entity that allows another entity to pass through it without altering either of the entities. **2.** In telecommunications, the property that allows a transmission system or channel to accept, at its input, unmodified user information, and deliver corresponding user information at its output, unchanged in form or information content. *Note:* The user information may be changed internally within the transmission system, but it is restored to its original form prior to the output without the involvement of the user. **3.** The quality of a data communications system or device that uses a bit-oriented link protocol that does not depend on the bit sequence structure used by the data source. **4.** An image fixed on a clear base by means of a photographic printing, chemical, or other process, especially adaptable for viewing by transmitted light. [JP1]

**transparent interface:** An interface that allows the connection and operation of a system, subsystem, or equipment with another without modification of system characteristics or operational procedures on either side of the interface.

**transparent loopback:** A loopback in which the signal is transmitted beyond the loopback point (the forward signal).

**transparent network:** *See transparency.*

**transponder:** **1.** An automatic device that receives, amplifies, and retransmits a signal on a different frequency. **2.** An automatic device that transmits a predetermined message in response to a predefined received signal. *Note:* An example of transponders is in identification-friend-or-foe systems and air-traffic-control secondary radar (beacon radar) systems. **3.** A receiver-transmitter that will generate a reply signal upon proper interrogation. [JP1]

**transport:** **1.** In telecommunications, to convey information from one location to another. [J.Beaty, FAA] **2.** Facilities associated with the carriage of OC-1 or higher level signals. [T1.105-1988]

**transportability:** **1.** In communications, the quality of equipment, devices, systems, and associated hardware that permits their being moved from one location to another to interconnect with locally available complementary equipment, devices, systems, associated hardware, or other complementary facilities. *Note:* Transportability implies the use of standardized components, such as standardized plugs and transmission media. **2.** The capability of material to be moved by towing, self-propulsion, or carrier through any means, such as railways, highways, waterways, pipelines, oceans, and airways. [JP 1-02]

**transportable station:** A station which is transferred to various fixed locations but is not intended to be used while in motion. [NTIA]

**Transport Layer:** *See Open Systems Interconnection--Reference Model.*

**transport overhead:** The overhead added to the STS SPE (synchronous transport signal -- synchronous payload envelope) for transport purposes. Transport overhead consists of line and section overhead. [T1.105-1988]

**transposition:** In INFOSEC, encryption that rearranges bits or characters according to some scheme. [2382-pt.8] *Note:* The resulting ciphertext is called transposition cipher. [2382-pt.8]

**transverse electric and magnetic (TEM) mode:** A mode whose electric and magnetic field vectors are both normal to the direction of propagation. *Note:* The TEM mode is the most useful mode in a coaxial cable.

**transverse electric (TE) mode:** A mode whose electric field vector is normal to the direction of propagation. *Note:* TE modes may be useful modes in waveguides. In an optical fiber, TE and TM modes correspond to meridional rays.

**transverse magnetic (TM) mode:** A mode whose magnetic field vector is normal to the direction of propagation. *Note:* TM modes may be useful in waveguides. In an optical fiber, TE and TM modes correspond to meridional rays.

**transverse offset loss:** *Synonym lateral offset loss.*

**transverse parity check:** A parity check performed on a group of binary digits recorded on parallel tracks of a data medium, such as a magnetic disk, tape, drum, or card. [From Weik '89]

**transverse redundancy check (TRC):** In synchronized parallel bit streams, a redundancy check (a) that is based on the formation of a block check following preset rules, (b) in which the check-formation rule applied to blocks is also applied to characters, and (c) in which the check is made on parallel bit patterns. *Note 1:* When the TRC is based on a parity bit applied to each character and block, the TRC can only detect, with limited certainty, whether or not there is an error. It cannot correct the error. Detection cannot be guaranteed because an even number of errors in the same character or block will escape detection, regardless of whether odd or even parity is used. *Note 2:* Two-dimensional arrays of bits may be used to represent characters or blocks in synchronized parallel data streams. When TRC is combined with longitudinal redundancy checking (LRC), individual erroneous bits can be corrected. *Synonym vertical redundancy check.*

**transverse resolution:** In a facsimile receiver, the dimension that (a) is perpendicular to a scanning line and (b) is the smallest recognizable detail of the image produced by the shortest signal capable of actuating the facsimile receiver under specified conditions. [From Weik '89]

**trapdoor:** A hidden software or hardware mechanism, usually created for testing and troubleshooting, that may be used to circumvent computer security. [2382-pt.8]

**trapped electromagnetic wave:** An electromagnetic wave that enters a layer of material that is surrounded on both sides by a layer of material of a lesser refractive index such that, if the wave is traveling parallel or nearly parallel to the surfaces of the layers and hence the incident angles with the surfaces are greater than the critical angle, *i.e.*, the angles are grazing with the surface, total internal reflection will occur on both sides and hence trap the wave. *Note:* Dielectric slabs, optical fibers, and layers of air can serve as an electromagnetic wave trap, thus confining the wave to a given direction of propagation and to a given point. [From Weik '89]

**trapped mode:** *Synonym bound mode.*

**trapped ray:** *Synonym guided ray.*

**traveling wave:** A wave that (a) propagates in a transmission medium, (b) has a velocity determined by the launching conditions and the physical properties of the medium, and (c) may be a longitudinal or transverse wave. *Note 1:* For the purposes of this definition, free space may be considered a medium, although it is not a physical medium. *Note 2:* A traveling wave is not a wave that is reduced to a standing wave by reflections from a distant boundary. *Note 3:* Examples of traveling waves are radio waves propagating in free space, lightwaves propagating in optical fibers, water waves on the surface of the ocean, and seismic waves. [From Weik '89]

**tree network:** *See network topology.*

**tree search:** In a tree structure, a search in which it is possible to decide, at each step, which part of the tree may be rejected without a further search.

**tree structure:** A hierarchical organization in which a given node is considered to be an ancestor of all the lower level nodes to which the given node is connected. *Note 1:* The root node, *i.e.*, the base node, is an ancestor of all the other nodes. *Note 2:* In a tree structure there is one and only one path from any point to any other point.

**tree topology:** *See network topology.*

**T reference point:** In Integrated Services Digital Networks (ISDN), the conceptual point dividing NT2 and NT1 functional groupings in a particular ISDN arrangement.

**tremendously high frequency (THF):** Frequencies from 300 GHz to 3000 GHz. *See electromagnetic spectrum.*

**triaxial cable:** A specialized form of coaxial cable, circular in cross-section and consisting of (a) a center conductor, often a solid wire but sometimes braided; separated by an insulating material from (b) a concentric solid or braided conductor which is in turn separated by an insulating material from (c) a third solid or braided conductor, concentric with the first two; and (d) a protective sheath.

**tributary circuit:** A circuit between a tributary office and a toll switchboard or intertoll dialing equipment in a toll center city. [47 CFR Pt.36-A]

**tributary office:** A local office which is located outside the exchange in which a toll center is located, which has a different rate center from its toll center and which usually tickets and times only a part of its originating toll traffic, but which may ticket or time all or none, of such traffic. The toll center handles all outward traffic not ticketed and timed at the tributary and normally switches all inward toll traffic from outside the tributary's toll center to the tributary. Tributary offices are indicated as such in the Toll Rate and Route Guide. [47 CFR Pt.36-A]

**tributary station:** **1.** In a data network, a station other than the control station. **2.** On a multipoint connection or a point-to-point connection using basic mode link control, any data station other than the control station.

**trim effect:** In a crystal oscillator, the degradation of frequency-vs.-temperature stability, and marked frequency offset, resulting from frequency adjustment which produces a rotation or distortion, or both, of the inherent frequency-vs.-temperature characteristic.

**triple data encryption algorithm (TDEA):** An encryption algorithm whose key consists of three DES (Data Encryption Standard) keys, which is also referred to as a key bundle. *Note 1:* A DES key consists of 64 binary digits ("0"s or "1"s) of which 56 bits are randomly generated and used directly by the algorithm. (The other 8 bits, which are not used by the algorithm, may be used for error detection.) *Note 2:* Each TDEA encryption/decryption operation (as specified in ANSI X9.52) is a compound operation of DES encryption and decryption operations. Let  $EK(I)$  and  $DK(I)$  represent the DES encryption and decryption of  $I$  using DES key  $K$  respectively. The following operations are

TDEA encryption operation: the transformation of a 64-bit block  $I$  into a 64-bit block  $O$  that is defined as follows:

$$O = EK_3(DK_2(EK_1(I)))$$

TDEA decryption operation: the transformation of a 64-bit block  $I$  into a 64-bit block  $O$  that is defined as follows:  $O = DK_1(EK_2(DK_3(I)))$ . The standard specifies the following keying options for bundle (K1, K2, K3)

Keying Option 1: K1, K2, and K3 are independent keys;

Keying Option 2: K1 and K2 are independent keys and  $K_3 = K_1$ ;

Keying Option 3:  $K_1 = K_2 = K_3$ .

**triple precision:** Characterized by the use of three computer words to represent a number in accordance with required precision.

**triplet:** A byte composed of three bits. *Synonym three-bit byte.*

**tristimulus values:** In a given trichromatic system, the amounts of the three reference color stimuli required to match the light considered in a given chromatic system. [After IEEE]

**TRI-TAC:** *Acronym for tri-services tactical. See tactical communications.*

**TRI-TAC equipment:** Equipment that (a) accommodates the transition from current manual and analog systems to fully automated digital systems and (b) provides for message switching, voice communications circuit switching, and the use of secure voice terminals, digital facsimile systems, and user digital voice terminals.

**Trojan horse:** **1.** An apparently harmless program containing malicious logic that allows the unauthorized collection, falsification, or destruction of data. [2382-pt.8] **2.** [A] program containing hidden code allowing the unauthorized collection, falsification, or destruction of information. [INFOSEC-99]

**troposcatter:** *Synonym tropospheric scatter.*

**troposphere:** **1.** The lower layers of atmosphere, in which the change of temperature with height is relatively large. It is the region where clouds form, convection is active, and



mixing is continuous and more or less complete. [JP1] **2.** The layer of the Earth's atmosphere, between the surface and the stratosphere, in which temperature decreases with altitude and which contains approximately 80% of the total air mass. *Note:* The thickness of the troposphere varies with season and latitude. It is usually 16 km to 18 km thick over tropical regions, and less than 10 km thick over the poles.

**tropospheric duct:** *See atmospheric duct.*

**tropospheric scatter:** **1.** The propagation of radio waves by scattering as a result of irregularities or discontinuities in the physical properties of the troposphere. [NTIA] [RR] [JP1] **2.** A method of transhorizon communications using frequencies from approximately 350 MHz to approximately 8400 MHz. *Note:* The propagation mechanism is still not fully understood, though it includes several distinguishable but changeable mechanisms such as propagation by means of random reflections and scattering from irregularities in the dielectric gradient density of the troposphere, smooth-Earth diffraction, and diffraction over isolated obstacles (knife-edge diffraction). *Synonym troposcatter.*

**tropospheric wave:** A radio wave that is propagated by reflection from a place of abrupt change in the dielectric constant, or its gradient, in the troposphere. *Note:* In some cases, a ground wave may be so altered that new components appear to arise from reflection in regions of rapidly changing dielectric constant. When these components are distinguishable from the other components, they are called "*tropospheric waves.*"

**true power:** *Synonym effective power.*

**truncated binary exponential backoff:** In carrier sense multiple access with collision avoidance (CSMA/CA) networks and in carrier sense multiple access with collision detection (CSMA/CD) networks, the algorithm used to schedule retransmission after a collision such that the retransmission is delayed by an amount of time derived from the slot time and the number of attempts to retransmit.

**truncation:** The deletion or omission of a leading or a trailing portion of a string in accordance with specified criteria.

**truncation error:** In the representation of a number, the error introduced when one or more digits are dropped.

**trunk:** **1.** In a communications network, a single transmission channel between two points that are switching centers or nodes, or both. **2.** [A] circuit between switchboards or other switching equipment, as distinguished from circuits which extend between central office switching equipment and information origination/termination equipment. [47 CFR Pt.36-A] *Note:* Trunks may be used to interconnect switches, such as major, minor, public and private switches, to form networks.

**trunk circuit identification code (TCIC):** A unique identity assigned to each SS7 message trunk interconnecting two switches. [T1.226-1992]

**trunk encryption device (TED):** A bulk encryption device used to provide secure communications over a wideband digital transmission link. *Note:* A TED is usually located between the output of a trunk group multiplexer and a wideband radio or cable facility.

**trunk group:** Two or more trunks of the same type between two given points.

**trunk group multiplexer (TGM):** A time-division multiplexer that combines individual digital trunk groups into a higher rate bit stream for transmission over wideband digital communications links.

**trunk group serial number (TGSN):** A unique alphanumeric code used to identify a trunk group. [T1.Rpt 11-1991]

**trunk hunting:** *See hunting.*

**trust:** In cryptology and cryptosystems, that characteristic allowing one entity to assume that a second entity will behave exactly as the first entity expects. *Note:* Trust may apply only for some specific function. The critical role of trust in the authentication framework is to describe the relationship between an authenticating entity and a certification authority; an authenticating entity must be certain that it can trust the certification authority to create only valid and reliable certificates. [After X.509]

**trusted computer system (TCS):** **1.** [An] information system (IS) employing sufficient hardware and software assurance measures to allow simultaneous processing of a range of classified or sensitive information. [INFOSEC-99] **2.** A data processing system that provides sufficient computer security to allow for concurrent access to data by users with different access rights and to data with different security classification and security categories. [2382-pt.8]

**trusted computing base (TCB):** [The] totality of protection mechanisms within a computer system, including hardware, firmware, and software, the combination of which is responsible for enforcing a security policy. [INFOSEC-99] *Note:* The ability of a trusted computing base to enforce correctly a unified security policy depends on the correctness of the mechanisms within the trusted computing base, the protection of those mechanisms to ensure their correctness, and the correct input of parameters related to the security policy. [NIS]

**trusted distribution:** [A] method for distributing trusted computing base (TCB) hardware, software, and firmware components that protects the TCB from modification during distribution. [INFOSEC-99]

**trusted identification forwarding:** [The] identification method used in information system (IS) networks whereby the sending host can verify an authorized user on its system is attempting a connection to another host. The sending host transmits the required user authentication information to the receiving host. [INFOSEC-99]

**trusted path:** [The] Mechanism by which a person using a terminal can communicate directly with the trusted computing base (TCB). Trusted path can only be activated by the person or the TCB and cannot be imitated by untrusted software. [INFOSEC-99]

**trusted process:** [A] process that has privileges to circumvent the system security policy and has been tested and verified to operate only as intended. [INFOSEC-99]

**trusted recovery:** [The] ability to ensure recovery without compromise after a system failure. [INFOSEC-99]

**trusted software:** [The] software portion of a trusted computing base (TCB). [INFOSEC-99]

**trusted third-party:** A security authority trusted by communicating entities with respect to specific security-related activities (*e.g.*, for the purpose of authentication). [T1.243-1995]

**truth table:** **1.** An operation table for a logic operation. **2.** A table that describes a logic function by listing all possible combinations of input values and indicating, for each combination, the output value.

**TSEC nomenclature:** [In security, the] system for identifying the type and purpose of certain items of COMSEC material. [INFOSEC-99]

**TSK:** *Abbreviation for transmission security key.*

**TSP:** *Abbreviation for Telecommunications Service Priority.*

**TSPS:** *Abbreviation for traffic service position system.*



**TSPS complex:** All groups of operator positions, wherever located, associated with the same TSPS stored program control units. [47 CFR Pt.36-A]

**TSP system:** See **Telecommunications Service Priority system**.

**T3 (carrier):** See **T-carrier**.

**TTTN:** Abbreviation for **tandem tie trunk network**.

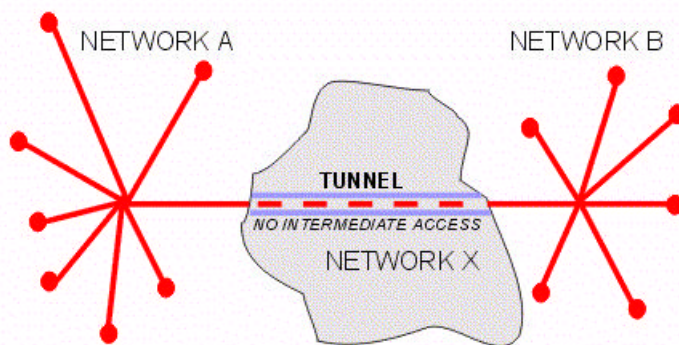
**T2 (carrier):** See **T-carrier**.

**TTY:** Abbreviation for **teletypewriter**.

**TTY/TDD:** A unique telecommunication device for the deaf, using TTY principles.

**tuning:** Adjusting the parameters and components of a circuit so that it resonates at a particular frequency or so that the current or voltage is either maximized or minimized at a specific point in the circuit. *Note:* Tuning is usually accomplished by adjusting the capacitance or the inductance, or both, of elements that are connected to or in the circuit. [From Weik '89]

**tunneling:** **1.** In computer networking, a technique for connecting two networks via a third, while totally isolating the connected traffic from other traffic in the third network. [After 2382-pt.35] **2.** Technology enabling one network to send its data via another network's connections. Tunneling works by encapsulating a network protocol within packets carried by the second network. [INFOSEC-99]



**tunneling mode:** *Synonym leaky mode.*

**tunneling ray:** *Synonym leaky ray.*

**Turing machine:** A mathematical model of a device that changes its internal state and reads from, writes on, and moves a potentially infinite tape, all in accordance with its present state, thereby constituting a model for computer-like behavior.

**turnaround time:** In a half-duplex circuit, the time required to reverse the direction of transmission from transmit to receive or vice versa.

**turnkey:** Pertaining to a procurement process that (a) includes contractual actions at least through the system, subsystem, or equipment installation phase and (b) may include follow-on contractual actions, such as testing, training, logistical, and operational support. *Note:* Precise definition of the types of allowable contractual features are contained in the Federal Acquisition Regulations (FAR).

**twin cable:** A cable composed of two parallel conductors separated from each other by a ribbon-like insulator or encased by a foam insulator. *Synonym twin-lead.*

**twin-lead:** *Synonym twin cable.*

**twinplex:** A frequency-shift-keyed (FSK) carrier telegraphy system in which four unique tones, *i.e.*, two pairs of tones, are transmitted over a single transmission channel, such as one twisted pair. *Note:* One tone of each pair represents a "mark" and the other a "space."

**twin sideband transmission:** See **independent-sideband transmission**.

**twist:** In telephony, a change, as a function of temperature, in the shape of the frequency-vs.-attenuation response curve, *i.e.*, characteristic, of a transmission line.

**twisted pair:** A pair of individually insulated conductors (wires) twisted together and treated as an entity in the transmission of electrical signals or power (*e.g.*, from an electronic power supply to a circuit). *Note 1:* In communications cables, the twisted pair is usually if not always composed of two individually insulated solid conductors (wires). In other applications, *e.g.*, in a power-supply application, each of the insulated conductors may consist of stranded wire. *Note 2:* Because the wires are twisted together, interfering signals tend to create opposing electromagnetic forces at frequent intervals, reducing the effect of the interference on the signal or power supply voltage being conducted. *Note 3:* Twisted pairs may be used for bit rates up to 1 Mb/s over short distances (<100 m) and lower bit rates over longer distances. More sophisticated driver and receiver circuits facilitate similar or higher data rates over longer distances. *Note 4:* Unshielded twisted pairs (UTPs) are used extensively in telephone networks and in many data communications applications.

**twisted pair cable:** See **paired cable**.

**two-out-of-five code:** A binary-coded decimal notation in which (a) each decimal digit is represented by a binary numeral consisting of five binary digits of which two are of one kind, called "ones," and three are of the other kind, called "zeros" and (b) the usual weights assigned to the digit positions are 0-1-2-3-6, except that "zero" is represented as 01100.

**two-part code:** Code consisting of an encoding section, in which the vocabulary items (with their associated code groups) are arranged in alphabetical or other systematic order; and a decoding section, in which the code groups (with their associated meanings) are arranged in a separate alphabetical or numeric order. [INFOSEC-99]

**two-person control:** Continuous surveillance and control of positive control material at all times by a minimum of two authorized individuals, each capable of detecting incorrect and unauthorized procedures with respect to the task being performed, and each familiar with established security and safety requirements. [INFOSEC-99]

**two-person integrity (TPI):** [A] system of storage and handling designed to prohibit individual access to certain COMSEC keying material by requiring the presence of at least two

authorized persons, each capable of detecting incorrect or unauthorized security procedures with respect to the task being performed. [INFOSEC-99]

**two-pilot regulation:** In frequency-division multiplexed (FDM) systems, the use of two pilot frequencies within a band so that the differential change in attenuation with respect to temperature, *i.e.*, twist, can be detected and compensated by a regulator.

**two-sample deviation:** The square root of the Allan variance.

**two-sample variance:** *Synonym* Allan variance.

**two-source frequency keying:** *Synonym* frequency-exchange signaling.

**two-tone keying:** In telegraphy systems, keying in which the modulating wave causes the carrier to be modulated with a single tone for the "mark" and modulated with a different single tone for the "space."

**two-tone telegraph:** *See* two-tone keying.

**two-way alternate operation:** *Synonym* half-duplex operation.

**two-way simultaneous operation:** *Synonym* duplex operation.

**two-wire circuit:** *Also* 2-wire circuit. A full-duplex communications circuit that utilizes only two metallic conductors, *e.g.*, a single twisted pair.

**TWX®:** *Acronym for* teletypewriter exchange service.

**TX:** *Abbreviation for* transmitter, transmit.

**type 1 product:** Classified or controlled cryptographic item for securing classified and sensitive U.S. Government information, when appropriately keyed. The term refers only to products, and not to information, key, services, or controls. Type 1 products contain classified algorithms. They are available to U.S. Government users, their contractors, and federally sponsored non-U.S. Government activities subject to export restrictions in accordance with International Traffic in Arms Regulation. [After INFOSEC-99]

**type 2 product:** Unclassified cryptographic equipment, assembly, or component, endorsed by the National Security Agency, for use in national security systems as defined in *Title 40 U.S.C. Section 1452*. [INFOSEC-99] *Note:* The term refers only to products, and not to information, key, services, or controls. Type 2 products may not be used for classified information, but contain classified National Security Agency algorithms that distinguish them from products containing the unclassified data algorithm. Type 2 products are subject to export restrictions in accordance with the International Traffic in Arms Regulation. [NIS]

**type 3 algorithm:** [A] cryptographic algorithm that has been registered by the National Institute of Standards and Technology (NIST) and published as a Federal Information Processing Standard (FIPS) for use in protecting unclassified sensitive, information or commercial information. [INFOSEC-99]

**type 4 algorithm:** [An] unclassified cryptographic algorithm that has been registered by the National Institute of Standards and Technology (NIST), but not published as a Federal Information Processing Standard (FIPS). [INFOSEC-99]

**UDP:** *Abbreviation for* user datagram protocol. An Internet protocol for datagram service.

**UHF:** *Abbreviation for* ultra high frequency. *See* electromagnetic spectrum.

**U interface:** For basic-rate access in an Integrated Services Digital Network (ISDN) environment, a user-to-network interface reference point that is characterized by the use of a 2-wire-loop transmission system that (a) conveys information between the 4-wire user-to-network interface, *i.e.*, the S/T reference point, and the local exchange, (b) is located in the servicing central office, and (c) is not as distance sensitive as a service using a T interface.

**ULF:** *Abbreviation for* ultra low frequency. *See* electromagnetic spectrum.

**ultra high frequency (UHF):** Frequencies from 300 MHz to 3000 MHz. *See* electromagnetic spectrum.

**ultra low frequency (ULF):** Frequencies from 300 Hz to 3000 Hz. *See* electromagnetic spectrum.

**ultraviolet (uv):** The portion of the electromagnetic spectrum in which the longest wavelength is just below the visible spectrum, extending from approximately 4 nm to approximately 400 nm. *Note:* Some authorities place the lower limit of uv at values between 1 and 40 nm, 1 nm being the upper wavelength limit of x-rays. The 400-nm limit is the lowest visible wavelength, *i.e.*, the highest visible frequency, violet. *See* electromagnetic spectrum.

**ultrawideband:** *See* UWB.

**unallowable character:** *Synonym* illegal character.

**unassigned cell:** A cell identified by a standardized virtual path identifier (VPI) and virtual channel identifier (VCI) value, which has been generated and does not carry information from an application using the ATM Layer service. [T1.627-1993]

**unauthorized disclosure:** Exposure of information to individuals not authorized to receive it. [INFOSEC-99]

**unavailability:** A expression of the degree to which a system, subsystem, or equipment is not operable and not in a committable state at the start of a mission, when the mission is called for at an unknown, *i.e.*, random, time. *Note 1:* The conditions determining operability and committability must be specified. *Note 2:* Expressed mathematically, unavailability is 1 minus the availability. *Note 3:* Unavailability may also be expressed mathematically as the ratio of the total time a functional unit is not capable of being used during a given interval to the length of the interval, *e.g.*, if the unit is not capable of being used for 68 hours a week, the unavailability is 68/168.

**unbalanced line:** A transmission line, such as a coaxial cable, in which the magnitudes of the voltages on the two conductors are not equal with respect to ground.

**unbalanced modulator:** A modulator in which the modulation factor is different for the alternate half-cycles of the carrier. *Synonym* asymmetrical modulator.

**unbalanced wire circuit:** A circuit in which the two sides are inherently electrically dissimilar.

**unbound mode:** *Synonym* radiation mode.

**unbundling:** In the context of the FCC's Computer III Inquiry, the process of separating individual tariffed offerings and services that are associated with a specific element in the CEI or ONA tariff from other tariffed basic service offerings. [After para. 158, FCC Report and Order, June 16, 1986.]

**unclassified:** Information that has not been determined pursuant to Executive Order (E.O.) 12958 or any predecessor order to require protection against unauthorized disclosure and that is not designated as classified. [INFOSEC-99]

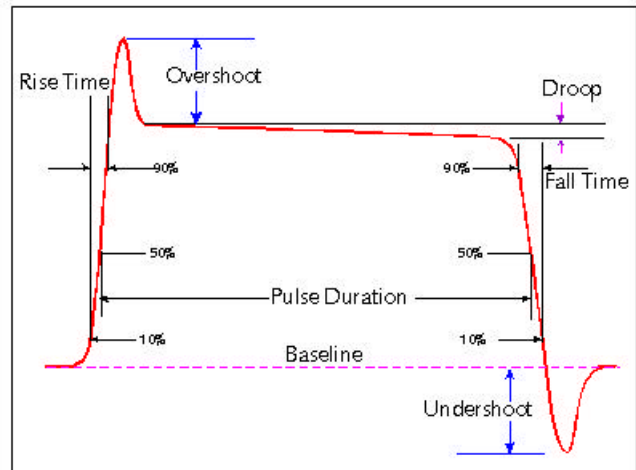
**underflow:** In computing, a condition occurring when a machine calculation produces a non-zero result that is smaller than the smallest non-zero quantity that the machine's storage unit is capable of storing or representing.

**underground cable:** A communication cable designed to be placed under the surface of the Earth in a duct system that isolates it from direct contact with the soil.

**underground plant:** Cable and wire plant, together with closures appropriate for the application, that is placed below ground in structures such as conduit or ducts. [T1.316-1997]

**underlap:** In facsimile, a defect that occurs when the width of the scanning line is less than the scanning pitch.

**undershoot:** *See overshoot.*



representative pulse waveform

**undesired signal:** Any signal that tends to produce degradation in the operation of equipment or systems.

**undetected error rate:** *Deprecated synonym for undetected error ratio.*

**undetected error ratio:** The ratio of the number of bits, unit elements, characters, or blocks incorrectly received and undetected, to the total number of bits, unit elements, characters, or blocks sent. *Synonyms residual error rate, undetected error rate [deprecated].*

**undisturbed day:** A day during which neither sunspot activity nor ionospheric disturbance causes detectable interfere with radio communications.

**unequipped indication:** A code placed in unequipped channels by originating equipment to indicate to path terminating equipment that the channel is intentionally unoccupied so that alarms can be inhibited. [T1.105-1988]

**unexpected frame:** A valid frame that cannot be processed. The frame itself is perfectly legitimate. Its unexpected character is defined by two conditions: the specific type of frame and the state of the receiver. [T1.218-1991] The layer-2 protocol states define the proper sequence in which frames are expected to occur. The receiver will compare received frames with its own protocol state to determine whether or not a valid frame is unexpected. [T1.218-1991]

**UNICOM station:** *Synonym aeronautical advisory station.*

**unidirectional:** The condition where information flow is provided only in one direction. [T1.615-1992]

**unidirectional channel:** *Synonym one-way-only channel.*

**unidirectional operation:** Operation in which data are transmitted from a transmitter to a receiver in only one direction.

**unidirectional path:** A path that logically connects a single path source with the associated path sink. [T1.231-1997]

**uniform encoding:** An analog-to-digital conversion process in which, except for the highest and lowest quantization steps, all of the quantization subrange values are equal. *Synonym uniform quantizing.*

**uniform linear array:** An antenna composed of a relatively large number of usually identical elements arranged in a single line or in a plane with uniform spacing and usually with a uniform feed system.

**uniform quantizing:** *Synonym uniform encoding.*

**uniform-spectrum random noise:** *See white noise.*

**uniform time scale:** A time scale made up of equal intervals.

**uniform transmission line:** A transmission line that has distributed electrical properties, *i.e.*, resistance, inductance, and capacitance per unit length, that are constant along the line, and in which the voltage-to-current ratio does not vary with distance along the line, if the line is terminated in its characteristic impedance. *Note 1:* Examples of uniform transmission lines are coaxial cables, twisted pairs, and single wires at constant height above ground, all of which have no changes in geometry, materials, or construction along their length. *Note 2:* In a uniform transmission line, signal attenuation is a function of the length of the line and the frequency of the signal. [From Weik '89]

**unilateral control system:** *Synonym unilateral synchronization system.*

**unilateral synchronization system:** A system of synchronization in which signals from a single location are used to synchronize clocks at one or more other locations. *Synonym unilateral control system.*

**unimode fiber:** *Synonym single-mode optical fiber.*

**unintelligible crosstalk:** Crosstalk that consists of unintelligible signals, hence from which information cannot be derived.

**unintentional interference:** *See interference.*

**uninterruptible power supply (UPS):** A device that is inserted between a primary power source, such as a commercial utility, and the primary power input of equipment to be protected, *e.g.*, a computer system, for the purpose of eliminating the effects of transient anomalies or temporary outages. *Note 1:* An UPS consists of an inverter, usually electronic, that is powered by a battery that is kept trickle-charged by rectified ac from the incoming power line fed by the utility. In the event of an interruption, the battery takes over without the loss of even a fraction of a cycle in the ac output of the UPS. The battery also provides protection against transients. The duration of the longest outage for which protection is ensured depends on the battery capacity, and to a certain degree, on the rate at which the battery is drained. *Note 2:* An UPS should not be confused with a standby generator, which may not provide protection from a momentary power interruption, or which may result in a momentary power interruption when it is switched into service, whether manually or automatically.

**unipolar signal:** A two-state signal where one of the states is represented by voltage or current and the other state is represented by no voltage or current. *Note:* The current flow can be in either direction.

**unique key:** Key held only by one crypto-equipment and its associated distribution center.

**unit-distance code:** An unweighted code that changes at only one digit position when going from one number to the next in a consecutive sequence of numbers. *Note 1:* Use of one of the many unit-distance codes can minimize errors at symbol transition points when converting analog quantities into digital quantities. *Note 2:* An example of a unit-distance code is the Gray code. [From Weik '89]

**unit element:** In the representation of a character, a signal element that has a duration equal to the unit interval.

**unit impulse:** A mathematical artifice consisting of an impulse of infinite amplitude and zero width, and having an area of unity. *Note:* The unit impulse is useful for the mathematical expression of the impulse response, *i.e.*, the transfer function, of a device. *Synonym Dirac delta function.*

**unit interval:** In isochronous transmission, the longest interval of which the theoretical durations of the significant intervals of a signal are all whole multiples.

**universal digital loop carrier:** A digital loop carrier (DLC) that uses a central office terminal (COT). [T1.216-1998]

**universal personal telecommunications number:** *Synonym UPT number.*

**Universal Personal Telecommunications (UPT) service:** A telecommunications service that provides personal mobility and service profile management. *Note 1:* UPT service involves the network capability of identifying uniquely a UPT user by means of a UPT number. *Note 2:* The general principles of UPT are given in ITU-T Recommendation F.850. *Note 3:* UPT and PCS are sometimes mistakenly assumed to be the same service concept. UPT allows complete personal mobility across multiple networks and service providers. PCS may use UPT concepts to improve subscriber mobility in allowing roaming to different service providers, but UPT and PCS are not the same service concept.

**universal service:** The concept of making basic local telephone service (and, in some cases, certain other telecommunications and information services) available at an affordable price to all people within a country or specified jurisdictional area.

**Universal Time (UT):** **1.** The basis for coordinated dissemination of time signals, counted from 0000 at midnight. **2.** In celestial navigation applications, the time which gives the exact rotational orientation of the Earth obtained from UTC by applying increments determined by the U.S. Naval Observatory. **3.** A measure of time that conforms, within a close approximation, to the mean diurnal rotation of the Earth and serves as the basis of civil timekeeping. *Note:* Universal Time (UT1) is determined from observations of the stars, radio sources, and also from ranging observations of the Moon and artificial Earth satellites. The scale determined directly from such observations is designated Universal Time Observed (UTO); it is slightly dependent on the place of observation. When UTO is corrected for the shift in longitude of the observing station caused by polar motion, the time scale UT1 is obtained. When an accuracy better than one second is not required, Universal Time can be used to mean Coordinated Universal Time (UTC). *Synonym [in the DoD] Zulu Time.* [JP 1-02] **4.** The official civil time of the United Kingdom. *Formerly called Greenwich Mean Time.*

**UNIX™:** A portable, multiuser, time-shared operating system that supports process scheduling, job control, and a programmable user interface. *Note 1:* There are many proprietary operating systems that are based on UNIX™ and are commonly referred to as UNIX™, but are not necessarily interoperable. *Note 2:* Most UNIX™-based operating systems are POSIX compliant.

**unnumbered command:** In a data transmission, a command that does not contain sequence numbers in the control field.

**unnumbered information (UI) frame:** A frame used to transfer unacknowledged information between two link layer entities. The format and encoding are the same as specified in Recommendation 0.921/1.441. The CRC (cyclic redundancy check) is derived over the entire frame. [T1.509-1995]

**unnumbered response:** In data transmission, a response that does not contain sequence numbers in the control field.

**unpark:** A function performed by the network if a call remains parked longer than a predesignated time limit, or if the parked party disconnects. [T1.653-1996]

**unsuccessful call:** *Synonym unsuccessful call attempt.*

**unsuccessful call attempt:** A call attempt that does not result in the establishment of a connection. *Synonym unsuccessful call.*

**untrusted process:** [A] Process that has not been evaluated or examined for adherence to the security policy. It may include incorrect or malicious code that attempts to circumvent the security mechanisms. [INFOSEC-99]

**unused character:** *Synonym illegal character.*

**unwanted current:** With respect to telecommunications plant, any current that is not intentionally supplied from the central office or from telephone equipment. [After T1.316-1997]

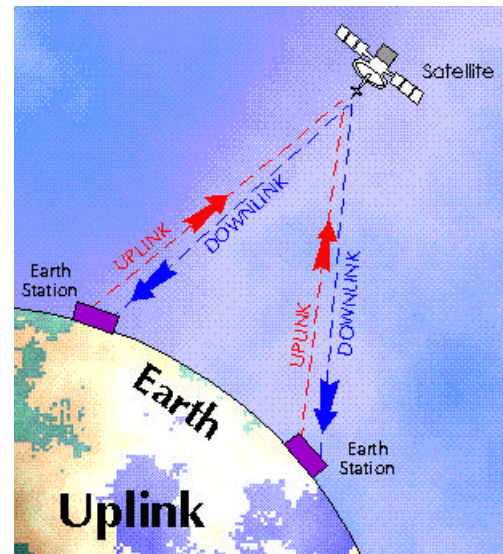
**unwanted voltage:** With respect to telecommunications plant, any voltage that is not intentionally supplied from the central office or from telephone equipment. [After T1.316-1997]

**up-converter:** A device that translates frequencies from lower to higher frequencies.

**update:** The regeneration of a display to show current status, based on changes to the previously displayed data. *Note:* An update can be accomplished upon user request or by automatic means.

**updating:** [In INFOSEC, an] automatic or manual cryptographic process that irreversibly modifies the state of a COMSEC key, equipment, device, or system. [INFOSEC-99]

**uplink (U/L):** **1.** The portion of a communications link used for the transmission of signals from an Earth terminal to a satellite or to an airborne platform. *Note:* An uplink is the converse of a downlink. **2.** Pertaining to data transmission from a data station to the headend.



**upright position:** *Synonym* erect position.

**UPS:** *Acronym for* uninterruptible power supply.

**upstream:** **1.** The direction opposite the data flow. **2.** With respect to the flow of data in a communications path: at a specified point, the direction toward which data are received earlier than at the specified point.

**UPT:** *See* Universal Personal Telecommunications service.

**UPT access code:** In universal personal telecommunications service, the code that UPT users may need to dial, when using some terminals and networks, to enter the UPT environment before executing any UPT procedures.

**UPT access number (UPTAN):** A number dialed by a UPT user to contact the service provider when using certain terminals and networks. In order to achieve its purpose, the UPTAN must contain information that can be used (a) to route the call to the user's service provider and (b) to specify the service profile. The UPTAN should be an E. 164 number. [After T1.Rpt41-1995]

**UPT database:** In universal personal telecommunications service, a repository for information, such as a service profile, that is related to a set of UPT customers and UPT users.

**UPT environment:** In universal personal telecommunications service, the environment within which the UPT service facilities are offered, consisting of combinations of networks and UPT service control facilities that, when combined, enable UPT users to make use of telecommunication services offered by these networks. *Note:* To the UPT user, the UPT environment appears as a single global network that provides personal mobility. However, when utilizing telecommunication services, the UPT network user may be limited by restrictions imposed by the network, by the capabilities of the terminal and network used, or by regulatory requirements.

**uptime:** The time during which a functional unit is fully operational.

**UPT indicator:** In universal personal telecommunications service, that portion (or portions) of the UPT number that identifies a call as a UPT call.

**UPT number:** In universal personal telecommunications service, the number that uniquely identifies a UPT user and that is used to place a call to, or to forward a call to, that user. *Note:* A user may have multiple UPT numbers, *e.g.*, a business UPT number for business calls and a private UPT number for private calls. In the case of multiple numbers, each UPT number is considered, from a network vantage point, to identify a distinct UPT user, even if all such numbers identify the same person or entity. *Synonym* **universal personal telecommunications number.**

**UPT routing address:** In universal personal telecommunications service, the number used by the network to direct a call according to the user's UPT service profile.

**UPT service profile:** In universal personal telecommunications service, a record that contains all information related to a UPT user, which information is required to provide that user with UPT service such as subscriptions to basic and supplementing services and call-routing preferences. *Note:* Each UPT service profile is associated with a single UPT number. *Synonym* **service profile.**

**UPT service profile management:** In universal personal telecommunications service, authorized access to and manipulation of the UPT service profile. *Note:* UPT service profile management can be performed by the UPT user, by the UPT customer (subscriber), or by the UPT service provider. *Synonym* **service profile management.**

**UPT subscriber:** In universal personal telecommunications service, a person who (or entity that) obtains a UPT service from a UPT service provider on behalf of one or more UPT users.

**UPT user:** In universal personal telecommunications service, a person who (or entity that) has access to universal personal telecommunications (UPT) services and who has been assigned a UPT number.

**UPT user group:** A specific set of universal personal telecommunications service users.

**U reference point:** The conceptual reference point at the network side of the network termination 1 (NT1) in a particular ISDN access arrangement. [T1.615-1992] [T1.105-1988]

**URL (uniform resource locator):** A character string describing the location and access method of a resource on the Internet. *Note:* For example, the URL



<http://www.ycom.com>

describes the type of access method being used (http) and the server location which hosts the Web site (www.ycom.com).

**usable line length:** *See available line.*

**usage:** *Synonym occupancy.*

**useful line:** *Synonym available line.*

**Usenet:** The name of a set of computers and networks used for creating, forwarding, or displaying some computer conferences. [2382-pt.35]

**user:** **1.** A person, organization, or other entity (including a computer or computer system), that employs the services provided by a telecommunication system, or by an information processing system, for transfer of information. *Note:* A user functions as a source or final destination of user information, or both. *Synonym subscriber.* **2.** [In security, a] person or process authorized access to an IS (information system); [an] individual defined, registered, and bound to a public key structure by certification authority. [INFOSEC-99]

**user channel:** A communications channel allocated to the user for input of information such as data communication for use in maintenance activities and removing of alarms external to the span equipment in a proprietary fashion. [After T1.105-1988]

**User Datagram Protocol (UDP):** In the Internet Protocol suite, a standard, low-overhead, connectionless, host-to-host protocol that is used over packet-switched computer communications networks, and that allows an application program on one computer to send a datagram to an application program on another computer. *Note:* The main difference between UDP and TCP is that UDP provides connectionless service, whereas TCP does not.

**user ID:** **1.** A character string or pattern that is used by a data processing system to identify a user. [2382-pt.8] **2.** [A] unique symbol or character string used by an information system (IS) to identify a specific user. [INFOSEC-99] *Synonym user identification.*

**user identification:** *See user ID.*

**user identity module (UIM):** A standard device or functionality providing secure procedures in support of registration, authentication, and privacy for wireless access to PCS, and which may also be used to facilitate other services (*e.g.*, UPT, banking). [After T1.Rpt44-1995]

**user information:** Information transferred across the functional interface between a source user and a telecommunications system for delivery to a destination user. *Note:* In telecommunications systems, user information includes user overhead information.

**user information bit:** A bit transferred from a source user to a telecommunications system for delivery to a destination user. *Note 1:* User information bits do not include the overhead bits originated by, or having their primary functional effect within, the telecommunications system. *Note 2:* User information bits are encoded to form channel bits.

**user information block:** A block that contains at least one user information bit.

**user line:** *Synonym loop.*

**user-network interface (UNI):** **1.** The point of demarcation between a common carrier's facilities and customer's installation, which demarcation establishes both the technical interface and the division of operational responsibility. In this context, "customer" refers to the end-user. [J.Beatty FAA] **2.** The term used to refer to the network interface (NI) as well as to interfaces within the customer installation (CI). [T1.640-1996]

**user overhead information:** *See overhead information.*

**user part:** A functional part of the common channel signaling system that transfers signaling messages via the message transfer part. Different types of user parts exist (*e.g.*, for telephone and data services), each of which is specified to a particular use of the signaling system. [T1.110-1987]

**user privacy:** Protection of information about users from uninvited and possibly illegal access. [T1.Rpt34-1994]

**user profile:** **1.** The profile that includes the service profile and contains all the data associated with the user, *e.g.*, incoming call handling information, selection of service provider/service area coverage, service subscriptions, service parameters, *etc.* [T1.Rpt34-1994] **2.** A description of a user, typically used for access control. [2382-pt.8] *Note:* A user profile may include data such as user ID, user name, password, access rights, and other attributes. [2382-pt.8] **3.** A pattern of a user's activity that can be used to detect changes in the activity. [2382-pt.8] **4.** Patterns of a user's activity that can show changes from normal behavior. [INFOSEC-99]

**user-provided number (UPN):** An ISDN number, supplied completely or partially by the calling user or the redirecting user, that is associated with the calling user or the redirecting user. The UPN may also be accompanied by a subaddress. [T1.625-1993]

**user representative:** [A] person authorized by an organization to order COMSEC keying material and interface with the keying system; providing information to key users and ensuring the correct type of key is ordered. [INFOSEC-99]

**user service class:** *Synonym class of service.*

**UT:** *Abbreviation for Universal Time.*

**UTC:** *Abbreviation for Coordinated Universal Time.*

**UTC(i):** Coordinated Universal Time (UTC), as kept by the "i" laboratory, where i is any laboratory cooperating in the determination of UTC. *Note:* In the United States, the official UTC is kept by the U.S. Naval Observatory and is referred to as UTC (USNO).

**utility load:** *Synonym nonoperational load.*

**utility program:** A computer program that is in general support of the operations and processes of a computer. *Note:* Examples of utility programs include diagnostic programs, trace programs, input routines, and programs used to perform routine tasks, *i.e.*, perform everyday tasks, such as copying data from one storage location to another. *Synonyms service program, service routine, tool, utility routine.*

**utility routine:** *Synonym utility program.*

**uudecode:** A standardized, MIME-compliant method of decoding uuencoded e-mail messages by decoding binary data that was conveyed as a character string over a character-only channel. [After 2382-pt.35]

**uuencode:** **1.** A standardized, MIME-compliant method of encoding e-mail and other electronically transferred messages to provide a minimum level of security through encryption.



2. The name of a program for conveying binary data as a character string over a character-only channel. [2382-pt.35]

**uv:** *Abbreviation for ultraviolet.*

**UWB:** *Abbreviation for ultrawideband.* **1.** Referring to any radio or wireless device where the occupied bandwidth is greater than 25% of the center frequency or greater than 1.5 GHz. **2.** A radio or wireless system that uses narrow pulses (on the order of 1 to 10 nanoseconds), also called carrierless or impulse systems, for communications and sensing (short-range radar). **3.** A radio or wireless system that uses time-domain modulation methods (e.g., pulse-position modulation) for communications applications, or time-domain processing for sensing applications.

**vacant code (VC):** A call-disposition category for a call attempt to an unassigned NPA (numbering plan area) or NXX. [T1.207-1998]

**vaccine program:** *Synonym anti-virus program.*

**validation:** **1.** Tests to determine whether an implemented system fulfills its requirements. **2.** The checking of data for correctness or for compliance with applicable standards, rules, and conventions. **3.** [The] process of applying specialized security test and evaluation procedures, tools, and equipment needed to establish acceptance for joint usage of an information system (IS) by one or more departments or agencies and their contractors. [INFOSEC-99] *Note:* This action will include, as necessary, final development, evaluation, and testing, preparatory to acceptance by senior security test and evaluation staff specialists. [NIS] **4.** In universal personal telecommunications, the process of verifying that a user or terminal is authorized to access UPT services.

**validation system:** The system containing the data base information to be used in validation of the telecommunications charge card or billed number screening data. [T1.230-1992]

**value-added carrier:** A company that sells the services of a value-added network.

**value-added network (VAN):** A network using the communication services of other commercial carriers, using hardware and software that permit enhanced telecommunication services to be offered.

**value date:** The date the transfer entry to an account is considered effective; either the day the instruction is received or some future date as stipulated by the originator. [After X9.9]

**VAN:** *Acronym for value-added network.*

**variable length buffer:** A buffer into which data may be entered at one rate and removed at another rate without changing the data sequence. *Note:* Most first-in first-out (FIFO) storage devices are variable-length buffers in that the input rate may be variable while the output rate is constant or the output rate may be variable while the input rate is constant. Various clocking and control systems are used to allow control of underflow or overflow conditions.

**variable slope delta modulation:** *See continuously variable slope delta modulation.*

**variance:** In statistics, in a population of samples, the mean of the squares of the differences between the respective samples and their mean, expressed mathematically as:

$$\sigma^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2 ,$$

where  $n$  is the number of samples,  $x_i$  is the value of sample  $i$ ,  $\bar{x}$  is the mean of the samples, and  $\sigma^2$  is the variance. *Note:* The square root of the variance,  $\sigma$ , is the standard deviation.

**variant:** **1.** One of two or more code symbols having the same plain text equivalent. [INFOSEC-99] **2.** One of several plain text meanings that are represented by a single code group. [JP1]

**variant of a key:** A new key formed by a nonsecret process with the original key, such that one or more of the nonparity bits of the new key differ from the corresponding bits of the original key. [After X9.8]

**variation monitor:** In ac power distribution, a device for sensing deviations of any measured variable, such as voltage, current, or frequency, and capable of initiating a programmed action, such as transfer to other power sources, when programmed limits of voltage, current, frequency, or time are exceeded, or providing an alarm, or both.

**vars:** *Abbreviation for volt-amperes reactive.*

**VC:** *Abbreviation for virtual circuit.*

**VCR:** *Abbreviation for video cassette recorder. See video recorder.*

**VDU:** *Abbreviation for visual display unit. See monitor.*

**vector processor:** *Synonym array processor.*

**velocity of propagation:** Of an electrical or electromagnetic signal, its speed in a physical medium such as a coaxial cable or optical fiber.

**verification:** **1.** In information assurance, comparing an activity, a process, or a product with the corresponding requirements or specifications. *Note:* Examples of verification are comparing a specification with a security policy model or comparing object code with source code. [2382-pt.8] **2.** [The] process of comparing two levels of an information system (IS) specification for proper correspondence (e.g., security policy model with top-level specification, top-level specification with source code, or source code with object code). [INFOSEC-99]

**verified off-hook:** In telephone systems, a service provided by a unit that is inserted on each end of a transmission circuit for the purpose of verifying supervisory signals on the circuit. *See automatic ringdown circuit.*

**verifier:** The entity that verifies the authenticity of a digital signature. [After X9.31]

**Vernam cypher:** An extremely secure cryptographic approach to enciphering messages, wherein each character of a message gets assigned a random character from the key; the one-time keypad is physically delivered to the receiver and then is destroyed. *Note:* The Vernam cypher requires the prospective user to first courier the megabyte key to the intended message partner. The Vernam cypher is the only provably secure (using information theory) crypto system.

**vertex angle:** In an optical fiber, the angle formed by the extreme bound meridional rays accepted by the fiber, or emerging from it, equal to twice the acceptance angle; the angle formed by the largest cone of light accepted by the fiber or emitted from it. [FAA]

**vertical portal:** A Web search engine that locates very precisely a few Web pages of particular interest according to the character strings or subject entered as the search topic.

**vertical redundancy check (VRC):** *Synonym* transverse redundancy check.

**very high frequency (VHF):** Frequencies from 30 MHz to 300 MHz. *See* electromagnetic spectrum.

**very low frequency (VLF):** Frequencies from 3 kHz to 30 kHz. *See* electromagnetic spectrum.

**vestigial sideband (VSB) transmission:** Modified AM transmission in which one sideband, the carrier, and only a portion of the other sideband are transmitted.

**VF:** *Abbreviation for voice frequency.*

**VFCT:** *Abbreviation for voice frequency carrier telegraph. See voice-frequency telegraph.*

**VFCTG:** *Abbreviation for voice-frequency carrier telegraph. See voice-frequency telegraph.*

**VF patch bay:** *See* voice frequency primary patch bay.

**VFTG:** *Abbreviation for voice-frequency telegraph.*

**VHF:** *Abbreviation for very high frequency. See electromagnetic spectrum.*

**via net loss (VNL):** Pertaining to circuit performance prediction and description that allows circuit parameters to be predetermined and the circuit to be designed to meet established criteria by analyzing actual, theoretical, and calculated losses.

**video:** **1.** An electrical signal containing timing (synchronization), luminance (intensity), and often chrominance (color) information that, when displayed on an appropriate device, gives a visual image or representation of the original image sequences. *Note:* Correlated audio is included and usually implied. **2.** Pertaining to the sections of a television system that carry television signals, either in unmodulated or modulated form. **3.** Pertaining to the demodulated radar signal that is applied to a radar display device. **4.** Pertaining to the bandwidth or data rate necessary for the transmission of real-time television pictures. [After FAA] *Note:* In practice, the baseband bandwidth required for the transmission of NTSC television pictures (not including the audio carriers) is approximately 5 MHz.

**video codec:** *See* codec.

**videoconference:** *See* video teleconference.

**video description:** An audio narration for television viewers who are blind or visually disabled, which consists of verbal descriptions of key visual elements in a television program, such as settings and actions not reflected in dialog. [FCC] *Note:* Narrations are usually inserted into the program's naturally occurring pauses, and are typically provided through the secondary audio programming channel. [After FCC]

**video display terminal:** *Synonym* visual display unit. *See* monitor.

**video display unit:** *Synonym* visual display terminal. *See* monitor.

**video frame:** *See* frame.

**video imagery:** A sequence of video frames. [T1.801.02-1996]

**video pair cable:** Transmission cable containing low-loss pairs with an impedance of 125 ohms; used for telephone carrier circuits, closed-circuit TV, TV pick-ups *etc.*

**videophone:** **1.** A telephone that is coupled to an imaging device that enables the call receiver or the call originator, or both, to view one another as on television, if they so desire. [From Weik '89] **2.** A military communications terminal that (a) has video teleconference capability, (b) is usually configured as a small desktop unit, designed for one operator, and (c) is a single, integrated unit. [From Weik '89]

**video recorder (VCR):** Equipment for recording the video waveform so that the mapped images may be stored and later retrieved as the video waveform. [After SMPTE]

**video server:** A server that distributes video images on demand. [2382-pt.35]

**video signal description:** The standard video-signal waveform, measured in IRE units. [After T1.Rpt16-1992]

**video teleconference:** **1.** A teleconference that includes video communications. **2.** Pertaining to a two-way electronic communications system that permits two or more persons in different locations to engage in the equivalent of face-to-face audio and video communications. *Note:* Video teleconferences may be conducted as if all of the participants were in the same room.

**video teleconferencing unit (VTU):** Equipment that performs video teleconference functions, such as coding and decoding of audio and video signals and multiplexing of video, audio, data, and control signals, and that usually does not include I/O devices, cryptographic devices, network interface equipment, network connections, or the communications network to which the unit is connected.

**view:** In satellite communications, the quality or degree of visibility of a satellite to a ground station; *i.e.*, the degree to which the satellite is sufficiently above the horizon and clear of obstructions so that it is within a clear line of sight by an Earth terminal. *Note:* A pair of satellite Earth terminals has a satellite in mutual view when both have unobstructed line-of-sight contact with the satellite simultaneously.

**viewdata:** A type of information-retrieval service in which a subscriber can (a) access a remote database via a common carrier channel, (b) request data, and (c) receive requested data on a video display over a separate channel. *Note:* The access, request, and reception are usually via common carrier broadcast channels.

**viewer:** Application software that enables a user to have read-only access to electronic documents or images. [After 2382-pt.35]

**violation:** *See* AMI violation.

**virtual call:** A call, established over a network, that uses the capabilities of either a real or virtual circuit by sharing all or any part of the resources of the circuit for the duration of the call.

**virtual call capability:** A service feature in which (a) a call set-up procedure and a call disengagement procedure determine the period of communication between two data terminal equipments (DTEs) in which user data are transferred by the network in the packet mode of operation, (b) end-to-end transfer control of packets within the network is required, (c) data may be delivered to the network by the call originator before the call access phase is completed, but the data are not delivered to the call receiver if the call attempt is unsuccessful, (d) the network delivers all the user data to the call receiver in the same sequence in which the data are received by the network, and (e) multi-access DTEs may have several virtual calls in progress at the same time. *Synonym* **virtual call facility**.

**virtual call facility:** *Synonym* **virtual call capability**.

**virtual carrier frequency:** In radio or carrier systems in which no carrier is transmitted, *e.g.*, single sideband or double sideband with suppressed carrier, the location in the frequency spectrum that the carrier would occupy if it were present.

**virtual channel connection (VCC):** A concatenation of VCLs (virtual channel links) that extends between the points where the ATM (asynchronous transfer mode) service users access the ATM Layer. The points at which the ATM cell payload is passed to, or received from, the user of the ATM Layer (*i.e.*, a higher layer or ATM management entity) for processing, signifying the endpoints of a VCC. VCCs are unidirectional. [T1.630-1999]

**virtual channel link (VCL):** A means of unidirectional transport of ATM cells between the point where a VCI value is assigned and the point where that value is translated or removed. [T1.630-1999]

**virtual channel (VC):** The communication channel associated with a virtual channel connection (VCC) that provides for the transport of asynchronous transfer mode (ATM) cells among ATM active elements. A VCC is an association established at the ATM Layer between two or more endpoints for the purpose of user-user, user-network, or network-network information transfer. A VCC consists of the concatenation of virtual channel links (VCLs). A VCL is a means of unidirectional transport of ATM cells between the points where a VCI value is assigned and the point where the value is translated or removed. The VPI and VCI within the ATM cell header associates each cell with a particular VCL over a given physical link. The points at which the ATM cell payload is passed to the AAL for processing signify the endpoints of a VCC. [T1.649-1995]

**virtual circuit (VC):** A communications arrangement in which data from a source user may be passed to a destination user over various real circuit configurations during a single period of communication. *Note:* Virtual circuits are generally set up on a per-call basis and are disconnected when the call is terminated; however, a permanent virtual circuit can be established as an option to provide a dedicated link between two facilities. *Synonyms* **logical circuit, logical route**.

**virtual circuit capability:** A network-provided service feature in which a user is provided with a virtual circuit. *Note:* Virtual circuit capability is not necessarily limited to packet mode transmission. For example, an analog signal may be converted to a digital signal and then be routed over the network via any available route.

**virtual connection:** A logical connection that is made to a virtual circuit.

**virtual data link capability (VDLC) protocol:** A wideband protocol that is used to transport digital data packets arriving from the channelized side in HDLC frames. [T1.509-1995]

**virtual domain:** An alias for an IP address or server operated by an Internet Presence Provider or an Internet Service Provider. The virtual domain allows individuals or companies to have a domain name without the effort and cost of maintaining a server. [Bahorsky]

**virtual height:** The apparent height of an ionized layer, as determined from the time interval between the transmitted signal and the ionospheric echo at vertical incidence.

**virtual instruction:** *Synonym* **teletraining**.

**virtual local area network (VLAN):** A computer network using internetworks as data links that are transparent for users and that do not have restrictions on protocols, so that the network has the characteristics of a local area network. *Note:* Data links over internetworks often use tunneling. [2382-pt.35]

**virtual memory:** In computer systems, the memory as it appears to, *i.e.*, as it is available to, the operating programs running in the central processing unit (CPU). *Note:* The virtual memory may be smaller, equal to, or larger than the real memory present in the system.

**virtual network:** A network that provides virtual circuits and that is established by using the facilities of a real network.

**virtual office:** A work environment in which employees work cooperatively from different locations using a computer network. [After 2382-pt.35] *Synonym* **virtual workplace**.

**virtual password:** [An] information system (IS) password computed from a passphrase meeting the requirements of password storage (*e.g.*, 64 bits). [INFOSEC-99]

**virtual path:** *See* **virtual circuit**.

**virtual private network (VPN):** [A] protected information-system (IS) link utilizing tunneling, security controls (*see* **information assurance**), and end-point address translation giving the user the impression a dedicated line exists between nodes. [INFOSEC-99]

**virtual reality:** An interactive, computer-generated simulated environment with which users can interact using specialized peripherals such as data gloves and head-mounted computer-graphic displays.

**virtual storage:** The storage space that may be regarded as addressable main storage by the user of a computer system in which virtual addresses are mapped into real addresses. *Note:* The size of virtual storage is limited by the addressing scheme of the computer system and by the amount of auxiliary storage available, and not by the actual number of main storage locations.

**virtual terminal (VT):** In open systems, an application service that (a) allows host terminals on a multi-user network to interact with other hosts regardless of terminal type and characteristics, (b) allows remote log-on by local-area-network managers for the purpose of management, (c) allows users to access information from another host processor for transaction processing, and (d) serves as a backup facility.

**virtual tributary (VT):** A structure designed for transport and switching of sub-STs-1 payloads. There are currently four sizes of VT. [T1.105-1988]

**virtual workplace:** *Synonym* **virtual office**.

**virtual world:** A simulated environment that appears to have the characteristics of some other environment, and in which participants perceive themselves as interactive parts.

**virus:** **1.** An unwanted program which places itself into other programs, which are shared among computer systems, and replicates itself. *Note:* A virus is usually manifested by a destructive or disruptive effect on the executable program that it affects. **2.** Self-replicating, malicious program segment that attaches itself to an application program or other executable system component and leaves no obvious signs of its presence. [INFOSEC-99]

**virus signature:** A unique bit string that is common to each copy of a particular virus and that may be used by a scanning program to detect the presence of the virus. [2382-pt.8]

**visible spectrum:** The region of the electromagnetic spectrum that can be perceived by human vision, approximately the wavelength range of 0.4  $\mu\text{m}$  to 0.7  $\mu\text{m}$ .

**visual channel:** A means for delivering video frames from one point to another; a sequence of frames submitted to the channel input results in a similar (not necessarily identical) sequence of frames at the channel output. *Note:* The visual channel may be comprised of the following components: video format conversion devices, encoders (compressors) and decoders (decompressors), rate smoothing buffers, multiplexors and demultiplexors, modulators and demodulators, transmission facilities, switches, multi-point conference units, and other components necessary to achieve the desired channel characteristics. [After T1.801.04-1997]

**visual display unit (VDU):** *See monitor.*

**visual telephone services:** A group of audiovisual services including videophone as defined in ITU-T Recommendation F.721 and videoconferencing (defined in ITU-T H-Series Recommendations). [T1.800.01-1995]

**vitreous silica:** Glass consisting of almost pure silicon dioxide (SiO<sub>2</sub>). *Synonym fused silica.*

**VLF:** *Abbreviation for very low frequency. See electromagnetic spectrum.*

**VNL:** *Abbreviation for via net loss.*

**V number:** *Synonym normalized frequency.*

**vocoder:** *Abbreviation for voice-coder.* A device that usually consists of a speech analyzer, which converts analog speech waveforms into narrowband digital signals, and a speech synthesizer, which converts the digital signals into artificial speech sounds. *Note 1:* For COMSEC purposes, a vocoder may be used in conjunction with a key generator and a modulator-demodulator to transmit digitally encrypted speech signals over narrowband voice communications channels. These devices are used to reduce the bandwidth requirements for transmitting digitized speech signals. *Note 2:* Some analog vocoders move incoming signals from one portion of the spectrum to another portion.

**vodas:** *Acronym for voice-operated device anti-sing.* A device used to prevent overall voice-frequency singing in a two-way telephone circuit by ensuring that transmission can occur in only one direction at any given instant.

**vogad:** *Acronym for voice-operated gain-adjusting device.* A device that has a substantially constant output amplitude over a wide range of input amplitudes.

**voice band:** *Synonym voice frequency.*

**voice coder:** *See vocoder.*

**voice-data signal:** *See quasi-analog signal.*

**voice frame:** A UIH (unnumbered information with header check) frame that contains a voice packet in its information field. [T1.312-1991]

**voice frequency (VF):** Pertaining to those frequencies within that part of the audio range that is used for the transmission of speech. *Note 1:* In telephony, the usable voice-frequency band ranges from approximately 300 Hz to 3400 Hz. *Note 2:* In telephony, the bandwidth allocated for a single voice-frequency transmission channel is usually 4 kHz, including guard bands. *Synonym voice band. See electromagnetic spectrum.*

**voice frequency carrier telegraph (VFCT):** *Synonym voice-frequency telegraph.*

**voice-frequency (VF) channel:** A channel capable of carrying analog and quasi-analog signals.

**voice frequency (VF) primary patch bay:** A patching facility that provides the first appearance of local-user VF circuits in the technical control facility (TCF). *Note:* The VF primary patch bay provides patching, monitoring, and testing for all VF circuits. Signals will have various levels and signaling schemes depending on the user terminal equipment.

**voice-frequency telegraph (VFTG):** A method of multiplexing one or more dc telegraph channels onto a nominal 4-kHz voice frequency channel. *Synonym voice frequency carrier telegraph.*

**voice grade:** In the public regulated telecommunications services, a service grade that is described in part 68, Title 47 of the *Code of Federal Regulations [CFR]*. *Note:* Voice-grade service does not imply any specific signaling or supervisory scheme.

**voice information field:** The field within a voice packet that contains blocks arranged according to the significance of the bits: the first block contains the most significant bits (MSBs) of all samples, the second contains the second MSBs, and so on. Within a block, bits are ordered according to their corresponding sample numbers. [After T1.312-1991]

**voice-operated device anti-sing:** *See vodas.*

**voice-operated gain-adjusting device:** *See vogad.*

**voice operated relay circuit:** *Synonym vox.*

**voice operated transmit:** *Synonym vox.*

**voice-plus circuit:** *Synonym composited circuit.*

**volatile storage:** A storage device in which the contents are lost when power is removed.

**volatility:** *See data volatility.*

**voltage rating:** The highest voltage that can be applied to a wire or conductor in conformance with standards.

**voltage standing wave ratio (VSWR):** In a transmission line, the ratio of maximum to minimum voltage in a standing wave pattern. *Note:* The VSWR is a measure of impedance mismatch between the transmission line and its load. The higher the VSWR, the greater the mismatch. The minimum VSWR, *i.e.*, that which corresponds to a perfect impedance match, is unity.

**volt-amperes reactive (vars):** In alternating-current power transmission and distribution, the product of the rms voltage and amperage, *i.e.*, the apparent power, multiplied by the sine of the phase angle between the voltage and the current. *Note 1:* Vars represents the power not consumed by a reactive load, *i.e.*, when there is a phase difference between the applied voltage and the current. *Note 2:* Only effective power, *i.e.*, the actual power delivered to or consumed by the load, is expressed in watts. Volt-amperes reactive is properly expressed only in volt-amperes, never watts. *Note 3:* To maximize transmission efficiency, vars must be minimized by balancing capacitive and inductive loads, or by the addition of an appropriate capacitive or inductive reactance to the load.

**volume:** A portion of data, with its physical storage medium, that can be handled conveniently as a unit. *Note:* An example of a volume is a "floppy" diskette.

**volume unit (vu):** A unit of measurement of the power of an audio-frequency signal, as measured by a vu meter. *Note 1:* The vu meter is built and used in accordance with American National Standard C16.5-1942. *Note 2:* When using the vu meter to measure sine wave test tone power, 0 vu equals 0 dBm.

**vox:** An acoustoelectric transducer and a keying relay connected so that the keying relay is actuated when sound, or voice, energy above a certain threshold is sensed by the transducer. *Note:* A vox is used to eliminate the need for push-to-talk operation of a transmitter by using voice energy to turn on the transmitter. *Synonyms* **voice operated relay circuit**, **voice operated transmit**.

**V reference point:** The interface point in an ISDN environment between the line termination and the exchange termination.

**VSB:** *Abbreviation for vestigial sideband. See vestigial sideband transmission.*

**V-series Recommendations:** Sets of telecommunications protocols and interfaces defined by CCITT (now ITU-T) Recommendations. *Note:* Some of the more common V.-series Recommendations are:

- **V.21:** A CCITT Recommendation for modem communications over standard commercially available lines at 300 b/s. This protocol is generally not used in the United States.
- **V.22bis:** A CCITT Recommendation for modem communications over standard commercially available voice-grade channels at 2,400 b/s and below.
- **V.32:** A CCITT Recommendation for modem communications over standard commercially available voice-grade channels at 9.6 kb/s and below.
- **V.32bis:** A CCITT Recommendation for modem communication over standard commercially available voice-grade channels at 14.4 kb/s and below.
- **V.34:** An ITU-T Recommendation for modem communication over standard commercially available voice-grade channels at 28.8 kb/s and below.
- **V.42:** A CCITT Recommendation for error correction on modem communications.
- **V.42bis:** A CCITT Recommendation for data compression on a modem circuit.
- **V.FAST:** A new CCITT Recommendation for high-speed modems currently under development.

**VSWR:** *Abbreviation for voltage standing wave ratio.*

**vu:** *Abbreviation for volume unit.*

**vulnerability:** **1.** In communications security, *see* **susceptibility**. **2.** The extent to which a system will degrade when subjected to a specified set of environmental conditions. **3.** In communications interference, *see* **susceptibility threshold**. **4.** In cryptology, the point of weakness within the encrypted system where threats can occur, such as equipment, facilities, hardware, software, operating systems and personnel. [After X9.49] **5.** [A] weakness in an information system (IS), [in] system security procedures, [in] internal controls, or [in] implementation that could be exploited. [INFOSEC-99]

**vulnerability assessment:** **1.** The systematic examination of a system to identify those critical infrastructures or related components that may be at risk from an attack and the determination of appropriate procedures that can be implemented to reduce that risk. **2.** [The] systematic examination of an information system (IS) or product to determine the adequacy of security measures, identify security deficiencies, provide data from which to predict the effectiveness of proposed security measures, and confirm the adequacy of such measures after implementation. [INFOSEC-99]

**VW-1:** Flammability rating established by Underwriters Laboratories for wires and cables that pass a specially designed vertical flame test formerly designated FR-1.

**wafer:** A thin slice of semiconducting material, such as a silicon crystal, upon which microcircuits are constructed by diffusion and deposition of various materials. *Note:* Millions of individual circuit elements, constituting hundreds of microcircuits, may be constructed on a single wafer. The individual microcircuits are separated by scoring and breaking the wafer into individual chips ("dice").

**WAIS:** *Acronym for Wide Area Information Servers.* A distributed text searching system that uses the protocol standard ANS Z39.50 to search index databases on remote computers. *Note 1:* WAIS libraries are most often found on the Internet. *Note 2:* WAIS allows users to discover and access information resources on the network without regard to their physical location. *Note 3:* WAIS software uses the client-server model.

**wallpaper:** A graphic image that serves as a background for a Web page or for a computer operating system's screen.

**WAN:** *Acronym for wide area network.*

**wander:** Relative to jitter and swim, long-term random variations of the significant instants of a digital signal from their ideal positions. *Note 1:* Wander variations are those that occur over a period greater than 1 s (second). *Note 2:* Jitter, swim, wander, and drift have increasing periods of variation in that order.

**warm boot:** *Synonym* **warm restart**.

**warm restart:** **1.** A sequence of operations that is performed to reset a previously running system, after an unintentional shutdown. *Synonym* **warm start**. **2.** In computer operations, the restarting of equipment, after a sudden shutdown, that allows reuse of previously retained initialized input data, retained programs, and retained output queues. *Note 1:* A warm restart may be needed after a program failure. *Note 2:* A warm start or restart cannot occur if initial data, programs, and files are not retained after closedown. *Synonyms* **hot boot**, **warm boot**. [From Weik '89]

**warm start:** *Synonym* **warm restart**.

**Warner exemption:** A statutory exemption pertaining to the acquisition of telecommunications systems that meet the exclusionary criteria of the Warner Amendment, Public Law 97-86, 1 December 1981, which is also known as the Brooks Bill. *Note:* Use of FTS2000 by U.S. Government agencies is mandatory when telecommunications are required. However, the Warner Amendment excludes the mandatory use of FTS2000 in instances related to maximum security.

**watermark:** **1.** A copyright-protection method of embedding a code into a digital audio or video file to attempt to thwart piracy or unlicensed use. **2.** In desktop publishing, an inserted (and usually faint) overlay of an image or text onto pages of a document. *Note:* The watermark is usually visible on the computer screen in WYSIWIG fashion and on the printed pages of the final document. The watermark often verifies authenticity of authorship or release authority.

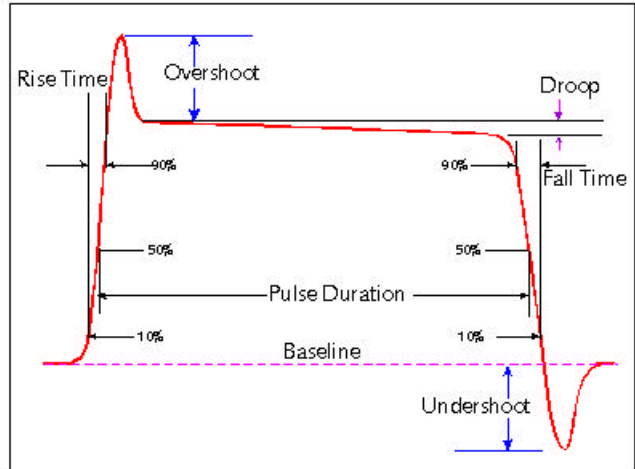
**WATS:** *Acronym for Wide Area Telephone Service.*

**.wav:** A file extension name for one format [ *i.e.*, a wave format] of a sound file. [Source: [http://www.webwords.net/html/\\_p\\_.html](http://www.webwords.net/html/_p_.html)]

**wave equation:** *See* **Maxwell's equations**.



**waveform:** The representation of a signal as a plot of amplitude versus time.



representative pulse waveform

**wavefront:** The surface defined by the locus of points that have the same phase, *i.e.*, have the same path length from the source. [After 2196] *Note 1:* The wavefront is perpendicular to the ray that represents an electromagnetic wave. *Note 2:* The plane in which the electric and magnetic field vectors lie is tangential to the wavefront at every point. *Note 3:* The vector that represents the wavefront indicates the direction of propagation. *Note 4:* For parallel, *i.e.*, collimated, rays, the wavefront is plane. For rays diverging from a point, or converging toward a point, the wavefront is spherical. For rays with varying divergence or convergence, the wavefront has other shapes, such as ellipsoidal and paraboloidal, depending on the nature of the source.

**waveguide:** A material medium that confines and guides a propagating electromagnetic wave. *Note 1:* In the microwave regime, a waveguide normally consists of a hollow metallic conductor, usually rectangular, elliptical, or circular in cross section. This type of waveguide may, under certain conditions, contain a solid or gaseous dielectric material. *Note 2:* In the optical regime, a waveguide used as a long transmission line consists of a solid dielectric filament (optical fiber), usually circular in cross section. In integrated optical circuits an optical waveguide may consist of a thin dielectric film. *Note 3:* In the rf regime, ionized layers of the stratosphere and refractive surfaces of the troposphere may also act as a waveguide.

**waveguide dispersion:** See dispersion.

**waveguide scattering:** Scattering (other than material scattering) that is attributable to variations of geometry and refractive index profile of an optical fiber.

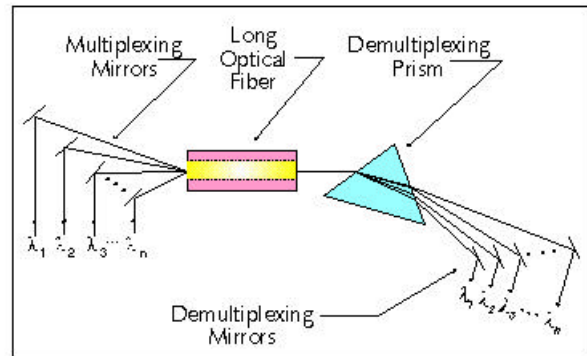
**wave impedance:** At a point in an electromagnetic wave, the ratio of the electric field strength to the magnetic field strength. *Note 1:* If the electric field strength is expressed in volts per meter and the magnetic field strength is expressed in ampere-turns per meter, the wave impedance will have the units of ohms. The wave impedance,  $Z$ , of an electromagnetic wave is given by

$$Z = \sqrt{\frac{\mu}{\epsilon}}$$

where  $\mu$  is the magnetic permeability and  $\epsilon$  is the electric permittivity. For free space, these values are  $4\pi \times 10^{-7}$  H/m (henries per meter) and  $(1/36\pi)$  F/m (farads per meter), from which  $120\pi$ , *i.e.*, 377, ohms is obtained. In dielectric materials, the wave impedance is  $377/n$ , where  $n$  is the refractive index. *Note 2:* Although the ratio is called the wave impedance, it is also the impedance of the free space or the material medium.

**wavelength:** The distance between points of corresponding phase of two consecutive cycles of a wave. *Note:* The wavelength,  $\lambda$ , is related to the propagation velocity,  $v$ , and the frequency,  $f$ , by  $\lambda = v/f$ .

**wavelength-division multiplexing (WDM):** In optical fiber communications, any technique by which two or more optical signals having different wavelengths may be simultaneously transmitted in the same direction over one fiber, and then be separated by wavelength at the distant end.



one kind of wavelength-division multiplexer

**wavelength stability:** Of an optical source during a specified period, the maximum deviation of the peak wavelength from its mean value.

**wave trap:** A device used to exclude unwanted frequency components, such as noise or other interference, of a wave. *Note:* Traps are usually tunable to permit selection of unwanted or interfering signals. [From Weik '89]

**WDM:** *Abbreviation for wavelength-division multiplexing.*

**weak bit:** A bit intentionally written on a diskette with a weak magnetic field strength that may be interpreted as zero or one and that is written as part of a method of copy protection. [2382-pt.8]

**weakly guiding fiber:** An optical fiber in which the refractive index contrast is small (substantially less than 1%).

**Web:** *See World Wide Web.*

**web browser:** A user interface (usually graphical) to hypertext information on the World Wide Web.

**Web crawler:** *Synonym spider.*

**Web document:** An HTML (hypertext markup language) document available on the World Wide Web. [Bahorsky]

**Webmaster:** A person or group of people responsible for the design, implementation, management, and maintenance of a Web site. *Note:* Webmastery often includes the fields of network configuration, interface, and graphics design, software development, business strategy, writing, marketing, and project management. [Bahorsky]

**Web node:** *Synonyms Web site, Web server.*

**Web page:** An HTML document accessible on the World Wide Web. [Bahorsky] *Note:* The number and types of features that can be offered on a web page is growing almost exponentially.

**Web page search engine:** *Loosely synonymous with portal. See droid.*

**Web phone:** *See Internet phone.*

**Web ring:** A confederation of (usually linked) Web sites that serve a particular special interest group or that have similar or related content. [Bahorsky]

**Web server:** A software program or server computer equipped to offer World Wide Web access. *Note:* A web server accommodates requests from users, retrieves requested files or applications, and issues error messages. [Bahorsky]

**Web site:** One or more web pages available on the World Wide Web, usually consisting of a home page and often additional pages accessed via the home page via hyperlinks. [Bahorsky] *Note:* Web sites have been expanded and now provide many online services such as free e-mail, news, chat, and personalized functions like stock quotes, local weather, and sports. Web sites get much of their revenue from advertising.

**Webspace:** The virtual space created by the World Wide Web or a subset of that space occupied by a particular Web site. [After Bahorsky]

**Web spider:** *Synonym droid. See also spider.*

**Web surfer:** *Synonym cybernaut. See also droid.*

**Web television:** The concept of providing Internet access (usually Web access and e-mail) in a format that can be viewed on a standard television set rather than on the customer's computer. The service usually consists of a set top box that is connected to the user's television, a keyboard, and a telephone line.

**webzine:** *See e-zine.*

**weighted standard work second:** A measurement of traffic operating work which is used to express the relative time required to handle the various kinds of calls or work functions, and which is weighted to reflect appropriate degrees of waiting to serve time. [47 CFR Pt.36-A]

**weighting network:** A network having a loss that varies with frequency in a predetermined manner, and which network is used for improving or correcting transmission characteristics, or for characterizing noise measurements.

**whip antenna:** A flexible rod antenna, usually between 1/10 and 5/8 wavelength long, supported on a base insulator.

**white area:** The area or population which does not receive interference-free primary service from an authorized AM station or does not receive a signal strength of at least 1 mV/m from an authorized FM station. [47CFR]

**whiteboard:** A feature of an Internet videoconferencing program that allows participants to use drawing and/or annotation tools to develop collaborative images or to annotate documents that can be viewed by all videoconference participants simultaneously. [After Bahorsky]

**white clip:** The maximum system-permissible excursion of the video signal in the white direction. [After SMPTE]

**white compression:** In television technology, the reduction of gain applied to light areas in picture signal (corresponding to the midrange light value in the picture). *Note:* The gain in signal amplitude is small compared to the total peak-to-peak picture signal. Measuring the differential gain yields a quantitative evaluation of this effect. The effect of white compression beyond bandwidth limiting is a reduction in contrast in the highlights of the picture as seen on the monitor. [After SMPTE]

**white facsimile transmission:** **1.** In an amplitude-modulated facsimile system, transmission in which the maximum transmitted power corresponds to the minimum density, *i.e.*, the white area, of the object. **2.** In a frequency-modulated facsimile system, transmission in which the lowest transmitted frequency corresponds to the minimum density *i.e.*, the white area, of the object.

**white noise:** Noise having a frequency spectrum that is continuous and uniform over a specified frequency band. *Note:* White noise has equal power per hertz over the specified frequency band. *Synonym additive white gaussian noise.*

**white pages:** **1.** A hard copy telephone directory listing of subscriber names, addresses, and telephone numbers. *Note:* *White pages* is associated with the residential subscriber listings in the standard directories distributed by the Bell System before divestiture. **2.** An electronic information database that contains user names and their associated network addresses, in the manner of a telephone directory. *Note:* Electronic white pages usually contain additional information, such as office location, phone number, and mailstop.

**white peak:** In video, a peak excursion of the picture signal in the white direction. [After IEEE-100] [After SMPTE]

**white point:** In video technology, that point on the chromaticity diagram having the tristimulus of a source appearing white under the viewing conditions; *i.e.*, a spectrally

nonselective sample under the illumination of viewing conditions. [After SMPTE]

**white reference:** **1.** In video teleconferencing, the light from a nonselective diffuse reflector (in the original scene) that is lighted by the normal illumination of the scene; *i.e.*, that white with which the display device simulates reference white of the original scene. [After IEEE 100] [After SMPTE] **2.** In the context of video production, the luminance of a white card having 90% reflectance, and subjected to scene illumination. *Note:* Usually there will be some discrimination of surface texture or detail within that portion of the transfer function incorporating reference white. [After SMPTE]

**white signal:** In facsimile systems, the signal resulting from scanning a minimum-density area, *i.e.*, the white area, of the object.

**white space:** In a Web page, line feeds, carriage returns, spaces, and other typed characters not visible through the browser display window but considered part of the content of a Web page. [After Bahorsky]

**who-are-you (WRU) character:** A transmission-control character used for (a) switching on an answer-back unit in the station with which the connection has been established, (b) triggering the receiving unit to transmit an answer-back code to the terminal that transmitted the WRU signal, and (c) initiating a response that might include station identification, an indication of the type of equipment that is in service, and the status of the station. *Note 1:* The WRU signal corresponds to the 7-bit code assigned to the WRU. *Note 2:* The receiving unit may be a telegraph unit, data terminal equipment (DTE), or other unit. *Synonym* WRU. [From Weik '89]

**whois:** **1.** An Internet program or a UNIX<sup>TM</sup> command that displays personal information (*e.g.*, full name, address, company name, phone number, e-mail address, and log-in status) for an account holder, which information is also used by an Internet network information center (InterNIC) to enable users to identify the existence of a given domain name or the owner of a given domain name. [After Bahorsky] **2.** The name of a variety of white pages used within the Internet. [After 2382-pt.35]

**Wide Area Information Server (WAIS):** *See* WAIS.

**wide area network (WAN):** A physical or logical network that provides data communications to a larger number of independent users than are usually served by a local area network (LAN) and is usually spread over a larger geographic area than that of a LAN. *Note 1:* WANs may include physical networks, such as Integrated Services Digital Networks (ISDNs), X.25 networks, and T1 networks. *Note 2:* A metropolitan area network (MAN) is a WAN that serves all the users in a metropolitan area. WANs may be nationwide or worldwide.

**Wide Area Telephone Service (WATS):** A toll service offering for customer dial type telecommunications between a given customer station and stations within specified geographic rate areas employing a single access line between the customer location and the serving central office. Each access line may be arranged for either outward (OUT-WATS) or inward (IN-WATS) service or both. [47 CFR Pt.36-A] *Note:* The offering is for fixed-rate inter- and intra-LATA services measured by zones and hours.

**wideband:** **1.** The property of any communications facility, equipment, channel, or system in which the range of frequencies used for transmission is greater than 0.1 % of the midband frequency. *Note:* "Wideband" has many meanings depending upon application. "Wideband" is often used to distinguish it from "narrowband," where both terms are subjectively defined relative to the implied context. **2.** In communications security systems, a bandwidth exceeding that of a nominal 4-kHz telephone channel. [From Weik '89] **3.** The property of a circuit that has a bandwidth wider than normal for the type of circuit, frequency of operation, or type of modulation. **4.** In telephony, the property of a circuit that has a bandwidth greater than 4 kHz. **5.** Pertaining to a signal that occupies a broad frequency spectrum. *Synonym [in analog technology] broadband.* [From Weik '89]

**wideband channel:** A communication channel of a bandwidth equivalent to twelve or more voice grade channels. [47 CFR Pt.36-A]

**wideband modem:** **1.** A modem whose modulated output signal can have an essential frequency spectrum that is broader than that which can be wholly contained within, and faithfully transmitted through, a voice channel with a nominal 4-kHz bandwidth. **2.** A modem whose bandwidth capability is greater than that of a narrowband modem.

**wide track:** A set of two or more adjacent tracks written on a diskette with the same data, as part of a method of copy protection. [2382-pt.8]

**wildcard:** A variable used in searches and comparisons (usually signified by an asterisk "\*") to denote that any value may be returned. *Note:* For example, a search of a database for the character string "fire\*" could return "firewall," "fire station," "firebug," *etc.*

**wildcard character:** **1.** A character that may be substituted for any of a defined subset of all possible characters. *Note 1:* In high-frequency (HF) radio automatic link establishment, the wildcard character "?" may be substituted for any one of the 36 characters, "A" through "Z" and "0" through "9." *Note 2:* Whether the wildcard character represents a single character or a string of characters must be specified. **2.** In computer (software) technology, a character that can be used to substitute for any other character or characters in a string. *Note:* The asterisk (\*) usually substitutes as a wildcard character for any one or more of the ASCII characters, and the question mark (?) usually substitutes as a wildcard character for any one ASCII character.

**wild-point detection:** *Synonym* reasonableness check.

**WIN:** *Abbreviation for* WWMCCS Intercomputer Network.

**window:** **1.** In fiber optics, a band of wavelengths at which an optical fiber is sufficiently transparent for practical use in communications applications. [After FAA] *Synonyms* spectral window, transmission window. **2.** In imagery, a portion of a display surface in which display images pertaining to a particular application can be presented, usually by using a graphical user interface (GUI). *Note:* Different applications can be displayed simultaneously in different windows. **3.** A period during which an event can occur, can be expected to occur, or is allowed to occur.

**windowing:** Sectioning of a video display area into two or more separate regions for the purpose of displaying images from different sources. *Note:* In windowing, one window could display data, another motion video from a remote site, and another, graphics.

**wink:** In telephone switching systems, a single supervisory pulse, *i.e.*, the momentary presence of, or interruption of, a supervisory signal. *Note:* An example of a wink is the momentary flash of a supervisory light on an attendant's switchboard.

**wink pulsing:** In telephone switching systems, recurring pulsing in which the off-condition is relatively short compared to the on-condition. *Note:* On key-operated telephone instruments, the hold position, *i.e.*, the hold condition, of a line is often indicated by wink pulsing the associated lamp at 120 pulses per minute. During 6% of the pulse period the lamp is off and 94% of the period the lamp is on, *i.e.*, 30 ms (milliseconds) off and 470 ms on.

**wink-start signal:** An off-hook condition applied to the NI (network interface) by the CI (customer installation) for a timed interval that indicates the CI recognizes a connect signal from the network and will be ready to receive address signals after return to on-hook. [T1.405-1989]

**wire center:** The location of one or more local switching systems; a location where customer loops converge. [T1.222-1991]

**wired community:** *Synonym* cybercommunity.

**wired radio frequency systems:** Systems employing restricted radiation devices in which the radio frequency energy is conducted or guided along wires or in cables, including electric power and telephone lines. [NTIA]

**wireless:** Descriptive of a network or terminal that uses electromagnetic waves (including rf, infrared, laser, visible light—and acoustic energy) rather than wire conductors for telecommunications. [After T1.414-1998]

**wireless access:** Terminal access to the network which uses wireless technology. [T1.Rpt22-1993]

**wireless access mode:** In personal communications service, interfacing with a network access point by means of a standardized air interface protocol without the use of a hardwired connection to the network.

**wireless mobility management:** In Personal Communications Service (PCS), the assigning and controlling of wireless links for terminal network connections. *Note:* Wireless mobility management provides an "alerting" function for call completion to a wireless terminal, monitors wireless link performance to determine when an automatic link transfer is required, and coordinates link transfers between wireless access interfaces.

**wireless services provider:** A company that provides wireless telecommunication service to customers, *e.g.*, cellular service providers, radio common carriers, paging companies. [T1.251-1996]

**wireless terminal:** Any mobile terminal, mobile station, personal station, or personal terminal using non-fixed access to the network.

**wireline:** A term associated with a network or terminal that uses metallic wire conductors (and/or optical fibers) for telecommunications. [After T1.414-1998]

**wireline access:** Terminal access to the network which uses wireline technology (*e.g.*, conventional telephone sets and subscriber lines). [T1.Rpt19-1993]

**wireline access mode:** Interfacing with the network via a physical wired connection. This can be employed by either a wired or wireless terminal operating in a wired mode via a standard physical interface. [T1.Rpt44-1995]

**wireline common carrier:** A telecommunications common carrier that is also engaged in the business of providing landline local exchange telephone service. [47CFR]

**wizard:** An intelligent, trainable Web spider. *Synonyms* **droid, smart bot, spider.**

**word:** A character string or a bit string considered to be an entity for some purpose. *Note:* In telegraph communications, six character intervals are defined as a word when computing traffic capacity in words per minute, which is computed by multiplying the data signaling rate in baud by 10 and dividing the resulting product by the number of unit intervals per character.

**word length:** The number of characters or bits in a word.

**word processing:** The use of a computer system to manipulate text. *Note:* Examples of word processing functions include entering, editing, rearranging, sorting, storing, retrieving, displaying, and printing text. *Synonym* **text processing.**

**working channels:** The channels over which working traffic is normally transported. [T1.Rpt31-1994]

**working loop:** A revenue producing pair of wires, or its equivalent, between a customer's station and the central office from which the station is served. [47 CFR Pt.36-A]

**working traffic:** Traffic traversing a ring normally carried in working channels, except in the event of a ring or span diversity routing, in which case it is restored on the protection channels. [T1.Rpt31-1994]

**work space:** In computers and data processing systems, the portion of main storage that is used by a computer program for the temporary storage of data.

**work station:** **1.** In automated systems, such as computer, communications, and control systems, the input, output, display, and processing equipment that provides the operator-system interface. **2.** A configuration of input, output, display, and processing equipment that constitutes a stand-alone system not requiring external access.

**World Numbering Plan:** A plan created by the International Telegraph and Telephone Consultative Committee (CCITT—now, the ITU-T) that provides each telephone subscriber with a unique number. Each world telephone number consists of a country code followed by the national number. By international agreement, the number of digits in the country code plus national number is limited to a total of 15 digits. [After T1.104-1991]

**World Time:** *Synonym* **Coordinated Universal Time.**

**World Wide Web:** *Also* **Web, WWW, W3.** A global, virtual-network based hypertext information system that uses the Internet as its transport mechanism to display computer screens (or Web pages) of graphical, video, textual, and even audio information. *Note:* In a hypertext system, one navigates by clicking hyperlinks, which display another document which also contains hyperlinks. In Web navigation, the next document seen could be housed on a computer next door or half-way around the world. Created in 1989 at a research institute in Switzerland, the Web relies upon browsers and the hypertext transport protocol (http), an Internet standard that specifies how an application can locate and acquire resources stored on another computer on the Internet. Most Web documents are created using hypertext markup language (html), a coding system for WWW documents. Incorporating hypermedia (graphics, sounds, animations, video), the Web has become a popular medium for publishing information on the Internet. With the development of secured server protocol (https), the Web is now a commercial medium whereby consumers can browse on-line catalogs and purchase merchandise using secure, encrypted credit card information that is protected from interception. *Synonym* **Web.**

**worm:** **1.** A computer virus capable of disrupting a computer program. [After Weik '96] **2.** A self-contained program that can propagate itself through systems or networks. *Note:* Worms are often designed to use up available resources such as storage or processing time. [ANSDIT] **3.** [An] independent program that replicates from machine to machine across network connections, often clogging networks and computer systems as it spreads. [INFOSEC-99] **4.** *Acronym for* **write once, read many** (times). *Note:* A worm drive is used in recording data on a disk such that the data can then be read but not erased. [ANSDIT]

**worst hour of the year:** That hour of the year during which the median noise over any radio path is at a maximum. *Note:* This hour is considered to coincide with the hour during which the greatest transmission loss occurs.

**W-profile fiber:** *Synonym* **doubly clad fiber.**

**wrapping:** **1.** In a network using dual counter-rotating ring architecture, reconfiguration to circumvent a failed link or node. **2.** In open systems architecture, the use of a network to connect two other networks, thus providing an increased interaction capability between the two connected networks. *Note:* Recurring application of wrapping usually results in a hierarchical structure. [From Weik '89]

**write:** **1.** To make a permanent or transient recording of data in a storage device or on a data medium. **2.** [A] fundamental operation in an information system (IS) that results only in the flow of information from a subject to an object. [INFOSEC-99]

**write access:** An access right that gives permission to write data. *Note:* Write access may grant permission to append, modify, delete, or create data. [2382-pt.8]

**write cycle time:** The minimum time interval between the starts of successive write cycles of a storage device that has separate reading and writing cycles.

**write head:** A magnetic head capable of writing only.

**write protection label:** See **write-protect tab**.

**write-protect tab:** A movable or removable tab, label, or other device, the presence or absence of which on the casing of a recording medium prevents writing on the medium. *Note:* An example of a write-protect tab is the sliding tab on a 3½-inch (8.85-cm) magnetic diskette of the type used in conjunction with desktop computers.

**working key:** A key generated by the constructive process. [After X9.69]

**WRU:** See **who-are-you (WRU) character**.

**WRU signal:** *Synonym who-are-you character (WRU).*

**WWW robot:** A variety of search engine that automatically moves through Web hyperlinks to compile databases of available URLs (universal resource locators). [After Bahorsky]

**WYSIWYG:** (*Pronounced "wizzy-wig."*) *Abbreviation for "what you see is what you get;"* A descriptive designation for a form of visual display or graphical user interface (gui) that shows (on the screen) the actual appearance of a document being processed. [After Bahorsky]

**X-bits:** Unassigned overhead bits. Transmitters should code these bits as zeros while receivers are required to be capable of ignoring the value contained in these bits. [T1.646-1995]

**X-dimension of recorded spot:** In facsimile systems, the effective recorded spot dimension measured in the direction of the recorded line. *Note 1:* By "effective recorded spot dimension" is meant the largest center-to-center spacing between recorded spots, which gives minimum peak-to-peak variation of density of the recorded line. *Note 2:* "X-dimension of recorded spot" implies that the facsimile equipment response to a constant density in the object (original) is a succession of discrete recorded spots.

**X-dimension of scanning spot:** In facsimile systems, the distance between the centers of adjacent scanning spots measured in the direction of the scanning line on the object. *Note:* The numerical value of the X-dimension of scanning spot depends upon the type of system.

**xerographic recording:** Recording enabled by the scanning action of an optical beam on a photoconducting surface on which an electrostatically charged latent image is developed with a resinous powder (toner).

**XML:** *Abbreviation for eXensible Markup Language.* A trimmed specification or version of the Standard Generalized Markup Language (SGML) that allows Web developers to create customized tags for additional functionality.

**XO:** *Abbreviation for crystal oscillator.*

**XOFF:** An abbreviation for the ASCII transmission-control character meaning "Transmitter off."

**XON:** An abbreviation for the ASCII transmission-control character meaning "Transmitter on."

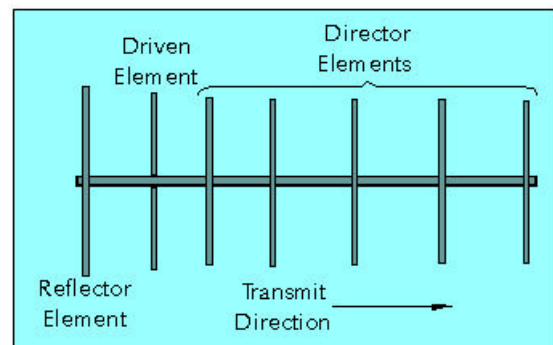
**X.-series Recommendations:** Sets of data telecommunications protocols and interfaces defined by CCITT (now, ITU-T) Recommendations. *Note:* Some of the more common X.-series Recommendations are:

- **X.25:** A Recommendation for public packet switched communications between a network user and the network itself.
- **X.75:** A Recommendation for public packet switched communications between network hubs.
- **X.400:** An addressing scheme for use with e-mail.
- **X.500:** An addressing scheme for directory services.

**XT:** *Abbreviation for crosstalk.*

**x-y mount:** *Synonym altazimuth mount.*

**Yagi antenna:** A linear end-fire antenna, consisting of three or more half-wave elements (one driven, one reflector, and one or more directors). *Note 1:* A Yagi antenna offers very high directivity and gain. *Note 2:* The formal name for a "Yagi antenna" is "Yagi-Uda array."



Yagi antenna

**Y-dimension of recorded spot:** In facsimile systems, the distance between the centers of adjacent recorded spots on adjacent lines measured perpendicular to the recorded line.

**Y-dimension of scanning spot:** In facsimile systems, the distance between the centers of adjacent scanning spots on adjacent lines measured perpendicular to the scanning line on the object. *Note:* The numerical value of the Y-dimension of scanning spot depends upon the type of system.

**yellow alarm:** An indication provided to a source device indicating a signal failure condition at a sink device. [T1.107-1988] *Synonyms remote alarm indication, yellow alarm signal.*



**yellow alarm signal:** *Synonym* yellow alarm.

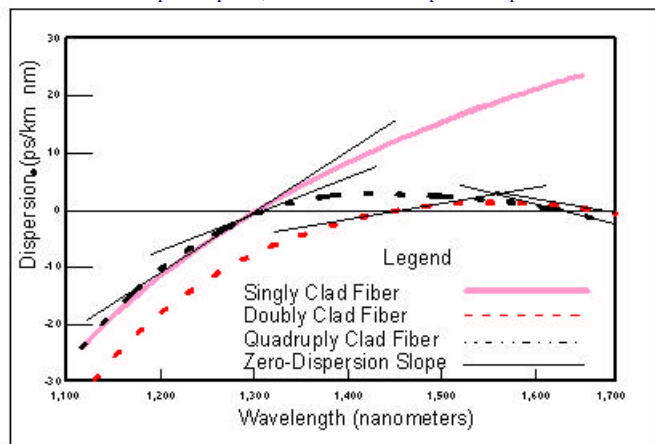
**Z:** *Abbreviation for Zulu time. See Coordinated Universal Time.*

**ZBTSI (zero-byte time slot interchange):** A technique applied to a DS1 frame to ensure pulse density requirements are met, where bits 2 through 193 of each frame are scrambled to minimize the occurrence of all-zero octets. When an all-zero octet is contiguous to another octet with zeros and they would combine to violate the ones density requirement, an algorithm is invoked where some all-zero octets are replaced by an address chain. The reverse algorithms are performed by the receiving terminal.

**zero-bit insertion:** A bit-stuffing technique used with bit-oriented protocols to ensure that six consecutive "1" bits never appear between the two flags that define the beginning and the ending of a transmission frame. *Note:* When five consecutive "1" bits occur in any part of the frame other than the beginning and ending flag, the sending station inserts an extra "0" bit. When the receiving station detects five "1" bits followed by a "0" bit, it removes the extra "0" bit, thereby restoring the bit stream to its original value. *Synonyms* zero insertion, zero stuffing.

**zero dBm transmission level point (0 dBm TLP):** In a communication system, a point at which the reference level is 1 mW, *i.e.*, 0 dBm. *Note:* The actual power level of the communications traffic is not necessarily 0 dBm. It is usually below the reference level. The reference is for system design and test purposes. *Synonym* zero transmission level point.

**zero-dispersion slope:** In a single-mode optical fiber, the rate of change of dispersion, with respect to wavelength, at the fiber's zero-dispersion wavelength. *Note 1:* In silica-based optical fibers, the zero-dispersion wavelength occurs at approximately 1.3  $\mu\text{m}$ , but this wavelength may be shifted toward the minimum-loss window by the addition of dopants to the fiber material during manufacture. *Note 2:* Doubly and quadruply clad single-mode fibers have two zero-dispersion points, and thus two zero-dispersion slopes.



zero-dispersion slopes for representative single-mode fibers

**zero-dispersion wavelength: 1.** In a single-mode optical fiber, the wavelength or wavelengths at which material dispersion and waveguide dispersion cancel one another. *Note:* In all silica-based optical fibers, minimum material dispersion occurs naturally at a wavelength of approximately 1.3  $\mu\text{m}$ . Single-mode fibers may be made of silica-based glasses containing dopants that shift the material-dispersion wavelength, and thus, the zero-dispersion wavelength, toward the minimum-loss window at approximately 1.55  $\mu\text{m}$ . The engineering tradeoff is a slight increase in the minimum attenuation coefficient. **2.** Loosely, in a multimode optical fiber, the wavelength at which material dispersion is minimum, *i.e.*, essentially zero. *Synonym* minimum-dispersion wavelength.

**zero dispersion window:** *Synonym* minimum-dispersion window.

**zerofill:** To fill unused storage locations in an information system (IS) with the representation of the character denoting "0". [INFOSEC-99]

**zero insertion:** *See* zero-bit insertion.

**zeroize:** To remove or eliminate the key from a crypto-equipment or fill device. [INFOSEC-99]

**zeroized:** Electronically stored data that have been degaussed, erased, or overwritten. [After X9.17]

**zero-level decoder:** A decoder that yields an analog level of 0 dBm at its output when the input is the digital milliwatt signal. [47CFR] *Note:* The signal is a 1-kHz sine wave.

**0 + (7 or 10 digits):** A feature of the North American Numbering Plan that identifies customer dialed calls that are operator assisted, either by electronic or manual (human) means. [After T1.401-1988]

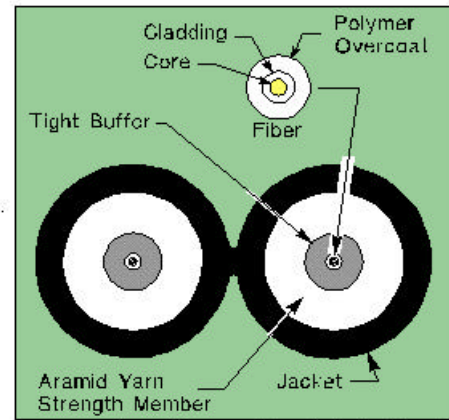
**zero stuffing:** *See* zero-bit insertion.

**zero suppression:** The elimination of nonsignificant zeros from a numeral.

**0TLP:** *Abbreviation for zero transmission level point.*

**zero transmission level point (0TLP):** *Synonym* zero dBm transmission level point.

**zip-cord:** In optical communications, a two-fiber cable consisting essentially of two single-fiber cables having their jackets conjoined by a strip of jacket material. *Note 1:* This name is borrowed from electrical terminology referring to lamp cord. As with lamp cord, optical zip-cord may be easily furcated by slitting or tearing the two jackets apart, permitting the installation of optical connectors. *Note 2:* Zip-cord cables include both loose-buffer and tight-buffer designs. [FAA]



cross section of a two-fiber tight-buffered zip-cord optical cable

**zone:** *See communications zone, Fresnel zone, skip zone.*

**zone of influence:** The area surrounding a power station that is raised in potential above a remote or true grounding (earthing) point. [T1.318-2000]

**zone of protection:** The space, adjacent to a lightning protection system, that is substantially immune to direct lightning strokes. [After T1.318-2000]

**zone of silence:** *Synonym skip zone.*

**zooming:** The act of changing the scale of a display, generally without changing the amount of screen space it occupies. [T1.232-1996]

**Z Time:** *Abbreviation for Zulu Time. See Coordinated Universal Time.*

**Zulu Time (Z):** *Synonym Coordinated Universal Time. Formerly a synonym for Greenwich Mean Time.*