

**Hagelbarger code:** A convolutional code that enables error bursts to be corrected provided that there are relatively long error-free intervals between the error bursts. *Note:* In the Hagelbarger code, inserted parity check bits are spread out in time so that an error burst is not likely to affect more than one of the groups in which parity is checked.



**half-duplex (HDX) operation:** Operation in which communication between two terminals occurs in either direction, but in only one direction at a time. (188) *Note:* Half-duplex operation may occur on a half-duplex circuit or on a duplex circuit, but it may not occur on a simplex circuit. *Synonyms* **one-way reversible operation, two-way alternate operation.**

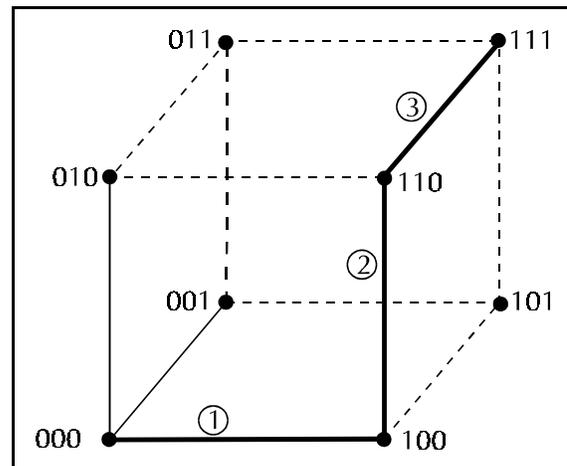
**halftone:** Any photomechanical printing surface or the impression therefrom in which detail and tone values are represented by a series of evenly spaced dots in varying size and shape, varying in direct proportion to the intensity of tones they represent. [JP1]

**halftone characteristic:** **1.** In facsimile systems, the relationship between the density of the recorded copy and the density of the object, *i.e.*, the original. (188) **2.** In facsimile systems, the relationship between the amplitude of the facsimile signal to either the density of the object or the density of the recorded copy when only a portion of the system is under consideration. *Note:* In an FM facsimile system, an appropriate parameter other than the amplitude is used.

**Hamming code:** An error-detecting and error-correcting binary code, used in data transmission, that can (a) detect all single- and double-bit errors and (b) correct all single-bit errors. *Note:* A Hamming code satisfies the relation  $2^m \geq n+1$ , where  $n$  is the total number of bits in the block,  $k$  is the number of information bits in the block, and  $m$  is the number of check bits in the block, where  $m = n - k$ .

**Hamming distance:** The number of digit positions in which the corresponding digits of two binary words of the same length are different. *Note 1:* The

Hamming distance between 1011101 and 1001001 is two. *Note 2:* The concept can be extended to other notation systems. For example, the Hamming distance between 2143896 and 2233796 is three, and between “toned” and “roses” it is also three. *Synonym* **signal distance.**



the number of digit positions in which the corresponding digits of two binary numbers or words of the same length are different

**Hamming weight:** The number of non-zero symbols in a symbol sequence. *Note:* For binary signaling, Hamming weight is the number of “1” bits in the binary sequence.

**handoff:** **1.** In cellular mobile systems, the process of transferring a phone call in progress from one cell transmitter and receiver and frequency pair to another cell transmitter and receiver using a different frequency pair without interruption of the call. **2.** In satellite communications, the process of transferring ground-station control responsibility from one ground station to another without loss or interruption of service. (188)

**handshaking:** **1.** In data communications, a sequence of events governed by hardware or software, requiring mutual agreement of the state of the operational modes prior to information exchange. **2.** The process used to establish communications parameters between two stations. (188) *Note:* Handshaking follows the establishment of a circuit between the stations and precedes information transfer. It is used to agree upon such parameters as

information transfer rate, alphabet, parity, interrupt procedure, and other protocol features.

**hangover:** *Synonym tailing.*

**HA1-receiver weighting:** A noise weighting used in a noise measuring set to measure noise across the HA1-receiver of a 302-type or similar instrument. (188) *Note 1:* The meter scale readings of an HA1 test set are in dBa (HA1). *Note 2:* HA1 noise weighting is obsolete for new DOD applications.

**hard copy:** In computer graphics and in telecommunications, a permanent reproduction, on any media suitable for direct use by a person, of displayed or transmitted data. (188) *Note 1:* Examples of hard copy include teletypewriter pages, continuous printed tapes, facsimile pages, computer printouts, and radiophoto prints. *Note 2:* Magnetic tapes, diskettes, and nonprinted punched paper tapes are not hard copy.

**hard disk:** A flat, circular, rigid plate with a magnetizable surface on one or both sides of which data can be stored. *Note:* A hard disk is distinguished from a diskette by virtue of the fact that it is rigid. Early in the development of computer technology, hard disks, often multiple disks mounted on a common spindle, were interchangeable and removable from their drives, which were separate from the processor chassis. This technology is still in use, especially in conjunction with large mainframe computers, but physically smaller computers use hard disks that are in sealed units, along with their control electronics and read/write heads. The sealed units are usually installed permanently in the same chassis that contains the processor.

**hardened:** Pertaining to the condition of a facility with protective features that enable it to withstand destructive forces, such as explosions, natural disasters, or ionizing radiation. (188)

**hard limiting:** *See limiting.*

**hard sectoring:** In magnetic or optical disk storage, sectoring that uses a physical mark on the disk, from which mark sector locations are referenced. *Note:* Hard sectoring may be done, for example, by punching an index hole in a floppy diskette. When

the presence of the index hole is recognized by an optical reader, a reference signal is generated. All sector locations can be referenced from this signal.

**hardware:** **1.** Physical equipment as opposed to programs, procedures, rules, and associated documentation. (188) **2.** The generic term dealing with physical items as distinguished from its capability or function such as equipment, tools, implements, instruments, devices, sets, fittings, trimmings, assemblies, subassemblies, components, and parts. *Note:* *Hardware* is often used in regard to the stage of development, as in the passage of a device or component from the design stage into the hardware stage as the finished object. [After JP1] **3.** In data automation, the physical equipment or devices forming a computer and peripheral components. [JP1]

**hardwire:** **1.** To connect equipment or components permanently in contrast to using switches, plugs, or connectors. (188) **2.** To wire in fixed logic or read-only storage that cannot be altered by program changes. (188)

**harmful interference:** **1.** Any emission, radiation, or induction interference that endangers the functioning or seriously degrades, obstructs, or repeatedly interrupts a communications system, such as a radio navigation service, telecommunications service, radio communications service, search and rescue service, or weather service, operating in accordance with approved standards, regulations, and procedures. (188) *Note:* To be considered harmful interference, the interference must cause serious detrimental effects, such as circuit outages and message losses, as opposed to interference that is merely a nuisance or annoyance that can be overcome by appropriate measures. **2.** Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with these [Radio] Regulations. [NTIA] [RR]

**harmonic:** **1.** Of a sinusoidal wave, an integral multiple of the frequency of the wave. *Note:* The frequency of the sine wave is called the fundamental frequency or the first harmonic, the second

harmonic is twice the fundamental frequency, the third harmonic is thrice the fundamental frequency, etc. **2.** Of a periodic signal or other periodic phenomenon, such as an electromagnetic wave or a sound wave, a component frequency of the signal that is an integral multiple of the fundamental frequency. *Note:* The fundamental frequency is the reciprocal of the period of the periodic phenomenon. *Contrast with* **fundamental, overtone.**

**harmonic distortion:** In the output signal of a device, distortion caused by the presence of frequencies that are not present in the input signal. *Note:* Harmonic distortion is caused by nonlinearities within the device. (188)

**hazards of electromagnetic radiation to fuel (HERF):** The potential for electromagnetic radiation to cause ignition or detonation of volatile combustibles, such as aircraft fuels. (188)

**hazards of electromagnetic radiation to ordnance (HERO):** The potential for electromagnetic radiation to affect adversely munitions or electroexplosive devices. (188)

**hazards of electromagnetic radiation to personnel (HERP):** The potential for electromagnetic radiation to produce harmful biological effects in humans. (188)

**H-bend:** A smooth change in the direction of the axis of a waveguide, throughout which the axis remains in a plane parallel to the direction of magnetic H-field (transverse) polarization. (188) *Synonym* **H-plane bend.**

**H-channel:** In Integrated Services Digital Networks (ISDN), a 384-kb/s, 1472-kb/s, or 1536-kb/s channel, designated as "H<sub>0</sub>", "H<sub>10</sub>", and "H<sub>11</sub>", respectively, accompanied by timing signals used to carry a wide variety of user information. (188) *Note:* Examples of types of user information representation forms include fast facsimile, video, high-speed data, high-quality audio, packet-switched data, bit streams at rates less than the respective H-channel bit rate that have been rate-adapted or multiplexed together, and packet-switched information.

**HDLC:** *Abbreviation for* **high-level data link control.**

**HDTV:** *Abbreviation for* **high-definition television.**

**HDX:** *Abbreviation for* **half duplex.**

**head:** A device that reads, writes, and/or erases data on a storage medium.

**head end: 1.** A central control device required by some networks (*e.g.*, LANs or MANs) to provide such centralized functions as remodulation, retiming, message accountability, contention control, diagnostic control, and access to a gateway. **2.** A central control device, within CATV systems, that provides centralized functions such as remodulation.

**header:** The portion of a message that contains information used to guide the message to the correct destination. (188) *Note:* Examples of items that may be in a header are the addresses of the sender and receiver, precedence level, routing instructions, and synchronizing bits.

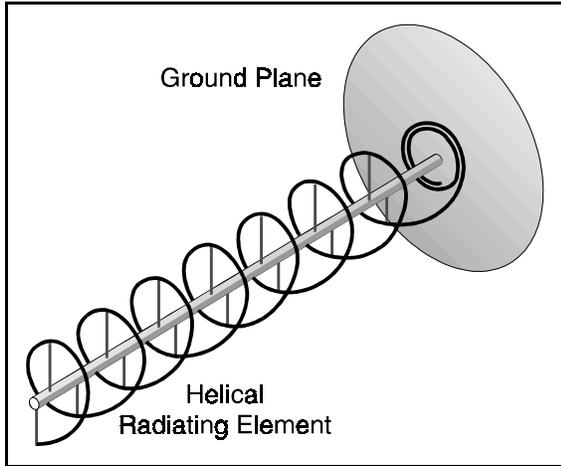
**head-of-bus function:** The function that generates management information and empty bus slots at the point on each bus where data flow begins. (188)

**head-on collision:** A collision that occurs on a communications channel when two or more users begin to transmit on the channel at approximately the same instant.

**Heaviside layer:** *Synonym* **E region.**

**height gain:** For a given propagation mode of an electromagnetic wave, the ratio of the field strength at a specified height to the field strength at the surface of the Earth.

**helical antenna:** An antenna that has the form of a helix. (188) *Note:* When the helix circumference is much smaller than one wavelength, the antenna radiates at right angles to the axis of the helix. When the helix circumference is one wavelength, maximum radiation is along the helix axis.



helical antenna

**HEMP:** *Abbreviation for high-altitude electromagnetic pulse.*

**HE<sub>11</sub> mode:** Designation for the fundamental hybrid mode of an optical fiber.

**HERF:** *Abbreviation for hazards of electromagnetic radiation to fuel.*

**HERO:** *Abbreviation for hazards of electromagnetic radiation to ordnance.*

**HERP:** *Abbreviation for hazards of electromagnetic radiation to personnel.*

**hertz (Hz):** **1.** The SI unit of frequency, equal to one cycle per second. *Note:* A periodic phenomenon that has a period of one second has a frequency of one hertz. (188) **2.** A unit of frequency which is equivalent to one cycle per second. [NTIA]

**Hertzian wave:** *Synonym radio wave.*

**heterochronous:** A relationship between two signals such that their corresponding significant instants do not necessarily occur at the same time. (188) *Note:* Two signals having different nominal signaling rates and not stemming from the same clock or from homochronous clocks are usually heterochronous.

**heterodyne:** **1.** To generate new frequencies by mixing two or more signals in a nonlinear device such as a vacuum tube, transistor, or diode mixer.

(188) *Note:* A superheterodyne receiver converts any selected incoming frequency by heterodyne action to a common intermediate frequency where amplification and selectivity (filtering) are provided.

**2.** A frequency produced by mixing two or more signals in a nonlinear device. (188)

**heterodyne repeater:** In radio reception and retransmission, a repeater that converts the original band of frequencies of the received signal to a different frequency band for retransmission after amplification. *Note:* Heterodyne repeaters are used, for example, in microwave systems, to avoid undesired feedback between the receiving and transmitting antennas. (188) *Synonym IF repeater.*

**heterogeneous multiplexing:** Multiplexing in which not all the information-bearer channels operate at the same data signaling rate.

**heuristic routing:** Routing in which data, such as time delay, extracted from incoming messages, during specified periods and over different routes, are used to determine the optimum routing for transmitting data back to the sources. *Note:* Heuristic routing allows a measure of route optimization based on recent empirical knowledge of the state of the network.

**hexadecimal:** **1.** Characterized by a selection, choice or condition that has sixteen possible different values or states. *Synonym sexadecimal.* **2.** Pertaining to a fixed-radix numeration system in which the radix is sixteen.

**HF:** *Abbreviation for high frequency.*

**HFDF:** *Abbreviation for high-frequency distribution frame.*

**hierarchical computer network:** A computer network in which processing and control functions are performed at several levels by computers specially suited for the functions performed, such as industrial process control, inventory control, database control, or hospital automation.

**hierarchically synchronized network:** A mutually synchronized network in which some clocks exert more control than others, the network operating

frequency being a weighted mean of the natural frequencies of the population of clocks.

**hierarchical routing:** Routing that is based on hierarchical addressing. *Note:* Most Transmission Control Protocol/Internet Protocol (TCP/IP) routing is based on a two-level hierarchical routing in which an IP address is divided into a network portion and a host portion. Gateways use only the network portion until an IP datagram reaches a gateway that can deliver it directly. Additional levels of hierarchical routing are introduced by the addition of subnetworks.

**high-altitude electromagnetic pulse (HEMP):** An electromagnetic pulse produced at an altitude effectively above the sensible atmosphere, *i.e.*, above about 120 km. (188)

**high-definition television (HDTV):** Television that has approximately twice the horizontal and twice the vertical emitted resolution specified by the NTSC standard. *Note 1:* In HDTV, the total number of pixels is therefore approximately four times that of the NTSC standard. *Note 2:* HDTV may include any or all improved-definition television (IDTV) and extended-television (EDTV) improvements. *Note 3:* HDTV employs a wide aspect ratio.

**higher frequency ground:** *Deprecated term name. See facility grounding system.*

**high frequency (HF):** Frequencies from 3 MHz to 30 MHz. (188)

**high-frequency distribution frame (HFDF):** A distribution frame that provides terminating and interconnecting facilities for those combined supergroup modulator output circuits and combined supergroup demodulator input circuits that contain signals occupying the baseband spectrum. (188)

**high-level control:** In the hierarchical structure of a primary or secondary data transmission station, the conceptual level of control or processing logic that (a) is above the Link Level and (b) controls Link Level functions, such as device control, buffer allocation, and station management.

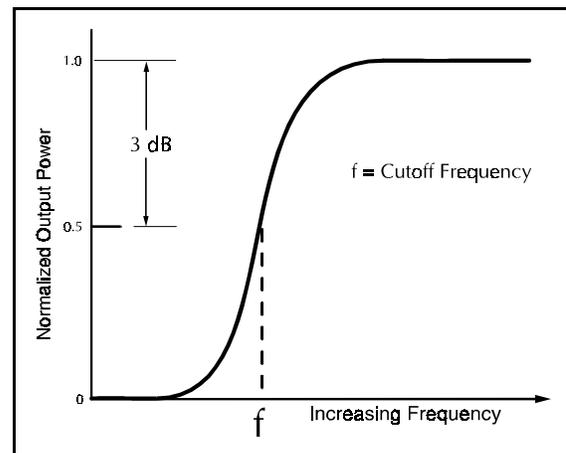
**high-level data link control (HDLC):** A Link-Level protocol used to facilitate reliable point-to-point

transmission of a data packet. *Note:* A subset of HDLC, known as "LAP-B," is the Layer-two protocol for CCITT Recommendation X.25.

**high-level language (HLL):** A computer programming language that is primarily designed for, and syntactically oriented to, particular classes of problems and that is essentially independent of the structure of a specific computer or class of computers; for example, Ada®, COBOL, Fortran, Pascal. *Synonym high-order language.*

**high-order language:** *Synonym high-level language.*

**high-pass filter:** A filter that passes frequencies above a given frequency and attenuates all others. (188)



high-pass filter

**high-performance equipment:** Equipment that (a) has the performance characteristics required for use in trunks or links, (b) is designed primarily for use in global and tactical systems, and (c) sufficiently withstands electromagnetic interference when operating in a variety of network or point-to-point circuits. (188) *Note:* Requirements for global and tactical high-performance equipment may differ.

**high-usage trunk group:** A group of trunks for which an alternate route has been provided to absorb the relatively high rate of overflow traffic. (188)

**highway:** **1.** A digital serial-coded bit stream with time slots allotted to each call on a sequential basis. **2.** A common path or a set of parallel paths over which signals from more than one channel pass with separation achieved by time division.

**hiss:** Noise in the audio frequency range, having subjective characteristics analogous to prolonged sibilant sounds. (188) *Note:* Noise in which there are no pronounced low-frequency components may be considered as hiss.

**hit:** **1.** A transient disturbance to a communication medium. (188) **2.** A match of data to a prescribed criterion.

**HLL:** *Abbreviation for high-level language.*

**hockey puck:** A polishing fixture used to facilitate the manual finishing of the endfaces of certain types of optical fiber connectors. *Note 1:* The hockey puck consists of the appropriate mating sleeve for the connector in question, mounted at right angles to, and in the center of, a disk of stainless steel or other hard material. When the unfinished connector, secured to the fiber-optic cable, is mounted in the hockey puck, excess material (*e.g.*, fiber end, bead of adhesive material, and excess connector length, if present) protrudes from the opposite side of the disk. The excess is then ground away as the fixture is manually swept to and fro, usually in a figure-8 pattern, in contact with a piece of microfinishing film which is in turn supported by a rigid flat substrate. Two to four grades of microfinishing film, with abrasive particles ranging in size from 15  $\mu\text{m}$  to 0.3  $\mu\text{m}$ , are commonly used. [After FAA] *Note 2:* Various manufacturers use proprietary names to identify this device; however "hockey puck" has become ubiquitous.

**hold-in frequency range:** The range of frequencies over which a phase-locked loop can vary and still maintain frequency lock.

**holding time:** The total length of time that a call makes use of a trunk or channel. (188) *Note:* Holding time is usually measured in seconds.

**homing:** **1.** A process in which a mobile station is directed, or directs itself, toward an electromagnetic,

thermal, sonic, or other source of energy, whether primary or reflected, or follows a vector force field or a gradient of a scalar force field. **2.** In radio direction finding, the locating of a moving signal source by a moving direction-finding station that has a mobile advantage. **3.** The act of approaching a source of electromagnetic radiation in which the approaching vehicle is guided by a receiver with a directional antenna. **4.** Seeking, finding, intercepting, and engaging an object, *i.e.*, a target (fixed or mobile) that may contain a signal source. [From Weik '89]

**homochronous:** The relationship between two signals such that their corresponding significant instants are displaced by a constant interval of time. (188)

**homogeneous cladding:** In an optical fiber, a cladding in which the nominal refractive index is constant throughout. *Note:* An optical fiber may have several homogeneous claddings, each having a different refractive index.

**homogeneous multiplexing:** Multiplexing in which all of the information-bearer channels operate at the same data signaling rate.

**hop:** **1.** The excursion of a radio wave from the Earth to the ionosphere and back to the Earth. (188) *Note:* The number of hops indicates the number of reflections from the ionosphere. **2.** A waveform transmitted for the duration of each relocation of the carrier frequency of a frequency-hopped system. (188) **3.** To modify a modulated waveform with constant center frequency so that it frequency hops. (188)

**hop count:** **1.** In a data communications network, the number of legs traversed by a packet between its source and destination. *Note:* Hop count may be used to determine the time-to-live for some packets. **2.** The number of signal regenerating devices (such as repeaters, bridges, routers, and gateways) through which data must pass to reach their destination.

**horizon angle:** Of a directional antenna, the angle, in a vertical plane, subtended by the lines extending (a) from the antenna to the radio horizon and (b) from

the antenna in its direction of maximum radiation. (188)

**horizontal redundancy check:** *Synonym longitudinal redundancy check.*

**horizontal resolution:** In facsimile, the number of picture elements per unit distance in the direction of scanning or recording. (188)

**horn:** **1.** In radio transmission, an open-ended waveguide, of increasing cross-sectional area, which radiates directly in a desired direction or feeds a reflector that forms a desired beam. (188) *Note 1:* Horns may have one or more expansion curves, *i.e.*, longitudinal cross sections, such as elliptical, conical, hyperbolic, or parabolic curves, and not necessarily the same expansion curve in each (E-plane and H-plane) cross section. *Note 2:* A very wide range of beam patterns may be formed by controlling horn dimensions and shapes, placement of the reflector, and reflector shape and dimensions. **2.** A portion of a waveguide in which the cross section is smoothly increased along the axial direction. (188) **3.** In audio systems, a tube, usually having a rectangular transverse cross section and a linearly or exponentially increasing cross-sectional area, used for radiating or receiving acoustic waves.

**horn gap switch:** A switch provided with arcing horns, ordinarily used for disconnecting or breaking the charging current of overhead transmission and distribution lines. (188)

**host:** **1.** In packet- and message-switching communications networks, the collection of hardware and software that makes use of packet or message switching to support user-to-user, *i.e.*, end-to-end, communications, interprocess communications, and distributed data processing. [From Weik '89] **2.** *Synonym host computer.*

**host computer:** **1.** In a computer network, a computer that provides end users with services such as computation and database access and that usually performs network control functions. *Synonym host.* **2.** A computer on which is developed software intended to be used on another computer.

**hot boot:** *Synonym warm restart.*

**hotline:** A point-to-point communications link in which a call is automatically originated to the preselected destination without any additional action by the user when the end instrument goes off-hook. *Note 1:* Hotlines cannot be used to originate calls other than to preselected destinations. *Note 2:* Various priority services that require dialing are **not** properly termed "hotlines." *Synonyms automatic signaling service, off-hook service.*

**hot standby:** *See standby.*

**house cable:** *Deprecated term.* Communication cable within a building or a complex of buildings. *Note:* House cable owned before divestiture by the Bell System and after divestiture by the Regional Bell Operating Companies will eventually be fully depreciated and will then belong to the customer. *See on-premises wiring.*

**housekeeping signals:** *Synonym service signals.*

**H-plane bend:** *Synonym H-bend.*

**HTML:** *Abbreviation for Hypertext Markup Language.* An application of SGML (Standard Generalized Markup Language [ISO 8879]) implemented in conjunction with the World Wide Web to facilitate the electronic exchange and display of simple documents using the Internet.

**HTTP:** *Abbreviation for Hypertext Transfer Protocol.* In the World Wide Web, a protocol that facilitates the transfer of hypertext-based files between local and remote systems.

**hub:** **1.** A distribution point in a network. **2.** A device that accepts a signal from one point and redistributes it to one or more points.

**Huffman coding:** A coding technique used to compact data by representing the more common events with short codes and the less common events with longer codes. (188) *Note:* Huffman coding is used in Group 3 facsimile.

**hundred call-seconds (CCS):** *See call-second.*

**hunting:** **1.** In telephony, pertaining to the operation of a selector or other similar device to find and

establish a connection with an idle circuit of a chosen group. (188) **2.** Pertaining to the failure of a device to achieve a state of equilibrium, usually by alternately overshooting and undershooting the point of equilibrium. (188)

**hybrid: 1.** A functional unit in which two or more different technologies are combined to satisfy a given requirement. *Note:* Examples of hybrids include (a) an electronic circuit having both vacuum tubes and transistors, (b) a mixture of thin-film and discrete integrated circuits, and (c) a computer that has both analog and digital capability. (188) **2.** A resistance hybrid. (188) **3.** A hybrid coil. (188)

**hybrid balance:** An expression of the degree of electrical symmetry between two impedances connected to two conjugate sides of a hybrid set or resistance hybrid. *Note 1:* Hybrid balance is usually expressed in dB. *Note 2:* If the respective impedances of the branches of the hybrid that are connected to the conjugate sides of the hybrid are known, hybrid balance may be computed by the formula for return loss. (188)

**hybrid cable:** An optical communications cable having two or more different types of optical fibers, *e.g.*, single-mode and multimode fibers. *Contrast with composite cable.*

**hybrid coil:** A single transformer that effectively has three windings, and which is designed to be configured as a circuit having four branches, *i.e.*, ports, that are conjugate in pairs. (188) *Note:* The primary use of a hybrid coil is to convert between 2-wire and 4-wire operation in concatenated sections of a communications circuit. Such conversion is necessary when repeaters are introduced in a 2-wire circuit. *Synonym bridge transformer.*

**hybrid communications network:** A communications network that uses a combination of line facilities, *i.e.*, trunks, loops, or links, some of which use only analog or quasi-analog signals and some of which use only digital signals. (188) *Synonym hybrid system.*

**hybrid computer:** A computer that processes both analog and digital data.

**hybrid connector:** A connector that contains contacts for more than one type of service. *Note:* Examples of hybrid connectors are those that have contacts for both optical fibers and twisted pairs, electric power and twisted pairs, or shielded and unshielded twisted pairs.

**hybrid coupler:** In an antenna system, a hybrid junction used as a directional coupler. *Note:* The loss through a hybrid coupler is usually  $\approx 3$  dB. (188)

**hybrid interface structure:** In integrated services digital networks (ISDN), an interface structure that uses both labeled and positioned channels.

**hybrid junction:** A waveguide or transmission line arranged such that (a) there are four ports, (b) each port is terminated in its characteristic impedance, and (c) energy entering any one port is transferred, usually equally, to two of the three remaining ports. (188) *Note:* Hybrid junctions are used as mixing or dividing devices.

**hybrid mode:** A mode consisting of components of both electrical and magnetic field vectors in the direction of propagation. (188) *Note:* In fiber optics, such modes correspond to skew (nonmeridional) rays.

**hybrid network:** *See hybrid communications network.*

**hybrid routing:** Routing in which numbering plans and routing tables are used to permit the collocation, in the same area code, of switches using a deterministic routing scheme with switches using a nondeterministic routing scheme, such as flood search routing. *Note:* Routing tables are constructed with no duplicate numbers, so that direct dial service can be provided to all network subscribers. This may require the use of 10-digit numbers.

**hybrid set:** Two or more transformers interconnected to form a network having four ports that are conjugate in pairs. *Note:* The primary use of a hybrid set is to convert between 2-wire and 4-wire operation in concatenated sections of a communications circuit. Such conversion is necessary when repeaters are introduced in a 2-wire circuit. (188)

**hybrid spread spectrum:** A combination of frequency hopping spread spectrum and direct-sequence spread spectrum. [NTIA]

**hybrid system:** *Synonym* **hybrid communications network.**

**hybrid topology:** *See* **network topology.**

**hydroxyl ion absorption:** In optical fibers, the absorption of electromagnetic waves, including the near-infrared, due to the presence of trapped hydroxyl ions remaining from water as a contaminant. *Note:* The hydroxyl ( $\text{OH}^-$ ) ion can penetrate glass during or after product fabrication, resulting in significant attenuation of discrete optical wavelengths, *e.g.*, approximately 1.3  $\mu\text{m}$ , used for communications via optical fibers.

**hypermedia:** Computer-addressable files that contain pointers for linking to multimedia information, such as text, graphics, video, or audio in the same or other documents. *Note:* The use of hypertext links is known as navigating.

**hypertext:** The system of coding that is used to create or navigate hypermedia in a nonsequential manner.

**Hypertext Transfer Protocol:** *See* **HTTP.**

**Hz:** *Abbreviation for* **hertz.**

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