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. (188)

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 format: The structure of data, address, and control information in a packet. (188) *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 Internet groper: *See* **ping.**

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. (188)

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. (188)

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. (188)

packet-switching network: A switched network that transmits data in the form of packets. (188)

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. (188) *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.

packing density: The number of storage cells per unit length, area, or volume of storage media. *Note:* Examples of packing density are the number of bits or characters stored per unit length of magnetic tape and the number of bits stored per unit length of track on an optical disk.

pad: A network, of fixed resistors, that attenuates signals by a fixed amount with negligible distortion. (188) *Note:* The resistive network is called an *attenuator* if the resistance is adjustable.

PAD: *Acronym for* **packet assembler/disassembler.**

pager: A mobile receiver for paging communications, also known as a *"beeper."* [47CFR]

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]

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. (188)

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. (188) *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. (188)

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.

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. (188) *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. *Contrast with* **serial port.** [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. *Contrast with* **serial-to-parallel conversion.**

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. (188) *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. (188) *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. (188)

parity: 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.

parity check: A test that determines whether the number of ones or zeros in an array of binary digits is odd or even. (188) *Note:* Odd parity is standard for synchronous transmission and even parity for asynchronous transmission. *Synonym* **odd-even check.**

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). (188) *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.

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 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. (188) *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 network: A network that does not require a power source for its operation. (188) [From Weik '89]

passive repeater: An unpowered device used to route a microwave beam over or around an obstruction. (188) *Note:* Examples of passive repeaters are (a) two parabolic antennas connected back-to-back, and (b) a flat reflector used as a mirror.

passive satellite: 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. (188)

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.

password: 1. [A] protected/private character string used to authenticate an identity or to authorize access to data. [NIS] **2**. In data communications, a word, character, or combination thereof, that permits access to otherwise inaccessible data, information, or facilities. (188)

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. (188) **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. (188) *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. (188)

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. (188) *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. (188) *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 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. (188) *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. (188)

path survey: The assembling of pertinent geographical and environmental data required to design a radio communication system. (188)

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: 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.**

payload module: The portion of a payload that completely occupies one or more channels.

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. (188)

PBX: *Abbreviation for* **private branch exchange.** **1.** A subscriber-owned telecommunications ex-

change 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. (188) **3.** A private telephone switchboard that provides on-premises dial service and may provide connections to local and trunked communications networks. (188) *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. *Contrast with* **Universal Personal Telecommunications service.**

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.

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] (188)

peak limiting: A process by which the absolute instantaneous value of a signal parameter is prevented from exceeding a specified value. (188)

peak power output: The output power averaged over that cycle of an electromagnetic wave having the maximum peak value that can occur during transmission. (188)

peak signal level: **1.** In a transmission path, the maximum instantaneous signal power, voltage, or current at any point. (188) **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. (188) *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]

peer entity: In layered systems, one of a set of entities that are in the same layer or the equivalent layer of another system.

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]

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 reliability 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 passage through a partition or wall of an equipment or enclosure by a wire, cable, or other conductive object. (188) **2.** [The] unauthorized act of bypassing the security mechanisms of a cryptographic system or AIS. [NIS] **3.** The passage of a radio frequency through a physical barrier, such as a partition, a wall, a building, or earth.

PEP: *Deprecated abbreviation for* **peak envelope power.** Either "*PX*" or "*pX*" is now preferred. *See* **peak envelope power, power.**

percentage modulation: 1. In angle modulation, the fraction of a specified reference modulation, expressed in percent. (188) **2.** In amplitude modulation, the modulation factor expressed in percent. (188) *Note:* Percentage modulation may also be expressed in dB below 100% modulation.

percent break: In telephone dialing, the ratio, expressed in percent, of the open circuit time to the sum of the open and closed circuit times allotted to a single dial pulse cycle. (188)

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. (188)

performance measurement period: The period during which performance parameters are measured. (188) *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.

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. (188) *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: The processing of various levels of classified or unclassified information at distinctly different times. *Note:* 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. [NIS] (188)

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. (188) *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. (188)

permanent signal (PS): An extended off-hook condition not followed by dialing.

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]

Personal Communications Service: *See* **PCS.**

personal mobility: In universal personal telecommunications, (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:* 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 2:* "Access" is intended to convey the concepts of both originating and terminating services. *Note 3:* Management of the service profile by the user is not part of personal mobility. The personal mobility aspects of personal communications are based on the UPT number.

personal registration: In universal personal telecommunications, the process of associating a UPT user with a specific terminal.

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.

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. (188)

phantom group: Three circuits that are derived from simplexing two physical circuits to form a phantom circuit. (188)

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. (188) *Note 1:* Phase, *i.e., phase time* (frequently abbreviated simply to "phase" in colloquial 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^{o} (2π radians). *Note 3:* Phase may be represented (a) in polar coordinates by $M\angle\theta$, where M is the magnitude and θ 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 θ is the phase angle, and the magnitude, M, is $(a^2 + b^2)^{½}$ **2.** A distinguishable state of a phenomenon. (188) **3.** That period of time during which a specified function occurs in a sequential list of functions. (188)

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^{o} (2π 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 θ 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. (188)

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. (188)

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. (188)

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. (188) *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. (188) *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. (188)

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. (188) *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. (188) *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 2π radians. (188) *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. (188)

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. (188)

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. (188)

phase inversion: Introduction of a phase difference of 180°. *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 $f(t) = Ae^{j\omega t}$, after phase inversion, becomes $f_1(t) = Ae^{j(\omega t+\pi)}$, where t is time, A is the magnitude of the vector, ω 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. (188) *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. (188)

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. (188) *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. (188)

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. (188)

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. (188) *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. (188)

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. (188) **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 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. (188) *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.** *Colloquially*, 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 currently authorized words 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**ango, **U**niform, **V**ictor, **W**hiskey, **X**-ray, **Y**ankee, **Z**ulu. [JP1]

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 $h\nu$, where h is Planck’s constant and ν is the frequency of the electromagnetic wave.

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. (188)

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: *See* **Open Systems Interconnection—Reference Model.**

physical optics: The branch of optics that treats light propagation as a wave phenomenon rather than a ray phenomenon, as in geometric optics.

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. (188) *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.**

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] (188) **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: A signal, usually a single frequency, transmitted over a communications system for supervisory, control, equalization, continuity, synchronization, or reference purposes. (188) *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.

pilot frequency: *See* **synchronizing pilot.**

pilot-make-busy (PMB) circuit: 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. (188)

pilot tone: *See* **pilot.**

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.**

pixel: In a raster-scanned imaging system, the smallest discrete scanning line sample that can contain gray scale information. (188)

PLA: *Abbreviation for* **programmable logic array.**

plain text: Unencrypted information. [NIS] (188) *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. (188) *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 ν 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 ν 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 polarization: *Synonym* **linear polarization.**

plane wave: 1. A wave whose surfaces of constant phase are infinite parallel planes normal to the direction of propagation. (188) **2.** An electromagnetic wave that predominates in the far-field region of an antenna, and has a wavefront that is essentially in a plane. (188) *Note:* In free space, the characteristic impedance of a plane wave is 377 Ω.

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**.

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. (188) *Note:* There is no limit to the phase difference that can accumulate between corresponding significant instants over a long period of time.

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.**

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.**

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.

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 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-point link: A dedicated data link that connects only two stations. (188)

point-to-point transmission: Communications between two designated stations only. (188)

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 ($e \simeq 2.71828$), λ is the constant rate that the events occur, and λt 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. (188) *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. (188) *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. (188) *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 (188)

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). (188)

polar orbit: An orbit for which the angle of inclination is 90°. (188) *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. (188)

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. (188)

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. (188) **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]

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. (188) *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 feedback: *Synonym* **regeneration (def. #1).**

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.

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.**

post-production processing: In broadband ISDN (B-ISDN), applications, the processing of audio and video information after contribution and prior to final use.

power: 1. The rate of transfer or absorption of energy per unit time in a system. (188) **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. (188) **2.** A circuit breaker used on ac circuits rated in excess of 1500V. (188)

power density: *Deprecated synonym for* **irradiance.**

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

$$n(r) = \begin{cases} n_1\sqrt{1 - 2\Delta\left(\dfrac{r}{\alpha}\right)^g}, & r \le \alpha \\ n_1\sqrt{1 - 2\Delta}, & r \ge \alpha \end{cases}$$

$$\text{where} \quad \Delta = \frac{n_1^2 - n_2^2}{2n_1^2},$$

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 $r \ge \alpha$), α is the core radius, and g is a parameter that defines the shape of the profile. *Note 1:* α 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.**

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.**

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. (188)

precise frequency: A frequency that is maintained to the known accuracy of an accepted reference frequency standard. (188) *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. (188) *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)* **reproducibility. 4.** In computer science, a measure of the ability to distinguish between nearly equal values. (188) **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.**

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. (188) *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. (188) *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. (188)

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-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 a CCITT 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 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.

premises wiring: *See* **on-premises wiring.**

premodulation combining: *Synonym* **precombining.**

Presentation Layer: *See* **Open Systems Interconnection—Reference Model.**

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. (188)

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. (188) **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 µm, 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 distribution system: A system of alternating current distribution for supplying the primaries of distribution transformers from the generating station or substation distribution buses. (188)

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 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. (188) *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 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 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 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: 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.

primary substation: Equipment that switches or modifies voltage, frequency, or other characteristics of primary power. (188)

primary time standard: A time standard that does not require calibration against another time standard. (188) *Note 1:* Examples of primary time, (*i.e.*, frequency standards) are cesium standards and hydrogen masers. *Note 2:* The international second is based on the microwave frequency (9,192,631,770 Hz) associated with the atomic resonance of the hyperfine ground-state levels of the cesium-133 atom in a magnetically neutral environment. Realizable cesium frequency standards use a strong electromagnet to deliberately introduce a magnetic field which overwhelms that of the Earth. The presence of this strong magnetic field introduces a slight, but known, increase in the atomic resonance frequency. However, very small variations in the calibration of the electric current in the electromagnet introduce minuscule frequency variations among different cesium oscillators.

principal clock: Of a set of redundant clocks, the clock that is selected for normal use. (188) *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."*

print-through: A transfer of magnetically recorded data from one part of a data medium to another part of the data medium when these parts are brought into physical contact. *Note:* Print-through is most commonly observed in magnetic tape. Print-through may be avoided by rewinding at timely intervals. [From Weik '89]

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. [JP1]

privacy: 1. In a communications system or network, the protection given to information to conceal it from persons having access to the system or network. *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. (188) *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.

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 line: In the telephone industry usage, a service that involves dedicated circuits, private switching arrangements, and/or predefined transmission paths, whether virtual or physical, which provide communications between specific locations. *Note:* Among subscribers to the public switched telephone network(s), the term *"private line"* is often used to mean a one-party switched access line.

private NS/EP telecommunications services: Non-common-carrier telecommunications services, including private line, virtual private line, and private switched network services.

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.

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. (188) **2.** A person who prepares computer programs, *i.e.*, writes sequences of instructions for execution by a computer. (188)

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. (188) *See figure at* **assembly 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.**

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: 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, λ, is a complex quantity given by $\lambda = \alpha + i\beta$, where α, the real part, is the

attenuation constant and β, the imaginary part, is the phase constant.

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. (188)

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. (188) *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. (188)

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. (188) *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. (188)

protected distribution system (PDS): [A] wireline or fiber-optics telecommunication system that includes terminals and adequate acoustical, electrical, electromagnetic, and physical safeguards to permit its use for the unencrypted transmission of classified information. [NIS] *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 (def. #5).**

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. (188)

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]

protector: In telecommunications systems, a device used to protect facilities and equipment from abnormally high voltages or currents. (188) *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. (188) *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.

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 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. [JP1]

provisioning: 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.

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. (188) *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. (188) *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.

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), dBm0p.**

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 600Ω 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. (188) *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. (188)

PTTI: *Abbreviation for* **precise time and time interval.**

public correspondence: Any telecommunication which the offices and stations must, by reason of their being at the disposal of the public, accept for transmission. [NTIA] [RR]

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. (188)

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 cryptography: 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]

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): Any common carrier network that provides circuit switching among public users. (188) *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.

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-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. (188) **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.

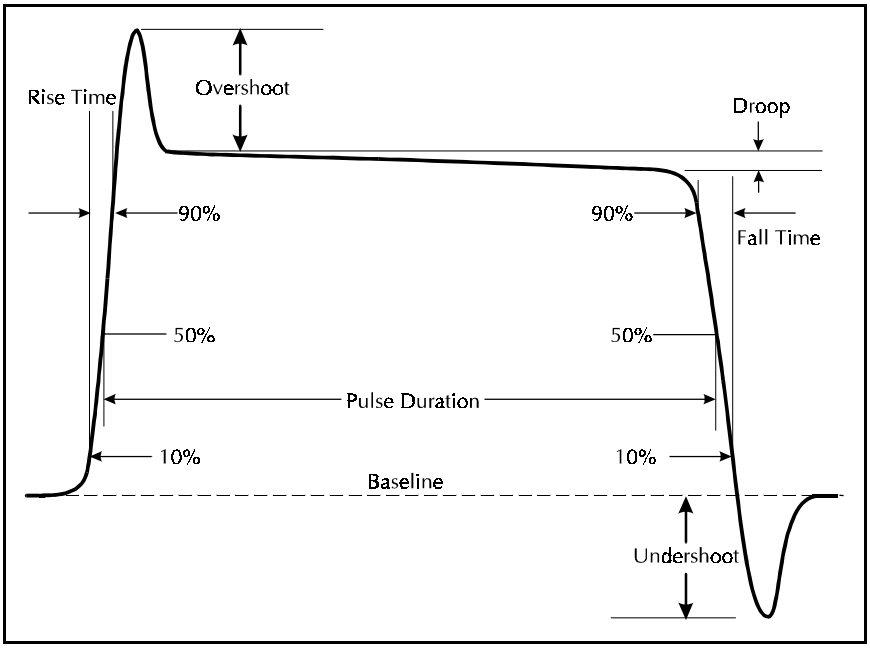
pulse-address multiple access (PAMA): The ability of a communication satellite to receive signals from several Earth terminals simultaneously and to amplify, translate, and relay the signals back to Earth, based on the addressing of each station by an assignment of a unique combination of time and frequency slots. (188) *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. *See illustration under* **pulse.**

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. (188) *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

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. (188) *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 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. (188) *See illustration under* **pulse.** *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.[JP1]

pulse-duration modulation (PDM): Modulation in which the duration of pulses is varied in accordance with some characteristic of the modulating signal. (188) *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. (188)

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. (188)

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. (188) *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. (188)

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.**

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, and (c) each pushbutton or key represents a unique digit or symbol. [From 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. (188) *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. (188) *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. (188) *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**.

p x 64: In video teleconferencing, pertaining to a family of CCITT Recommendations, where p is a non-zero positive integer indicating the number of 64 kb/s channels. (188) *Note:* The p x 64 family includes CCITT Recommendations H.261, H.221, H.242, H.230, and H.320. These Recommendations form the basis for video telecommunications interoperability.

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