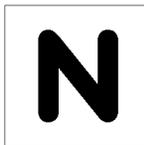


NA: *Abbreviation for numerical aperture.*



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

NAK: *Acronym for negative-acknowledge character.*

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

narrative traffic: Traffic consisting of plain or encrypted messages written in a natural language and transmitted in accordance with standard formats and procedures. (188) *Note:* Examples of narrative traffic include (a) messages that are placed on paper tape and transmitted via a teletypewriter (TTY), and on reception, are converted back to a printed page on another teletypewriter or teleprinter and (b) messages printed on a sheet of paper, transmitted via optical character recognition (OCR) equipment, and on reception, converted back to a printed page on a printer.

narrowband modem: A modem whose modulated output signal has an essential frequency spectrum that is limited to that which can be wholly contained within, and faithfully transmitted through, a voice channel with a nominal 4-kHz bandwidth. (188) *Note:* High frequency (HF) modems are limited to operation over a voice channel with a nominal 3-kHz bandwidth.

narrowband radio voice frequency (NBRVF): In narrowband radio, the nominal 3-kHz bandwidth allocated for single channel radio that provides a transmission path for analog and quasi-analog signals. (188)

narrowband signal: Any analog signal or analog representation of a digital signal whose essential spectral content is limited to that which can be contained within a voice channel of nominal 4-kHz

bandwidth. (188) *Note:* Narrowband radio uses a voice channel with a nominal 3-kHz bandwidth.

***n*-ary code:** A code that has *n* significant conditions, where *n* is a positive integer greater than 1. (188) *Note 1:* The integer substituted for *n* indicates the specific number of significant conditions, *i.e.*, quantization states, in the code. For example, an 8-ary code has eight significant conditions and can convey three bits per code symbol. *Note 2:* A prefix that indicates an integer, *e.g.*, “bi,” “tern,” or “quater,” may be used in lieu of a numeral, to produce “binary,” “ternary,” or “quaternary” (2, 3, and 4 states respectively).

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

NATA: *Abbreviation for North American Telecommunications Association.*

National Command Authorities (NCA): The President and the Secretary of Defense or their duly deputized alternates or successors. [JP1]

National Communications System (NCS): **1.** The organization established by Section 1(a) of Executive Order No. 12472 to assist the President, the National Security Council, the Director of the Office of Science and Technology Policy, and the Director of the Office of Management and Budget, in the discharge of their national security emergency preparedness telecommunications functions. The NCS consists of both the telecommunications assets of the entities represented on the NCS Committee of Principals and an administrative structure consisting of the Executive Agent, the NCS Committee of Principals, and the Manager. **2.** The telecommunications system that results from the technical and operational integration of the separate telecommunications systems of the several executive branch departments and agencies having a significant telecommunications capability. [JP1]

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

National Electric Code® (NEC): A standard that governs the use of electrical wire, cable, and fixtures, and electrical and optical communications cable installed in buildings. *Note:* The NEC was developed by the NEC Committee of the American National Standards Institute (ANSI), was sponsored by the National Fire Protection Association (NFPA), and is identified by the description ANSI/NFPA 70-XXXX, the last four digits representing the year of the NEC revision. (188)

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

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

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

natural frequency: Of an antenna, the lowest frequency at which the antenna resonates without the addition of any inductance or capacitance. (188)

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

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

NBRVF: *Abbreviation for narrowband radio voice frequency.*

NCA: *Abbreviation for National Command Authorities.*

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

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

near-end crosstalk: Crosstalk that is propagated in a disturbed channel in the direction opposite to the direction of propagation of a signal in the disturbing channel. *Note:* The terminals of the disturbed channel, at which the near-end crosstalk is present, and the energized terminal of the disturbing channel, are usually near each other. (188)

near field: *Synonym near-field region (def. #1).*

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

near-field region: **1.** The close-in region of an antenna wherein the angular field distribution is dependent upon distance from the antenna. (188) *Synonyms near field, near zone.* **2.** In optical fiber communications, the region close to a source or aperture. *Note:* The diffraction pattern in this region typically differs significantly from that observed at infinity and varies with distance from the source.

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

near real time: **1.** Pertaining to the delay introduced, by automated data processing, between the occurrence of an event and the use of the processed data, *e.g.*, for display or feedback and control

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

near-vertical-incidence skywave: In radio propagation, a wave that is reflected from the ionosphere at a nearly vertical angle and that is used in short-range communications to reduce the area of the skip zone and thereby improve reception beyond the limits of the ground wave. (188)

near zone: *Synonym near-field region (def. #1).*

NEC: *Abbreviation for National Electric Code®.*

necessary bandwidth: For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions. [NTIA] [RR] (188) *Note:* Emissions useful for the adequate functioning of the receiving equipment, *e.g.*, the emission corresponding to the carrier of reduced carrier systems, must be included in the necessary bandwidth. (188) (*See Annex J of NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management for formulas used to calculate necessary bandwidth.*)

negation circuit: *Deprecated synonym for inverter.*

negative-acknowledge character (NAK): A transmission control character sent by a station as a negative response to the station with which the connection has been set up. (188) *Note 1:* In binary synchronous communication protocol, the NAK is used to indicate that an error was detected in the previously received block and that the receiver is ready to accept retransmission of that block. *Note 2:* In multipoint systems, the NAK is used as the not-ready reply to a poll.

negative feedback: *See feedback (def. #1).*

negative justification: *Synonym de-stuffing.*

negative pulse stuffing: *Synonym de-stuffing.*

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

NEP: *Abbreviation for noise equivalent power.*

neper (Np): A unit used to express ratios, such as gain, loss, and relative values. *Note 1:* The neper is analogous to the decibel, except that the Napierian base 2.718281828... is used in computing the ratio in nepers. *Note 2:* The value in nepers, *Np*, is given by $Np = \ln(x_1/x_2)$, where x_1 and x_2 are the values of interest, and \ln is the natural logarithm, *i.e.*, logarithm to the base *e*. (188) *Note 3:* One neper (Np) = 8.686 dB, where $8.686 = 20/(\ln 10)$. *Note 4:* The neper is often used to express voltage and current ratios, whereas the decibel is usually used to express power ratios. *Note 5:* Like the dB, the Np is a dimensionless unit. *Note 6:* The ITU recognizes both units.

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

net: *Synonym communications net.*

net control station (NCS): **1.** A radio station that performs net control functions, such as controlling traffic and enforcing operational discipline. (188) [From Weik '89] **2.** [A] terminal in a secure telecommunications net responsible for distributing key in electronic form to the members of the net. [NIS]

net gain: The overall gain of a transmission circuit. (188) *Note 1:* Net gain is measured by applying a test

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

net loss: The overall loss of a transmission circuit. (188)

net loss variation: The maximum change in net loss occurring in a specified portion of a communication system during a specified period. (188)

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

net radio interface (NRI): An interface between a single-channel radio station (usually in a radio net) and switched communications systems. (188)

network: **1.** An interconnection of three or more communicating entities. **2.** An interconnection of usually passive electronic components that performs a specific function (which is usually limited in scope), *e.g.*, to simulate a transmission line or to perform a mathematical function such as integration or differentiation. *Note:* A network may be part of a larger circuit. (188)

network administration: A group of network management functions that (a) provide support services, (b) ensure that the network is used efficiently, and (c) ensure prescribed service-quality objectives are met. (188) *Note:* Network administration may include activities such as network

address assignment, assignment of routing protocols and routing table configuration, and directory service configuration.

network architecture: **1.** The design principles, physical configuration, functional organization, operational procedures, and data formats used as the bases for the design, construction, modification, and operation of a communications network. (188) **2.** The structure of an existing communications network, including the physical configuration, facilities, operational structure, operational procedures, and the data formats in use. (188)

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

network connectivity: The topological description of a network that specifies, in terms of circuit termination locations and quantities, the interconnection of the transmission nodes. (188)

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

network element (NE): In integrated services digital networks, a piece of telecommunications equipment that provides support or services to the user. (188)

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

Network File System: *See* **NFS.**

network interface: **1.** The point of interconnection between a user terminal and a private or public network. **2.** The point of interconnection between the public switched network and a privately owned terminal. (188) *Note:* *Code of Federal Regulations*, Title 47, part 68, stipulates the interface parameters. **3.** The point of interconnection between one network and another network. (188)

network interface card (NIC): A network interface device (NID) in the form of circuit card that is installed in an expansion slot of a computer, to provide network access. *Note:* Examples of NICs are cards that interface a computer with an Ethernet LAN and cards that interface a computer with an FDDI ring network.

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

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

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

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

network management: The execution of the set of functions required for controlling, planning, allocating, deploying, coordinating, and monitoring the resources of a telecommunications network, including performing functions such as initial network planning, frequency allocation, predetermined traffic routing to support load balancing, cryptographic key distribution authorization, configuration management, fault management, security management, performance management, and accounting management. *Note:* Network management does not include user terminal equipment. (188)

network manager: In network management, the entity that initiates requests for management information from managed systems or receives spontaneous management-related notifications from managed systems. (188)

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

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

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

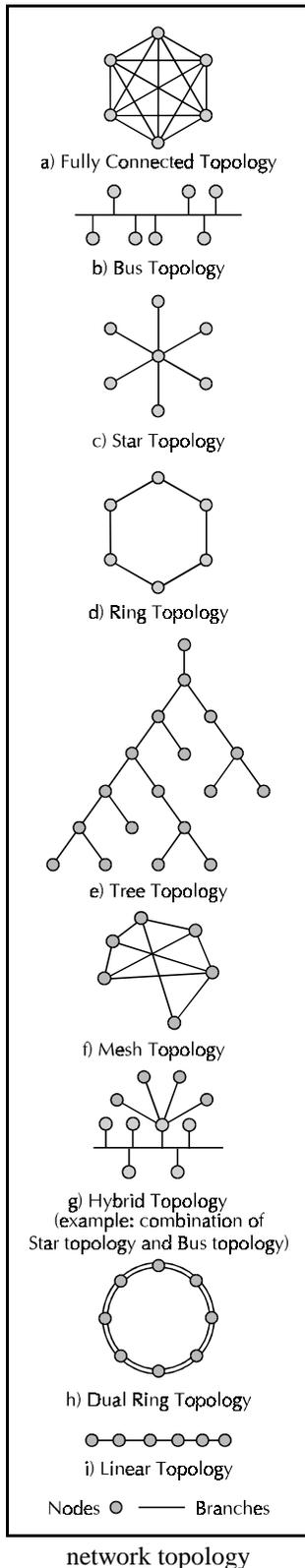
network terminating interface (NTI): *Synonym* **for demarcation point.**

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

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

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

network topology: The specific physical, *i.e.*, real, or logical, *i.e.*, virtual, arrangement of the elements of a



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

➤ **bus topology:** A network topology in which all nodes, *i.e.*, stations, are connected together by a single bus.

➤ **fully connected topology:** A network topology in which there is a direct path (branch) between any two nodes. *Note:* In a fully connected network with n nodes, there are $n(n-1)/2$ direct paths, *i.e.*, branches. *Synonym fully connected mesh network.*

➤ **hybrid topology:** A combination of any two or more network topologies. *Note 1:* Instances can occur where two basic network topologies, when connected together, can still retain the basic network character,

and therefore not be a hybrid network. For example, a tree network connected to a tree network is still a tree network. Therefore, a hybrid network accrues only when two basic networks are connected and the resulting network topology fails to meet one of the basic topology definitions. For example, two star networks connected together exhibit hybrid network topologies. *Note 2:* A hybrid topology always accrues when two different basic network topologies are connected.

➤ **linear topology:** See **bus topology**.

➤ **mesh topology:** A network topology in which there are at least two nodes with two or more paths between them.

➤ **ring topology:** A network topology in which every node has exactly two branches connected to it.

➤ **star topology:** A network topology in which peripheral nodes are connected to a central node, which rebroadcasts all transmissions received from any peripheral node to all peripheral nodes on the network, including the originating node. *Note 1:* All peripheral nodes may thus communicate with all others by transmitting to, and receiving from, the central node only. *Note 2:* The failure of a transmission line, *i.e.*, channel, linking any peripheral node to the central node will result in the isolation of that peripheral node from all others. *Note 3:* If the star central node is passive, the originating node must be able to tolerate the reception of an echo of its own transmission, delayed by the two-way transmission time, *i.e.*, to and from the central node, plus any delay generated in the central node. An active star network has an active central node that usually has the means to prevent echo-related problems. (188)

➤ **tree topology:** A network topology that, from a purely topologic viewpoint, resembles an interconnection of star networks in that individual peripheral nodes are required to transmit to and receive from one other node only, toward a central node, and are not required to act as repeaters or regenerators. (188) *Note 1:* The function of the central node may be distributed. *Note 2:* As in the conventional star network, individual nodes may thus still be isolated from the network by a single-point failure of a transmission path to the node. *Note 3:* A single-point failure of a transmission path within a

distributed node will result in partitioning two or more stations from the rest of the network.

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

neutral: 1. In ac power distribution, the conductor that (a) is intentionally grounded on the supply side of the service disconnect and (b) provides a current return path for ac power currents. (188) **2.** In three-phase ac “Y,” *i.e.*, wye, power distribution, the low-potential fourth wire that conducts only that current required to achieve electrical balance, *i.e.*, to provide a return path for any current imbalance among the three phases.

neutral direct-current telegraph system: A telegraph system in which (a) current flows during marking intervals and no current flows during spacing intervals for the transmission of signals over a line, and (b) the direction of current flow is immaterial. (188) *Synonyms* **single-current system, single-current transmission system, single-Morse system.**

neutral ground: An intentional ground applied to the neutral conductor or neutral point of a circuit, transformer, machine, apparatus, or system. (188)

neutral operation: A method of teletypewriter operation in which marking signals are formed by current pulses of one polarity, either positive or negative, and spacing signals are formed by reducing the current to zero or nearly zero. (188)

neutral relay: A relay in which the direction of movement of the armature does not depend upon the direction of the current in the circuit controlling the armature. (188)

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

NF: *Abbreviation for noise figure.*

NFS: *Abbreviation for Network File System.* A proprietary distributed file system that is widely used by TCP/IP vendors. *Note:* NFS allows different

computer systems to share files, and uses user datagram protocol (UDP) for data transfer.

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

nibble: Part of a byte, usually half of a byte. (*Obsolete*)

NIC: *Abbreviation for network interface card.*

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

NII: *Abbreviation for National Information Infrastructure.*

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

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

nmi: *Abbreviation for nautical mile.*

NOD: *Acronym for network outward dialing.*

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

nodal point: *Synonym node (def. #1).*

node: 1. In network topology, a terminal of any branch of a network or an interconnection common to two or more branches of a network. (188) *Synonyms* **junction point, nodal point.** **2.** In a switched network, one of the switches forming the network backbone. *Note:* A node may also include patching and control facilities. (188) **3.** A technical control facility (TCF). (188) **4.** A point in a standing or stationary wave at which the amplitude is a minimum. (188) *In this sense, synonym null.*

noise: 1. An undesired disturbance within the frequency band of interest; the summation of unwanted or disturbing energy introduced into a communications system from man-made and natural

sources. (188) **2.** A disturbance that affects a signal and that may distort the information carried by the signal. **3.** Random variations of one or more characteristics of any entity such as voltage, current, or data. **4.** A random signal of known statistical properties of amplitude, distribution, and spectral density. **5.** *Loosely*, any disturbance tending to interfere with the normal operation of a device or system.

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

noise equivalent power (NEP): At a given data-signaling rate or modulation frequency, operating wavelength, and effective noise bandwidth, the radiant power that produces a signal-to-noise ratio of unity at the output of a given optical detector. (188) *Note 1:* Some manufacturers and authors define NEP as the minimum detectable power per square root bandwidth. When defined this way, NEP has the units of watts per (hertz)^{1/2}. Therefore, the term is a misnomer, because the units of power are watts. *Note 2:* Some manufacturers define NEP as the radiant power that produces a signal-to-dark-current noise ratio of unity. The NEP measurement is valid only if the dark-current noise dominates the noise level.

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

noise figure (NF): The ratio of the output noise power of a device to the portion thereof attributable to thermal noise in the input termination at standard noise temperature (usually 290 K). (188) *Note:* The noise figure is thus the ratio of actual output noise to that which would remain if the device itself did not introduce noise. In heterodyne systems, output noise power includes spurious contributions from image-frequency transformation, but the portion attributable to thermal noise in the input termination at standard noise temperature includes only that which appears in the output via the principal frequency transformation of the system, and excludes that which appears via the image frequency transformation. *Synonym* **noise factor.**

noise level: The noise power, usually relative to a reference. (188) *Note:* Noise level is usually measured in dB for relative power or picowatts for absolute power. A suffix is added to denote a particular reference base or specific qualities of the measurement. Examples of noise-level measurement units are dBa, dBa(F1A), dBa(HA1), dBa0, dBm, dBm(psoph), dBm0, dBm0P, dBrn, dBrnC, dBrn(f_1 - f_2), dBrn(144-line), pW, pWp, and pWp0.

noise power: **1.** The power generated by a random electromagnetic process. (188) **2.** Interfering and unwanted power in an electrical device or system. **3.** In the acceptance testing of radio transmitters, the mean power supplied to the antenna transmission line by a radio transmitter when loaded with noise having a Gaussian amplitude-vs.-frequency distribution. (188)

noise power density: The noise power in a bandwidth of 1 Hz, *i.e.*, the noise power per hertz at a point in a noise spectrum. *Note:* The noise-power density of the internal noise that is contributed by a receiving system to an incoming signal is expressed as the product of Boltzmann's constant, k , and the equivalent noise temperature, T_n . Thus, the noise-power density is often expressed simply as kT . *Synonym* **kT .** [From Weik '89]

noise suppression: **1.** Reduction of the noise power level in electrical circuits. **2.** The process of automatically reducing the noise output of a receiver during periods when no carrier is being received. (188) *Contrast with* **squelch.**

noise temperature: At a pair of terminals, the temperature of a passive system having an available noise power per unit bandwidth at a specified frequency equal to that of the actual terminals of a network. *Note:* The noise temperature of a simple resistor is the actual temperature of that resistor. The noise temperature of a diode may be many times the actual temperature of the diode.

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

noise weighting: A specific amplitude-vs.-frequency characteristic that permits a measuring set to give numerical readings that approximate the interfering effects to any listener using a particular class of telephone instrument. (188) *Note 1:* Noise weighting measurements are made in lines terminated either by the measuring set or the class of instrument. *Note 2:* The most widely used noise weightings were established by agencies concerned with public telephone service, and are based on characteristics of specific commercial telephone instruments, representing successive stages of technological development. The coding of commercial apparatus appears in the nomenclature of certain weightings. The same weighting nomenclature and units are used in military versions of commercial noise measuring sets.

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

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

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

nominal bandwidth: The widest band of frequencies, inclusive of guard bands, assigned to a channel. (188) *Note:* Nominal bandwidth should not be confused with the terms “*necessary bandwidth*,” “*occupied bandwidth*,” or “*rf bandwidth*.”

nominal bit stuffing rate: The rate at which stuffing bits are inserted when both the input and output bit rates are at their nominal values. (188)

nominal linewidth: In facsimile systems, the average separation between centers of adjacent scanning or recording lines. (188)

nonassociated common-channel signaling: A form of common-channel signaling where the signaling channel serves one or more trunk groups, at least one of which terminates at a point other than the signal transfer point at which the signaling channel terminates. (188)

nonblocking switch: A switch that has enough paths across it that an originated call can always reach an available line without encountering a busy condition. (188)

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

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

noncircularity: *Synonym ovality.*

noncritical technical load: Of the total technical load at a facility during normal operation, the part that is not required for synchronous operation. (188)

nonerasable storage: *Synonym read-only memory.*

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

nonlinear distortion: Distortion caused by a deviation from a linear relationship between specified input and output parameters of a system or component. (188)

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

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

nonoperational load: Administrative, support, and housing power requirements. (188) *Synonym utility load.*

nonresonant antenna: *Synonym aperiodic antenna.*

non-return-to-zero (NRZ): A code in which "1s" are represented by one significant condition and "0s" are represented by another, with no neutral or rest condition, such as a zero amplitude in amplitude modulation (AM), zero phase shift in phase-shift keying (PSK), or mid-frequency in frequency-shift keying (FSK). (188) *Note 1: Contrast with Manchester code, return-to-zero.* *Note 2:* For a given data signaling rate, *i.e.*, bit rate, the NRZ code requires only one-half the bandwidth required by the Manchester code.

non-return-to-zero change-on-ones (NRZ1): A code in which "1s" are represented by a change in a significant condition and "0s" are represented by no change. (188)

non-return-to-zero mark (NRZ-M): A binary encoding scheme in which a signal parameter, such as electric current or voltage, undergoes a change in a significant condition or level every time that a "one" occurs, but when a "zero" occurs, it remains the same, *i.e.*, no transition occurs. *Note 1:* The transitions could also occur only when "zeros" occur and not when "ones" occur. If the significant condition transition occurs on each "zero," the encoding scheme is called "non-return-to-zero space" (NRZ-S). *Note 2:* NRZ-M and NRZ-S signals are technically interchangeable; *i.e.*, one is the logical "NOT"

(inverse) of the other. It is necessary for the receiver to have prior knowledge of which scheme is being used. Without such knowledge, it is impossible for the receiver to interpret the data stream correctly; *i.e.*, its output may be the correct data stream or the logical inverse of the correct data stream. [From Weik '89] *Contrast with non-return-to-zero space.* *Synonyms conditioned baseband representation, differentially encoded baseband, non-return-to-zero one (NRZ-1), NRZ-B.*

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

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

nonshifted fiber: *Synonym dispersion-unshifted fiber.*

nonsynchronous data transmission channel: A data transmission channel in which separate timing information is not transferred between the data terminal equipment (DTE) and the data circuit terminating equipment (DCE). (188)

nonsynchronous network: *Synonym asynchronous network.*

nonsynchronous system: *See asynchronous transmission.*

nonsynchronous transmission: *See asynchronous transmission.*

nontechnical load: Of the total operational load at a facility during normal operation, the part used for support purposes, such as general lighting, heating, air-conditioning, and ventilating equipment. (188)

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

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

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

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

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

where V is the normalized frequency greater than 5 and g is the profile parameter. *Note 2:* For a step index fiber, the mode volume is given by $V^2/2$. For single-mode operation, $V < 2.405$. *Synonym V number. 2.* The ratio between an actual frequency and a reference value. *3.* The ratio between an actual frequency and its nominal value. (188)

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

notched filter: *Synonym band-stop filter.*

notched noise: Noise from which a narrow band of frequencies has been removed. (188) *Note:* Notched noise is usually used for testing devices or circuits.

not-ready condition: At the data terminal equipment/data circuit-terminating equipment (DTE/DCE) interface, a steady-state condition that indicates that the DCE is not ready to accept a call-request signal or that the DTE is not ready to accept an incoming call. (188)

Np: *Abbreviation for neper.*

NRI: *Abbreviation for net radio interface.*

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

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

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

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

NTI: *Abbreviation for network terminating interface.*

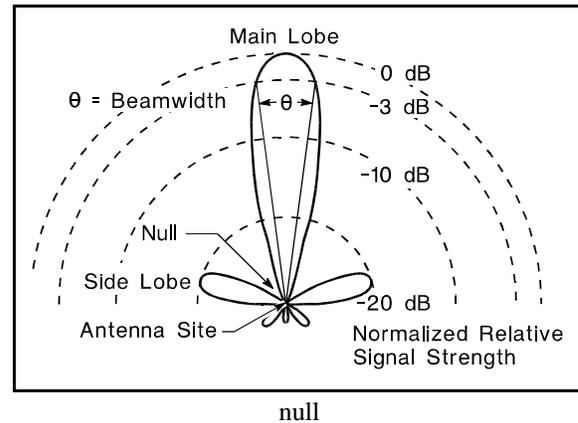
NTN: *Abbreviation for network terminal number.*

NTSC standard: *Abbreviation for National Television Standards Committee standard.* The North American standard (525-line interlaced raster-scanned video) for the generation, transmission, and reception of television signals. *Note 1:* In the NTSC standard, picture information is transmitted in vestigial-sideband AM and sound information is

transmitted in FM. *Note 2:* In addition to North America, the NTSC standard is used in Central America, a number of South American countries, and some Asian countries, including Japan. *Contrast with PAL, PAL-M, SECAM.*

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

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



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

numerical aperture (NA): **1.** The sine of the vertex angle of the largest cone of meridional rays that can enter or leave an optical system or element, multiplied by the refractive index of the medium in which the vertex of the cone is located. *Note:* The NA is generally measured with respect to an object or image point and will vary as that point is moved. **2.** For an optical fiber in which the refractive index decreases monotonically from n_1 on the axis to n_2 in the cladding, an expression of the extent of the fiber's ability to accept, in its bound modes, non-normal incident rays, given by $NA = (n_1^2 - n_2^2)^{1/2}$. *Note:* In multimode fibers, the term *equilibrium numerical aperture* is sometimes used. This refers to the numerical aperture with respect to the extreme exit angle of a ray emerging from a fiber in which equilibrium mode distribution has been established. (188) **3. Colloquially,** the sine of the radiation or acceptance angle of an optical fiber, multiplied by the refractive index of the material in contact with the exit or entrance face. *Note:* This usage is approximate and imprecise, but is often encountered.

numerical aperture loss: A loss of optical power that occurs at a splice or a pair of mated connectors when the numerical aperture of the "transmitting" fiber

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

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

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

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

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

Nyquist interval: The maximum time interval between equally spaced samples of a signal that will enable the signal waveform to be completely determined. (188) *Note 1:* The Nyquist interval is equal to the reciprocal of twice the highest frequency component of the sampled signal. *Note 2:* In practice, when analog signals are sampled for the purpose of digital transmission or other processing, the sampling rate must be more frequent than that defined by Nyquist’s

theorem, because of quantization error introduced by the digitizing process. The required sampling rate is determined by the accuracy of the digitizing process.

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

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

(this page intentionally left blank)