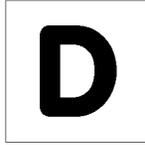


**D\*:** (Pronounced “D-Star”) See **specific detectivity**.



**D-A:** Abbreviation for **digital-to-analog**. See **digital transmission system**.

**DACS:** Acronym for **digital access and cross-connect system**.

**DAMA:** Abbreviation for **demand assignment multiple access**.

**damping:** **1.** The progressive diminution with time of certain quantities characteristic of a phenomenon. **2.** The progressive decay with time in the amplitude of the free oscillations in a circuit. (188)

**dark current:** The external current that, under specified biasing conditions, flows in a photoconductive detector when there is no incident radiation. (188)

**data:** Representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means. Any representations such as characters or analog quantities to which meaning is or might be assigned. [JP1]

**data access arrangement:** **1.** In public switched telephone networks, a single item or group of items at the customer side of the network interface for data transmission purposes, including all equipment that may affect the characteristics of the interface. **2.** A data circuit-terminating equipment (DCE) supplied or approved by a common carrier that permits a DCE or data terminal equipment (DTE) to be attached to the common carrier network. *Note:* Data access arrangements are an integral part of all modems built for the public telephone network.

**data attribute:** A characteristic of a data element such as length, value, or method of representation.

**data bank:** **1.** A set of data related to a given subject and organized in such a way that it can be consulted by users. **2.** A data repository accessible by local and remote users. (188) *Note:* A data bank may contain information on single or multiple subjects, may be organized in any rational manner, may

contain more than one database, and may be geographically distributed. More than one data bank may be required to build a comprehensive database.

**database:** **1.** A set of data that is required for a specific purpose or is fundamental to a system, project, enterprise, or business. (188) *Note:* A database may consist of one or more data banks and be geographically distributed among several repositories. **2.** A formally structured collection of data. *Note:* In automated information systems, the database is manipulated using a database management system.

**database engineering:** The discipline involving (a) the conception, modeling, and creation, *i.e.*, programming, of a database, (b) data analysis and administration of the database, and (c) database documentation.

**database management system (DBMS):** A software system that facilitates (a) the creation and maintenance of a database or databases, and (b) the execution of computer programs using the database or databases. (188)

**data burst:** *Synonym burst transmission (def. #2).*

**data bus:** A bus used to transfer data within or to and from a processing unit or storage device.

**data circuit connection:** The interconnection of any combination of links and trunks, on a tandem basis, by means of switching equipment to facilitate information interchange. (188)

**data circuit-terminating equipment:** *See DCE.*

**data collection facility:** A facility for gathering and organizing data from a group of sources.

**data communication:** The transfer of information between functional units by means of data transmission according to a protocol. (188) *Note:* Data are transferred from one or more sources to one or more sinks over one or more data links.

**data communication control procedure:** A means used to control the orderly communication of information among stations in a data communication network.

**data communications control character:** *See* control character.

**data communications equipment:** *Deprecated term. See DCE.*

**data compaction:** The reduction of the number of data elements, bandwidth, cost, and time for the generation, transmission, and storage of data without loss of information by eliminating unnecessary redundancy, removing irrelevancy, or using special coding. *Note 1:* Examples of data compaction methods are the use of fixed-tolerance bands, variable-tolerance bands, slope-keypoints, sample changes, curve patterns, curve fitting, variable-precision coding, frequency analysis, and probability analysis. *Note 2:* Simply squeezing noncompacted data into a smaller space, for example by increasing packing density or by transferring data on punched cards onto magnetic tape, is not data compaction. *Note 3:* Whereas data compaction reduces the amount of data used to represent a given amount of information, data compression does not.

**data compression:** **1.** Increasing the amount of data that can be stored in a given domain, such as space, time, or frequency, or contained in a given message length. **2.** Reducing the amount of storage space required to store a given amount of data, or reducing the length of message required to transfer a given amount of information. *Note 1:* Data compression may be accomplished by simply squeezing a given amount of data into a smaller space, for example, by increasing packing density or by transferring data on punched cards onto magnetic tape. *Note 2:* Data compression does not reduce the amount of data used to represent a given amount of information, whereas data compaction does. Both data compression and data compaction result in the use of fewer data elements for a given amount of information.

**data concentrator:** A functional unit that permits a common transmission medium to serve more data sources than there are channels currently available within the transmission medium.

**data conferencing repeater:** A device that enables any one user of a group of users to transmit a message to all other users in that group. (188) *Synonym* technical control hubbing repeater.

**data contamination:** *Synonym* data corruption.

**data corruption:** The violation of data integrity. (188) *Synonym* data contamination.

**data country code:** A 3-digit numerical country identifier that is part of the 14-digit network terminal numbering plan. *Note:* The data country code prescribed numerical designation further constitutes a segment of the overall 14-digit X.121 numbering plan for a CCITT X.25 network.

**data-dependent protection:** The application of protective data elements to a data stream in such a manner that the composition of the data stream determines the amount or type of protective elements to be added.

**data dictionary:** **1.** A part of a database management system that provides a centralized repository of information about data in a database, such as meaning, relationship to other data. **2.** An inventory that describes, defines, and lists all of the data elements that are stored in a database.

**data directory:** An inventory that specifies the source, location, ownership, usage, and destination of all of the data elements that are stored in a database.

**data element:** **1.** A named unit of data that, in some contexts, is considered indivisible and in other contexts may consist of data items. **2.** A named identifier of each of the entities and their attributes that are represented in a database. **3.** A basic unit of information built on standard structures having a unique meaning and distinct units or values. [JP1] **4.** In electronic recordkeeping, a combination of characters or bytes referring to one separate item of information, such as name, address, or age. [JP1]

**Data Encryption Standard (DES):** [A] cryptographic algorithm for the protection of unclassified computer data and published by the National Institute of Standards and Technology in Federal Information Processing Standard Publication 46-1. [NIS] *Note:* DES is **not** approved for protection of national security classified information.

**data forwarder:** A device that (a) receives data from one data link and retransmits data representing the same information, using proper format and link protocols, to another data link and (b) may forward data between (a) links that are identical, *i.e.*, TADIL B to TADIL B, (b) links that are similar, *i.e.*, TADIL A to TADIL B, or (c) links that are dissimilar, *i.e.*, TADIL A to TADIL J.

**datagram:** In packet switching, a self-contained packet, independent of other packets, that contains information sufficient for routing from the originating data terminal equipment (DTE) to the destination DTE without relying on prior exchanges between the equipment and the network. *Note:* Unlike virtual call service, when datagrams are sent there are no call establishment or clearing procedures. Thus, the network may not be able to provide protection against loss, duplication, or misdelivery.

**data integrity:** **1.** [The] condition that exists when data is unchanged from its source and has not been accidentally or maliciously modified, altered, or destroyed. [NIS] **2.** The condition in which data are identically maintained during any operation, such as transfer, storage, and retrieval. (188) **3.** The preservation of data for their intended use. **4.** Relative to specified operations, the *a priori* expectation of data quality.

**data item:** **1.** A named component of a data element; usually the smallest component. **2.** A subunit of descriptive information or value classified under a data element. For example the data element "military personnel grade" contains data items such as sergeant, captain, and colonel. [JP1]

**data link:** **1.** The means of connecting one location to another for the purpose of transmitting and receiving data. [JP1] **2.** An assembly, consisting of parts of two data terminal equipments (DTEs) and the interconnecting data circuit, that is controlled by a link protocol enabling data to be transferred from a data source to a data sink. (188)

**data link escape character (DLE):** A transmission control character that changes the meaning of a limited number of contiguously following characters or coded representations.

**Data Link Layer:** *See* **Open Systems Interconnection—Reference Model.**

**data logging:** The dating, time-labeling, and recording of data. (188)

**data management:** The control of data handling operations—such as acquisition, analysis, translation, coding, storage, retrieval, and distribution of data—but not necessarily the generation and use of data. [From Weik '89]

**data management system:** *See* **database management system.**

**data medium:** The material in or on which one or more characteristics of the material may be used to represent information statically or dynamically. *Note:* Examples of data media are films, compact optical disks, cards, magnetic disks, magnetic drums, and paper.

**data mode:** In a communications network, the state of data circuit-terminating equipment (DCE) when connected to a communications channel and ready to transmit data, usually digital data. *Note:* When in the data mode, the DCE is not in a talk or dial mode.

**data network identification code (DNIC):** In the CCITT International X.121 format, the first four digits of the international data number, the three digits that may represent the data country code, and the 1-digit network code, *i.e.*, the network digit.

**data numbering plan area (DNPA):** In the U.S. implementation of a CCITT X.25 network, the first three digits of a network terminal number (NTN). *Note:* The 10-digit NTN is the specific addressing information for an end-point terminal in an X.25 network.

**data phase:** The phase of a data call during which data may be transferred between data terminal equipments (DTEs) that are interconnected via the network. *Note:* The data phase of a data call corresponds to the information transfer phase of an information transfer transaction.

**data processing:** The systematic performance of operations upon data such as handling, merging, sorting, and computing. (188) *Note:* The semantic

content of the original data should not be changed. The semantic content of the processed data may be changed. *Synonym information processing.*

**data rate:** *See data signaling rate.*

**data register:** *See register (def. #2).*

**data scrambler:** A device used in digital transmission systems to convert digital signals into a pseudorandom sequence that is free from long strings of simple patterns, such as marks and spaces. *Note:* The data scrambler facilitates timing extraction, reduces the accumulation of jitter, and prevents baseline drift.

**data security:** [The] protection of data from unauthorized (accidental or intentional) modification, destruction, or disclosure. [NIS]

**data service unit (DSU):** **1.** A device used for interfacing data terminal equipment (DTE) to the public telephone network. (188) **2.** A type of short-haul, synchronous-data line driver, usually installed at a user location, that connects user synchronous equipment over a 4-wire circuit at a preset transmission rate to a servicing central-office. *Note:* This service can be for a point-to-point or multipoint operation in a digital data network.

**data set:** *Deprecated term. See DCE.*

**data signaling rate (DSR):** The aggregate rate at which data pass a point in the transmission path of a data transmission system. *Note 1:* The DSR is usually expressed in bits per second. *Note 2:* The data signaling rate is given by

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

where  $m$  is the number of parallel channels,  $n_i$  is the number of significant conditions of the modulation in the  $I$ -th channel, and  $T_i$  is the unit interval, expressed in seconds, for the  $I$ -th channel. *Note 3:* For serial transmission in a single channel, the DSR reduces to  $(1/T)\log_2 n$ ; with a two-condition modulation, *i.e.*,  $n=2$ , the DSR is  $1/T$ . *Note 4:* For

parallel transmission with equal unit intervals and equal numbers of significant conditions on each channel, the DSR is  $(m/T)\log_2 n$ ; in the case of a two-condition modulation, this reduces to  $m/T$ . *Note 5:* The DSR may be expressed in bauds, in which case, the factor  $\log_2 n_i$  in the above summation formula should be deleted when calculating bauds. *Note 6:* In synchronous binary signaling, the DSR in bits per second may be numerically the same as the modulation rate expressed in bauds. Signal processors, such as four-phase modems, cannot change the DSR, but the modulation rate depends on the line modulation scheme, in accordance with Note 4. For example, in a 2400 b/s 4-phase sending modem, the signaling rate is 2400 b/s on the serial input side, but the modulation rate is only 1200 bauds on the 4-phase output side.

**data signaling rate transparency:** *See transparency.*

**data sink:** *See sink.*

**data source:** *See source.*

**data station:** Data terminal equipment (DTE), data circuit-terminating equipment (DCE), and any intermediate equipment connected at one location. *Note:* The DCE may be connected directly to a data processing system or it may be a part of the data processing system.

**data stream:** A sequence of digitally encoded signals used to represent information in transmission.

**data subscriber terminal equipment:** In the DDN, a general purpose terminal device that consists of (a) all the equipment necessary to provide interface functions, perform code conversion, and transform messages on various data media, such as punched cards, magnetic tapes, and paper tapes, to electrical signals for transmission and (b) all the equipment necessary to convert received electrical signals into data stored or recorded on various data media. [From Weik '89]

**data switching exchange (DSE):** The equipment installed at a single location to perform switching functions such as circuit switching, message switching, and packet switching.

**data terminal equipment:** *See* DTE.

**data transfer rate:** The average number of bits, characters, or blocks per unit time passing between corresponding equipment in a data transmission system. (188)

**data transfer request signal:** A call control signal transmitted by the data circuit-terminating equipment (DCE) to the data terminal equipment (DTE) indicating that a request signal, originated by a distant DTE, has been received from a distant DCE to exchange data with the station.

**data transfer time:** The time between (a) the instant at which a user data unit, such as a character, word, block, or message, is made available to a network for transfer by a transmitting data terminal equipment (DTE) and (b) the receipt of that complete data unit by a receiving DTE. (188)

**data transmission:** The sending of data from one place to another by means of signals over a channel. (188)

**data transmission circuit:** The transmission media and the intervening equipment used for the transfer of data between data terminal equipments (DTEs). (188) *Note 1:* A data transmission circuit includes any required signal conversion equipment. *Note 2:* A data transmission circuit may transfer information in (a) one direction only, (b) either direction but one way at a time, or (c) both directions simultaneously.

**data volatility:** Pertaining to the rate of change in the values of stored data over a period of time.

**date:** An instant in the passage of time, identified with desired precision by a clock and a calendar. *Note:* An example of a date is 23 seconds after 3:14 PM on February 9, 1926. This date might be represented as 1926FEB091514.23.

**date-time group (DTG):** In a message, a set of characters, usually in a prescribed format, used to express the day of the month, the hour of the day, the minute of the hour, the time zone, and the year. *Note 1:* The DTG is usually placed in the header of the message. *Note 2:* The DTG may be used as a message identifier if it is unique for each message. *Note 3:* The DTG may indicate either the date and

time a message was dispatched by a transmitting station or the date and time it was handed into a transmission facility by a user or originator for dispatch.

**dating format:** The format used to express the time of an event. (188) *Note:* The time of an event on the UTC time scale is given in the following sequence: hour, day, month, year; e.g., 0917 UT, 30 August 1997. The hour is designated by the 24-hour system.

**dB:** *Abbreviation for decibel(s).* One tenth of the common logarithm of the ratio of relative powers, equal to 0.1 B (bel). *Note 1:* The decibel is the conventional relative power ratio, rather than the bel, for expressing relative powers because the decibel is smaller and therefore more convenient than the bel. The ratio in dB is given by

$$dB = 10 \log_{10} \left( \frac{P_1}{P_2} \right),$$

where  $P_1$  and  $P_2$  are the actual powers. Power ratios may be expressed in terms of voltage and impedance,  $E$  and  $Z$ , or current and impedance,  $I$  and  $Z$ , since

$$P = I^2 Z = \frac{E^2}{Z}.$$

Thus dB is also given by

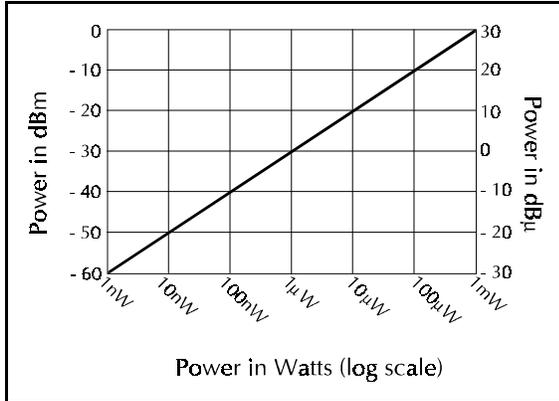
$$dB = 10 \log_{10} \left( \frac{E_1^2/Z_1}{E_2^2/Z_2} \right) = 10 \log_{10} \left( \frac{I_1^2 Z_1}{I_2^2 Z_2} \right).$$

If  $Z_1 = Z_2$ , these become

$$dB = 20 \log_{10} \left( \frac{E_1}{E_2} \right) = 20 \log_{10} \left( \frac{I_1}{I_2} \right).$$

*Note 2:* The dB is used rather than arithmetic ratios or percentages because when circuits are

connected in tandem, expressions of power level, in dB, may be arithmetically added and subtracted. For example, in an optical link, if a known amount of optical power, in dBm, is launched into a fiber, and the losses, in dB, of each component (e.g., connectors, splices, and lengths of fiber) are known, the overall link loss may be quickly calculated with simple addition and subtraction.



relationship between absolute power and dBm, dBμ

**dBa:** *Abbreviation for decibels adjusted.* Weighted absolute noise power, calculated in dB referenced to 3.16 picowatts (-85 dBm), which is 0 dBa. (188) *Note:* The use of F1A-line or HA1-receiver weighting must be indicated in parentheses as required. A one-milliwatt, 1000-Hz tone will read +85 dBa, but the same power as white noise, randomly distributed over a 3-kHz band (nominally 300 to 3300 Hz), will read +82 dBa, due to the frequency weighting. *Synonym* **dBrn adjusted.**

**dBa(F1A):** Weighted absolute noise power in dBa, measured by a noise measuring set with F1A-line weighting. (188) *Note:* F1A weighting is no longer used for DOD applications.

**dBa(HA1):** Weighted noise power in dBa, measured across the receiver of a 302-type or similar subscriber set, by a noise measuring set with HA1-receiver weighting. (188) *Note:* HA1 weighting is no longer used in DOD applications.

**dBa0:** Noise power in dBa referenced to or measured at zero transmission level point (OTLP), also called a point of zero relative transmission level (0 dBr). (188) *Note:* It is preferred to convert noise readings from dBa to dBa0, as this makes it unnecessary to

know or state the relative transmission level at the point of actual measurement.

**dBc:** *Abbreviation.* dB relative to the carrier power.

**dBi:** *Abbreviation.* In the expression of antenna gain, the number of decibels of gain of an antenna referenced to the zero dB gain of a free-space isotropic radiator.

**dBm:** *Abbreviation.* dB referenced to one milliwatt. (188) *Note 1:* dBm is used in communication work as a measure of absolute power values. Zero dBm equals one milliwatt. *Note 2:* In DOD practice, unweighted measurement is normally understood, applicable to a certain bandwidth, which must be stated or implied. *Note 3:* In European practice, psophometric weighting may be implied, as indicated by context; equivalent to dBm0p, which is preferred.

**dBm(psoph):** Noise power in dBm, measured with psophometric weighting where

$$\begin{aligned} dBm(psoph) &= 10 \log_{10}(pWp) - 90 \\ &= dBa - 84, \end{aligned}$$

where *pWp* is power in picowatts psophometrically weighted and *dBa* is the weighted noise power in dB referenced to 3.16 picowatts.

**DBMS:** *Abbreviation for database management system.*

**dBmV:** *Abbreviation.* dB referenced to one millivolt across 75 ohms. (188) *Note:* This reference is not equivalent to dBm; it is, in fact,  $1.33 \times 10^{-5}$  milliwatts.

**dBm0:** Power in dBm referred to or measured at a zero transmission level point (OTLP). *Note 1:* A OTLP is also called a point of zero relative transmission level (0 dBr0). (188) *Note 2:* Some international documents use dBm0 to mean noise power in dBm0p (psophometrically weighted dBm0). In the United States, dBm0 is not so used.

**dBm0p:** Noise power in dBm0, measured by a psophometer or noise measuring set having psophometric weighting. (188)

**dBr:** *Abbreviation.* The power ratio, expressed in dB, between any point and a reference point selected as the zero relative transmission level point. (188)

*Note:* Any power expressed in dBr does not specify the absolute power. It is a relative measurement only.

**dBrn:** *Abbreviation.* dB above reference noise.

*Note 1:* Weighted noise power in dB is referred to 1.0 picowatt. Thus, 0dBrn = -90 dBm. Use of 144-line, 144-receiver, or C-message weighting, or flat weighting, must be indicated in parentheses as required. (188) *Note 2:* With C-message weighting, a one-milliwatt, 1000-Hz tone will read +90 dBrn, but the same power as white noise, randomly distributed over a 3-kHz band will read approximately +88.5 dBrn (rounded off to +88 dBrn), because of the frequency weighting.

*Note 3:* With 144 weightings, a one-milliwatt, 1000-Hz white noise tone will also read +90 dBrn, but the same 3-kHz power will only read +82 dBrn, because of the different frequency weighting.

**dBrn adjusted:** *Synonym* dBa.

**dBrnC:** Weighted noise power in dBrn, measured by a noise measuring set with C-message weighting. (188)

**dBrnC0:** Noise power in dBrnC referred to or measured at a zero transmission level point (OTLP). (188)

**dBrn( $f_1$ - $f_2$ ):** Flat noise power in dBrn, measured over the frequency band between frequencies  $f_1$  and  $f_2$ . (188)

**dBrn(144-line):** Weighted noise power in dBrn, measured by a noise measuring set with 144-line weighting. (188)

**dBv:** *Abbreviation.* dB relative to 1 volt peak-to-peak. *Note:* The dBv is usually used for television video signal level measurements. [From Weik '89]

**dBW:** *Abbreviation.* dB referenced to one watt. (188)

**dBx:** *Abbreviation.* dB above reference coupling. *Note:* dBx is used to express the amount of crosstalk

coupling in telephone circuits. dBx is measured with a noise measuring set. [From Weik '89]

**dc:** *Abbreviation for* direct current.

**DCA:** *Abbreviation for* Defense Communications Agency. Now DISA (Defense Information Systems Agency).

**DCE:** *Abbreviation for* data circuit-terminating equipment. **1.** In a data station, the equipment that performs functions, such as signal conversion and coding, at the network end of the line between the data terminal equipment (DTE) and the line, and that may be a separate or an integral part of the DTE or of intermediate equipment. **2.** The interfacing equipment that may be required to couple the data terminal equipment (DTE) into a transmission circuit or channel and from a transmission circuit or channel into the DTE. (188) *Synonyms* data communications equipment (*deprecated*), data set (*deprecated*).

**DCE clear signal:** A call control signal transmitted by data circuit-terminating equipment (DCE) to indicate that it is clearing the associated circuit after a call is finished.

**DCE waiting signal:** A call control signal at the data-circuit-terminating-equipment/data-terminal-equipment (DCE/DTE) interface that indicates that the DCE is ready for another event in the call establishment procedure.

**D channel:** In ISDN, the 16-kb/s segment of a 144-kb/s, full-duplex subscriber service channel that is subdivided into 2B+D channels, *i.e.*, into two 64-kb/s clear channels and one 16-kb/s channel for the ISDN basic rate. *Note 1:* The D channel is usually used for out-of-band signaling. The two 64-kb/s clear channels are used for subscriber voice and data services. *Note 2:* The D-channel specifications are addressed in the CCITT Recommendation for the Integrated Services Digital Network (ISDN). *Note 3:* The D-channel may be 64 kb/s for the primary rate ISDN service.

**dc patch bay:** A patch bay in which dc circuits are grouped. (188)

**DCS:** *Abbreviation for Defense Communications System.*

**DDD:** *Abbreviation for direct distance dialing.*

**DDN:** *Abbreviation for Defense Data Network.*

**deadlock:** **1.** Unresolved contention for the use of a system or component. [From Weik '89] **2.** In computer and data processing systems, an error condition such that processing cannot continue because each of two components or processes is waiting for an action or response from the other. [From Weik '89] **3.** A permanent condition in which a system cannot continue to function unless some corrective action is taken. [From Weik '89]

**dead sector:** In facsimile, the interval between (a) the end of scanning of one object line and (b) the start of scanning of the following line. (188)

**dead space:** The area, zone, or volume of space that is within the expected range of a radio, radar, or other transmitted signal but in which the signal is not detectable and therefore cannot be received. [From Weik '89]

**debug:** To detect, trace, and eliminate mistakes. (188)

**deception:** *See electronic deception.*

**deception repeater:** A device that can (a) receive a signal, (b) amplify, delay, or otherwise manipulate the signal, and (c) retransmit it solely for creating deception. [From Weik '89]

**decibel:** *See dB.*

**decipher:** [To] convert enciphered text to the equivalent plain text by means of a cipher system. [NIS] *Note:* This does not include solution by cryptanalysis.

**decision circuit:** A circuit that measures the probable value of a signal element and makes an output signal decision based on the value of the input signal and a predetermined criterion or criteria. (188)

**decision instant:** In the reception of a digital signal, the instant at which a decision is made by a receiving device as to the probable value of a signal condition. (188) *Synonym selection position.*

**decode:** **1.** To convert data by reversing the effect of previous encoding. (188) **2.** To interpret a code. **3.** [To] convert encoded text into equivalent plain text by means of a code. [NIS] (188) *Note:* Decoding does not include deriving plain text by cryptanalysis.

**decollimation:** In a beam with the minimum possible ray divergence or convergence, any mechanism by which rays are caused to diverge or converge from parallelism. *Note 1:* Decollimation may be deliberate for systems reasons, or may be caused by many factors, such as refractive index inhomogeneities, occlusions, scattering, deflection, diffraction, reflection, and refraction. *Note 2:* Decollimation occurs in applications such as radio, radar, sonar, and optical communications.

**decrypt:** **1.** [A] generic term encompassing decode and decypher. [NIS] **2.** To convert encrypted text into its equivalent plain text by means of a cryptosystem. (This does not include solution by cryptanalysis.) *Note:* The term “*decrypt*” covers the meanings of “*decipher*” and “*decode*.” [JP1]

**dedicated circuit:** A circuit designated for exclusive use by specified users. *Note:* DOD normally considers a dedicated circuit to be between two users only. (188)

**dedicated service:** In a communications system, a specified set of functions provided to designated users. (188) *Note:* Dedicated service is usually specified in a communications format, such as voice, digital data, facsimile, or video.

**deemphasis:** In FM transmission, the process of restoring (after detection) the amplitude-vs.-frequency characteristics of the signal. (188)

**deeply depressed cladding fiber:** An optical fiber construction, usually a single-mode fiber, that has an outer cladding of approximately the same refractive index as the core, and an inner cladding of very low (depressed) refractive index material between them.

**deep space:** Space at distances from the Earth equal to or greater than  $2 \times 10^6$  kilometers. [NTIA] [RR]

**de facto standard:** A standard that is widely accepted and used, but lacks formal approval by a recognized standards organization.

**default:** Pertaining to the pre-defined initial, original, or specific setting, condition, value, or action a system will assume, use, or take in the absence of instructions from the user. [From Weik '89]

**Defense Communications System (DCS):** Department of Defense long-haul voice, data, and record traffic system which includes the Defense Data Network, Defense Satellite Communications Systems, and Defense Switched Network.

**Defense Data Network (DDN):** A component of the Defense Communications System used for switching Department of Defense automated data processing systems. [JP1-A]

**Defense Switched Network (DSN):** A component of the Defense Communications System that handles Department of Defense voice, data, and video communications.

**definition:** A figure of merit for image quality. (188)  
*Note:* In an image, definition is usually expressed in terms of the smallest resolvable element, such as lines per inch, or pels per square inch.

**deflection: 1.** A change in the direction of a traveling particle, usually without loss of particle kinetic energy, representing a change in velocity without a change in the scalar speed of the particle. **2.** A change in the direction of a wave, beam, electron, or other entity, such as might be accomplished by an electric or magnetic field. *Note:* If the deflection is caused by a prism (refraction), a mirror (reflection), or optical grating (diffraction), the specific applicable term should be used. [From Weik '89]

**degradation: 1.** The deterioration in quality, level, or standard of performance of a functional unit. **2.** In communications, a condition in which one or more of the required performance parameters fall outside predetermined limits, resulting in a lower quality of

service. *Note:* Degradation is usually categorized as either “graceful” or “catastrophic.”

**degraded service state:** The condition that exists when one or more of the required service performance parameters fall outside predetermined limits, resulting in a lower quality of service. (188)  
*Note:* A degraded service state is considered to exist when a specified level of degradation persists for a specified period of time.

**degree of coherence:** A dimensionless unit, expressed as a ratio, used to indicate the extent of coherence of an electromagnetic wave such as a lightwave. (188) [After 2196] *Note 1:* For lightwaves, the magnitude of the degree of coherence is equal to the visibility,  $V$ , of the fringes of a two-beam interference test, as given by

$$V = \frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}},$$

where  $I_{\max}$  is the intensity at a maximum of the interference pattern, and  $I_{\min}$  is the intensity at a minimum. *Note 2:* Light is considered to be highly coherent when the degree of coherence exceeds 0.88, partially coherent for values less than 0.88 but more than nearly zero values, and incoherent for nearly zero and zero values.

**degree of isochronous distortion:** In data transmission, the ratio of (a) the absolute value of the maximum measured difference between the actual and the theoretical intervals separating any two significant instants of modulation (or demodulation) to (b) the unit interval. *Note 1:* These instants are not necessarily consecutive. (188)  
*Note 2:* The degree of isochronous distortion is usually expressed as a percentage. *Note 3:* The result of the measurement should be qualified by an indication of the period, usually limited, of the observation. For a prolonged modulation (or demodulation), it will be appropriate to consider the probability that an assigned value of the degree of distortion will be exceeded.

**degree of start-stop distortion: 1.** In asynchronous data transmission, the ratio of (a) the absolute value of the maximum measured difference between the actual and theoretical intervals separating any

significant instant of modulation (or demodulation) from the significant instant of the start element immediately preceding it to (b) the unit interval.

**2.** The highest absolute value of individual distortion affecting the significant instants of a start-stop modulation. *Note:* The degree of distortion of a start-stop modulation (or demodulation) is usually expressed as a percentage. Distinction can be made between the degree of late (positive) distortion and the degree of early (negative) distortion.

**dehop:** To modify a frequency-hopping signal so that it has a constant center frequency. (188)

**dejitterizer:** A device that reduces jitter in a digital signal. *Note 1:* A dejitterizer usually consists of an elastic buffer in which the signal is temporarily stored and then retransmitted at a rate based on the average rate of the incoming signal. *Note 2:* A dejitterizer is usually ineffective in dealing with low-frequency jitter, such as waiting-time jitter.

**delay:** **1.** The amount of time by which an event is retarded. **2.** The time between the instant at which a given event occurs and the instant at which a related aspect of that event occurs. (188) *Note 1:* The events, relationships, and aspects of the entity being delayed must be precisely specified. *Note 2:* Total delay may be demonstrated by the impulse response of a device or system. *Note 3:* In analog systems, total delay is described in terms of the transfer functions in the frequency domain. *Synonym delay time.* **3.** In radar, the electronic delay of the start of the time base used to select a particular segment of the total.

**delay distortion:** In a waveform consisting of two or more wave components at different frequencies, distortion caused by the difference in arrival times of the frequency components at the output of a transmission system. (188) *Synonyms time-delay distortion.*

**delayed-delivery facility:** In a communications network, a facility that stores data, destined for delivery to one or more addresses, for delivery at a later time.

**delay encoding:** The encoding of binary data to form a two-level signal such that (a) a “0” causes no

change of signal level unless it is followed by another “0” in which case a transition to the other level takes place at the end of the first bit period; and (b) a “1” causes a transition from one level to the other in the middle of the bit period. *Note:* Delay encoding is used primarily for encoding radio signals because the frequency spectrum of the encoded signal contains less low-frequency energy than a conventional non-return-to-zero (NRZ) signal and less high-frequency energy than a biphasic signal.

**delay equalizer:** A corrective network designed to make the phase delay or envelope delay of a circuit or system substantially constant over a desired frequency range. (188)

**delay line:** **1.** A transmission line, or equivalent device, used to delay a signal. (188) **2.** A single-input-channel device, such as a single-input sequential logic element, in which the output channel state at a given instant,  $t$ , is the same as the input channel state at the instant  $t-n$ , where  $n$  is a number of time units, *i.e.*, the input sequence undergoes a delay of  $n$  time units, such as  $n$  femtoseconds, nanoseconds, or microseconds. *Note:* The delay line may have additional taps yielding output channels with values less than  $n$ . (188)

**delay modulation:** *See delay encoding.*

**delay time:** *Synonym delay (def. #1).*

**delay working:** In telephone switchboard operations, operation intended to ensure fair distribution of the time of one or more lines among groups of call originators. *Note:* An example of delay working is the withdrawing of one or more lines from general use and placing them under the control of a delay operator so that when other operators book call demands on tickets, the tickets can be passed to the delay operator for connection in the order in which they are booked. [From Weik '89]

**deleted bit:** A bit not delivered to the intended destination. (188)

**deleted block:** A block not delivered to the intended destination. (188)

**delimiter:** **1.** A character used to indicate the beginning and end of a character string, *i.e.*, a

symbol stream, such as words, groups of words, or frames. **2.** A flag that separates and organizes items of data.

**delivered block:** A successfully transferred block.

**delivered overhead bit:** A bit that (a) is successfully transferred to a destination user, (b) performs its primary function within the telecommunications system, and (c) does not represent user information.

**delivered overhead block:** A block that (a) is successfully transferred to a destination user, (b) performs its primary function within the telecommunications system, and (c) does not contain user information bits.

**delivery confirmation:** Information returned to the originator indicating that a given unit of information has been delivered to the intended addressee(s).

**Dellinger effect:** An effect—lasting from several minutes to several hours—that causes electromagnetic sky wave signals to disappear rapidly as a result of greatly increased ionization in the ionosphere caused by increased noise from solar storms. *Synonyms:* **Dellinger fadeout, Dellinger fading.** [From Weik '89]

**Dellinger fadeout:** *Synonym Dellinger effect.*

**Dellinger fading:** *Synonym Dellinger effect.*

**delta modulation (DM):** Analog-to-digital signal conversion in which (a) the analog signal is approximated with a series of segments, (b) each segment of the approximated signal is compared to the original analog wave to determine the increase or decrease in relative amplitude, (c) the decision process for establishing the state of successive bits is determined by this comparison, and (d) only the change of information is sent, *i.e.*, only an increase or decrease of the signal amplitude from the previous sample is sent whereas a no-change condition causes the modulated signal to remain at the same 0 or 1 state of the previous sample. (188) *Note:* Examples of delta modulation are continuously variable slope delta modulation, delta-sigma modulation, and differential modulation.

**delta-sigma modulation:** Delta modulation in which the integral of the input signal is encoded rather than the signal itself. (188) *Note:* Delta-sigma modulation may be achieved by preceding a conventional delta-modulation encoder with an integrating network.

**demand assignment:** An operation in which several users share access to a communications channel on a real-time basis, *i.e.*, a user needing to communicate with another user on the same network requests the required circuit, uses it, and when the call is finished, the circuit is released, making the circuit available to other users. *Note:* Demand assignment is similar to conventional telephone switching, in which common trunks are provided for many users, on a demand basis, through a limited-size trunk group. (188)

**demand assignment multiple access (DAMA):** In a communications system, a technique for allocating use of bandwidth among multiple users, based on demand. *Note:* DAMA can be implemented in many ways including TDM and FDM.

**demand factor: 1.** The ratio of (a) the maximum real power consumed by a system to (b) the maximum real power that would be consumed if the entire load connected to the system were to be activated at the same time. (188) *Note:* The maximum real power is usually integrated over a specified time interval, such as 15 or 30 minutes, and is usually expressed in kilowatts. The real power that would be consumed if the entire load connected to the system were to be activated at the same time is obtained by summing the power required by all the connected equipment. This load is expressed in kilowatts if the consumed real power is expressed in kilowatts. **2.** The ratio of (a) the maximum power, integrated over a specified time interval, such as 15 or 30 minutes, and usually expressed in kilowatts, consumed by a system, to (b) the maximum volt-amperes, expressed in kilovolt-amperes if the power is expressed in kilowatts, integrated over a time interval of the same duration, though not necessarily during the same interval. *Note:* Charges for electrical power may be based on the demand factor as well as the kilowatt-hours of electrical energy consumed.

**demand load: 1.** In general, the total power required by a facility. (188) *Note:* The demand load is the

sum of the operational load (including any tactical load) and nonoperational demand loads. It is determined by applying the proper demand factor to each of the connected loads and a diversity factor to the sum total. **2.** At a communications center, the power required by all automatic switching, synchronous, and terminal equipment (operated simultaneously on-line or in standby), control and keying equipment, plus lighting, ventilation, and air-conditioning equipment required to maintain full continuity of communications. (188) **3.** The power required for ventilating equipment, shop lighting, and other support items that may be operated simultaneously with the technical load. (188) **4.** The sum of the technical demand and nontechnical demand loads of an operating facility. (188) **5.** At a receiver facility, the power required for all receivers and auxiliary equipment that may be operated on prime or spare antennas simultaneously, those in standby condition, multicouplers, control and keying equipment, plus lighting, ventilation, and air conditioning equipment required for full continuity of communications. (188) **6.** At a transmitter facility, the power required for all transmitters and auxiliary equipment that may be operated on prime or spare antennas or dummy loads simultaneously, those in standby condition, control and keying equipment, plus lighting, ventilation, and air conditioning equipment required for full continuity of communications. (188)

**demand service:** In ISDN applications, a telecommunications service that establishes an immediate communication path in response to a user request made through user-network signaling.

**demarc:** *Acronym for demarcation point.*

**demarcation point (demarc):** That point at which operational control or ownership of communications facilities changes from one organizational entity to another. *Note:* The demarcation point is usually the interface point between customer-premises equipment and external network service provider equipment. *Synonym* **network terminating interface.**

**democratically synchronized network:** A mutually synchronized network in which all clocks in the network are of equal status and exert equal amounts

of control on the others, the network operating clock pulse repetition rate being the mean of the natural (uncontrolled) clock pulse repetition rates of the population of clocks.

**demodulation:** The recovery, from a modulated carrier, of a signal having substantially the same characteristics as the original modulating signal. (188)

**demultiplex (DEMUX):** *See demultiplexing.*

**demultiplexing:** The separation of two or more channels previously multiplexed; *i.e.*, the reverse of multiplexing. (188)

**deMUX:** *Acronym for demultiplex and demultiplexer.*

**dense binary code:** A binary code in which all possible bit patterns that can be made from a fixed number of bits are used to encode user information but no overhead information. *Note:* Examples of dense binary codes are (a) a pure binary representation for hexadecimal digits using all sixteen possible patterns and (b) an octal representation using all eight patterns. A binary representation of decimal numbers using four binary digits of which only 10 of the possible 16 patterns are used is not a dense binary code. If a binary code is not dense, the unused patterns can be used to detect errors inasmuch as they should only occur if there is an error. [From Weik '89]

**density:** In a facsimile system, a measure of the light transmission or reflection properties of an area of an object. (188) *Note 1:* Density is usually expressed as the logarithm to the base 10 of the ratio of incident to transmitted or reflected irradiance. *Note 2:* There are many types of density, such as diffuse, double diffuse, and specular density, each of which will usually have different numerical values for different materials. The relevant type of density depends on the type of optical system, the component materials of the object, and the surface characteristics of the object.

**Department of Defense (DOD) master clock:** *See DOD master clock.*

**departure angle:** The angle between the axis of the main lobe of an antenna pattern and the horizontal plane at the transmitting antenna. (188) *Synonym takeoff angle.*

**depolarization:** **1.** Reducing or randomizing the polarization of an electromagnetic wave. *Note:* Depolarization may be caused by transmission through a nonhomogeneous medium or a depolarizer. (188) **2.** Prevention of polarization in an electric cell or battery. (188)

**depressed-cladding fiber:** *Synonym doubly clad fiber.*

**depressed-inner-cladding fiber:** *Synonym doubly clad fiber.*

**dequeue:** *Abbreviation for double-ended queue.*

**deregulation:** A reduction in regulation of (a) tariffs, (b) market entry and exit, and/or (c) facilities in public telecommunication services.

**DES:** *Abbreviation for Data Encryption Standard.*

**descrambler:** The inverse of a scrambler. *Note:* The descrambler output is a signal restored to the state that it had when it entered the associated scrambler, provided that no errors have occurred.

**desensitization:** The reduction of desired signal gain as a result of receiver reaction to an undesired signal. *Note:* The gain reduction is generally due to overload of some portion of the receiver (*e.g.*, the AGC circuitry) resulting in desired signal suppression because the receiver will no longer respond linearly to incremental changes in input voltage.

**design margin:** The additional performance capability above required standard basic system parameters that may be specified by a system designer to compensate for uncertainties. (188)

**design objective (DO):** In communications systems, a desired performance characteristic for communications circuits and equipment that is based on engineering analyses, but (a) is not considered feasible to mandate in a standard, or (b) has not been tested. (188) *Note 1:* DOs are used because

applicable systems standards are not in existence. *Note 2:* Examples of reasons for designating a performance characteristic as a DO rather than as a standard are (a) it may be bordering on an advancement in the state of the art, (b) the requirement may not have been fully confirmed by measurement or experience with operating circuits, and (c) it may not have been demonstrated that the requirement can be met considering other constraints, such as cost and size. *Note 3:* A DO is sometimes established in a standard for developmental consideration. A DO may also specify a performance characteristic that may be used in the preparation of specifications for development or procurement of new equipment or systems.

**despotically synchronized network:** A synchronized network in which a unique master clock controls all other clocks in the network. [From Weik '89]

**despun antenna:** In a rotating communications satellite, an antenna with a main beam that is continuously redirected with respect to the satellite so that the antenna illuminates a given area on the surface of the Earth, *i.e.*, the footprint does not move with respect to the Earth. *Note:* An antenna may be despun mechanically or electrically.

**destination routing:** In communications system operations, the routing of messages based on the name of the destination office, the destination user, or the address on the message, *i.e.*, the addressee. [From Weik '89]

**destination user:** In an information transfer transaction, the user that receives information from the source, *i.e.*, from the originating user.

**de-stuffing:** The controlled deletion of stuffing bits from a stuffed digital signal, to recover the original signal. *Synonyms negative justification, negative pulse stuffing.*

**detection:** **1.** The recovery of information from an electrical or electromagnetic signal. (188) *Note:* Conventional radio waves are usually detected by heterodyning, *i.e.*, coherent reception/detection. In this method of reception/detection, the received signal is mixed, in some type of nonlinear device, with a signal from a local oscillator, to produce an

intermediate frequency, *i.e.*, beat frequency, from which the modulating signal is recovered, *i.e.*, detected. The inherent instabilities of available optical sources have, until relatively recently, prevented practical use of coherent reception/detection in optical communication receivers. At present, coherent optical receivers, using sophisticated technology, are just beginning to emerge from the laboratory into the field. Virtually all existing optical receivers employ direct detection; that is, the received optical signal impinges directly onto a detector. Direct detection is less sensitive than coherent detection. [After FAA] **2.** In tactical operations, the perception of an object of possible military interest but unconfirmed by recognition. [JP1] **3.** In surveillance, the determination and transmission by a surveillance system that an event has occurred. [JP1]

**detectivity:** The reciprocal of noise equivalent power.

**detector:** **1.** A device that is responsive to the presence or absence of a stimulus. **2.** In an AM radio receiver, a circuit or device that recovers the signal of interest from the modulated wave. *Note:* In FM reception, a circuit called a discriminator is used to convert frequency variations to amplitude variations. **3.** In an optical communications receiver, a device that converts the received optical signal to another form. *Note:* Currently, this conversion is from optical to electrical power; however, optical-to-optical techniques are under development.

**deterministic routing:** **1.** In a switched network, switching in which the routes between given pairs of nodes are pre-programmed, *i.e.*, are determined, in advance of transmission. *Note:* The routes used to complete a given call through a network are identified, in advance of transmission, in routing tables maintained in each switch database. The tables assign the trunks that are to be used to reach each switch code, area code, and International Access Prefix (IAP), usually with one or two alternate routes. **2.** In a non-switched network, routing in which the routes between given pairs of nodes are determined in advance. *Note:* The routes used to send a given message through a network are identified in advance in routing tables maintained in a database.

**deterministic transfer mode:** An asynchronous transfer mode in which the maximum information transfer capacity of a telecommunication service is provided throughout a call.

**Deutsches Institut für Normung (DIN):** Germany's standards-setting organization, equivalent to the American National Standards Institute (ANSI).

**deviation ratio:** In a frequency modulation system, the ratio of the maximum frequency deviation of the carrier to the maximum modulating frequency of the system under specified conditions. (188)

**D4:** *See* channel bank.

**D-4:** A framing standard for traditional time-division multiplexing, which standard describes user channels multiplexed onto a trunk that has been segmented (framed) into 24 bytes of 8 bits each. *Note:* The multiplexing function is performed in the D-4 framing structure by interleaving bits of consecutive bytes as they are presented from individual circuits into each D-4 frame.

**DFSK:** *Abbreviation for* double-frequency shift keying.

**diad:** *Synonym* dibit.

**diagnostic program:** **1.** A program used to investigate the cause or the nature of conditions or problems within specified elements of a system. (188) **2.** A computer program that detects, locates, or identifies a fault in equipment, an error in input data, or an error in a computer program. (188)

**dialing:** In a communications system, using a device that generates signals for selecting and establishing connections. *Note:* The term "*dialing*" is often used to designate or refer to all calling devices used for inserting data to establish connections. [From Weik '89]

**dial mode:** Operation of data circuit-terminating equipment (DCE) so that circuitry, such as data terminal equipment (DTE), associated with call origination is directly connected to a communications channel.

**dial pulse:** A dc pulse produced by an end instrument that interrupts a steady current at a sequence and rate determined by the selected digit and the operating characteristics of the instrument. (188)

**dial pulsing:** Pulsing in which a direct-current pulse train is produced by interrupting a steady signal according to a fixed or formatted code for each digit and at a standard pulse repetition rate. *Note:* Dial pulsing originated with rotary mechanical devices integrated into telephone instruments, for the purpose of signaling. Subsequent applications use electronic circuits to generate dial pulses. *Synonym pulsing.*

**dial service assistance (DSA):** A network-provided service feature, associated with the switching center equipment, in which services, such as directory assistance, call interception, random conferencing, and precedence calling assistance, are rendered by an attendant. (188)

**dial signaling:** Signaling in which dual tone multifrequency (DTMF) signals or pulse trains are transmitted to a switching center. *Note 1:* Rotary dials produce pulse trains. Keypads may produce either DTMF signals or pulse trains. *Note 2:* Dial signaling traditionally refers to pulse trains only. (188)

**dial switching equipment:** Switching equipment actuated by electrical impulses generated by a dial or key pulsing arrangement. [47CFR]

**dial through:** A technique, applicable to access circuits, that permits an outgoing routine call to be dialed by the PBX user after the PBX attendant has established the initial connection. (188)

**dial tone:** A tone employed in a dial telephone system to indicate to the calling party that the equipment is ready to receive dial or tone pulses.

**dial-tone delay:** The time between the instant of going off-hook and the instant of receiving a dial tone.

**dial-up:** **1.** A service feature in which a user initiates service on a previously arranged trunk or transfers, without human intervention, from an active trunk to a standby trunk. (188) **2.** A service feature that

allows a computer terminal to use telephone systems to initiate and effect communications with other computers.

**diametral index of cooperation:** *Synonym index of cooperation.*

**dibit:** A group of two bits. *Note:* The four possible states for a dibit are 00, 01, 10, and 11. (188) *Synonym diad.*

**dichroic filter:** An optical filter that reflects one or more optical bands or wavelengths and transmits others, while maintaining a nearly zero coefficient of absorption for all wavelengths of interest. *Note:* A dichroic filter may be high-pass, low-pass, band-pass, or band rejection.

**dichroic mirror:** A mirror used to reflect light selectively according to its wavelength. (188)

**DID:** *Abbreviation for direct inward dialing.*

**dielectric:** **1.** A substance in which an electric field may be maintained with zero or near-zero power dissipation, *i.e.*, the electrical conductivity is zero or near zero. *Note 1:* A dielectric material is an electrical insulator. *Note 2:* In a dielectric, electrons are bound to atoms and molecules, hence there are few free electrons. **2.** Pertaining to a substance that has a zero or near zero electrical conductivity.

**dielectric filter:** *See interference filter.*

**dielectric lens:** In the radio regime, a lens made of dielectric material that refracts radio waves in the same manner that an optical lens refracts light waves. (188)

**dielectric strength:** **1.** Of an insulating material, the maximum electric field strength that it can withstand intrinsically without breaking down, *i.e.*, without experiencing failure of its insulating properties. *Note:* The theoretical dielectric strength of a material is an intrinsic property of the bulk material and is not dependent on the configuration of the material or the electrodes with which the field is applied. **2.** For a given configuration of dielectric material and electrodes, the minimum electric field that produces breakdown. *Note 1:* At breakdown, the electric field

frees bound electrons, turning the material into a conductor. *Note 2:* The field strength at which breakdown occurs in a given case is dependent on the respective geometries of the dielectric (insulator) and the electrodes with which the electric field is applied, as well as the rate of increase at which the electric field is applied. *Note 3:* The electric field strength is usually expressed in volts per meter. (188)

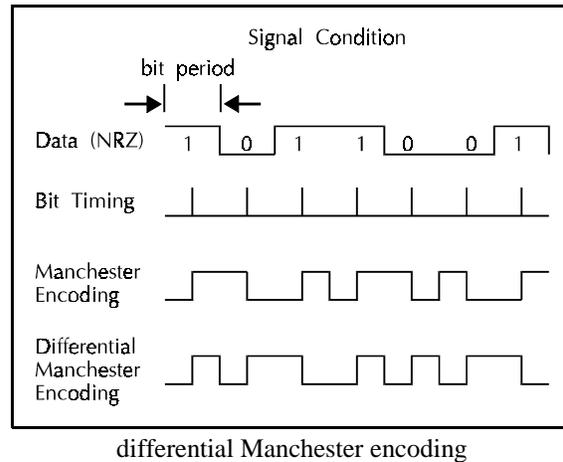
**dielectric waveguide:** A waveguide that consists of a dielectric material surrounded by another dielectric material, such as air, glass, or plastic, with a lower refractive index. *Note 1:* An example of a dielectric waveguide is an optical fiber. *Note 2:* A metallic waveguide filled with a dielectric material is not a dielectric waveguide.

**differential encoding:** Encoding in which signal significant conditions represent binary data, such as “0” and “1”, and are represented as changes to succeeding values rather than with respect to a given reference. *Note:* An example of differential encoding is phase-shift keying (PSK) in which the information is not conveyed by the absolute phase of the signal with respect to a reference, but by the difference between phases of successive symbols, thus eliminating the requirement for a phase reference at the receiver.

**differentially coherent phase-shift keying:** *See coherent differential phase-shift keying.*

**differentially encoded baseband:** *Synonym non-return-to-mark.*

**differential Manchester encoding:** Encoding in which (a) data and clock signals are combined to form a single self-synchronizing data stream, (b) one of the two bits, *i.e.*, “0” or “1”, is represented by no transition at the beginning of a pulse period and a transition in either direction at the midpoint of a pulse period, and (c) the other is represented by a transition at the beginning of a pulse period and a transition at the midpoint of the pulse period. *Note:* In differential Manchester encoding, if a “1” is represented by one transition, a “0” is represented by two transitions, and vice versa.



**differential mode attenuation:** In an optical fiber, the variation in attenuation among the propagating modes. (188)

**differential mode delay:** In an optical fiber, the variation in propagation delay that occurs because of the different group velocities of different modes. (188) *Synonym multimode group delay.*

**differential mode interference:** 1. Interference that causes a change in potential of one side of a signal transmission path relative to the other side. (188)  
2. Interference resulting from an interference current path coinciding with the signal path. (188)

**differential modulation:** Modulation in which the choice of the significant condition for any signal element is dependent on the significant condition for the previous signal element. (188) *Note:* An example of differential modulation is delta modulation.

**differential phase-shift keying (DPSK):** Phase-shift keying that is used for digital transmission in which the phase of the carrier is discretely varied (a) in relation to the phase of the immediately preceding signal element and (b) in accordance with the data being transmitted. (188)

**differential pulse-code modulation (DPCM):** Pulse-code modulation in which an analog signal is sampled and the difference between the actual value of each sample and its predicted value, derived from

the previous sample or samples, is quantized and converted, by encoding, to a digital signal. *Note:* There are several variations of differential pulse-code modulation.

**differential quantum efficiency:** In an optical source or detector, the slope of the curve relating output quanta to input quanta. (188)

**differentiating network:** A network, or circuit, that produces an output waveform that is the time derivative of the input waveform. *Note:* Differentiating networks are used in signal processing, such as for producing short timing pulses from square waves.

**diffraction:** The deviation of an electromagnetic wavefront from the path predicted by geometric optics when the wavefront interacts with, *i.e.*, is restricted by, a physical object such as an opening (aperture) or an edge. (188) *Note:* Diffraction is usually most noticeable for openings of the order of a wavelength. However, diffraction may still be important for apertures many orders of magnitude larger than the wavelength.

**diffraction grating:** An array of fine, parallel, equally spaced grooves (“rulings”) on a reflecting or transparent substrate, which grooves result in diffractive and mutual interference effects that concentrate reflected or transmitted electromagnetic energy in discrete directions, called “*orders*,” or “*spectral orders*.” *Note 1:* The groove dimensions and spacings are on the order of the wavelength in question. In the optical regime, in which the use of diffraction gratings is most common, there are many hundreds, or thousands, of grooves per millimeter. *Note 2:* Order zero corresponds to direct transmission or specular reflection. Higher orders result in deviation of the incident beam from the direction predicted by geometric (ray) optics. With a normal angle of incidence, the angle  $\theta$ , the deviation of the diffracted ray from the direction predicted by geometric optics, is given by

$$\theta = \pm \sin^{-1} \left( \frac{n\lambda}{d} \right),$$

where  $n$  is the spectral order,  $\lambda$  is the wavelength, and  $d$  is the spacing between corresponding parts of

adjacent grooves. *Note 3:* Because the angle of deviation of the diffracted beam is wavelength-dependent, a diffraction grating is dispersive, *i.e.*, it separates the incident beam spatially into its constituent wavelength components, producing a spectrum. *Note 4:* The spectral orders produced by diffraction gratings may overlap, depending on the spectral content of the incident beam and the number of grooves per unit distance on the grating. The higher the spectral order, the greater the overlap into the next-lower order. *Note 5:* By controlling the cross-sectional shape of the grooves, it is possible to concentrate most of the diffracted energy in the order of interest. This technique is called “*blazing*.”

**diffraction limited:** **1.** In optics, pertaining to a light beam in which the far-field beam divergence is equal to that predicted by diffraction theory. **2.** In focusing optics, pertaining to a light beam in which the impulse response or resolution limit is equal to that predicted by diffraction theory. (188) [After 2196]

**diffraction region:** In radio propagation, a region outside the line-of-sight region in which radio reception is made possible by the diffraction of the radiated waves.

**diffuse reflection:** Reflection from a rough or irregular surface which does not maintain the integrity of the incident wavefront. *Contrast with specular reflection.*

**digit:** A symbol, numeral, or graphic character that represents an integer. *Note 1:* Examples of digits include any one of the decimal characters “0” through “9” and either of the binary characters “0” or “1.” (188) *Note 2:* In a given numeration system, the number of allowable different digits, including zero, is always equal to the base (radix).

**digital:** Characterized by discrete states.

**digital access and cross-connect system (DACs):** In communications systems, a digital system in which (a) access is performed by T-1 hardware architecture in private and public networks with centralized switching and (b) cross-connection is performed by D3/D4 framing for switching digital-signal-0 (DS-0) channels to other DS-0 channels. *Note:* Modern digital access and cross-connect systems are not

limited to the T-carrier system, and may accommodate high data rates such as those of SONET.

**digital alphabet:** A coded character set in which the characters of an alphabet have a one-to-one relationship with their digitally coded representations. (188)

**digital circuit patch bay:** A patch bay in which low-level digital data circuits can be patched, monitored, and tested. (188) *Note:* A digital circuit patch bay can be either “D” type (unbalanced) or “K” type (balanced).

**digital combining:** A method of interfacing digital data signals, in either synchronous or asynchronous mode, without converting the data into a quasi-analog signal. (188)

**digital computer:** A computer that consists of one or more central processing units (CPUs), that is controlled by internally stored programs, and that stores and processes data in digital form.

**digital data: 1.** Data represented by discrete values or conditions, as opposed to analog data. (188) **2.** Discrete representations of quantized values of variables, *e.g.*, the representation of numbers by digits, perhaps with special characters and the “space” character.

**digital error:** An inconsistency between the digital signal actually received and the digital signal that should have been received. (188)

**digital facsimile equipment:** Facsimile equipment that digitally encodes the picture signal, *i.e.*, encodes the baseband signal resulting from scanning the object. *Note:* The facsimile equipment output may be either (a) analog, as defined by CCITT Group 3 protocol, or (b) digital, as defined by CCITT Group 4, STANAG 5000 Type I, and STANAG 5000 Type II protocols. (188)

**digital filter:** A filter (usually linear), in discrete time, that is normally implemented through digital electronic computation. (188) *Note:* Digital filters differ from continuous time filters only in application. The parameters of digital filters are generally more stable than the parameters of

commonly used analog (continuous) filters. Digital filters can be applied as optimal estimators. Commonly used forms are finite impulse response (FIR) and infinite impulse response (IIR).

**digital frequency modulation:** The transmission of digital data by frequency modulation of a carrier, as in binary frequency-shift keying. (188)

**digital group:** *See* digroup.

**digital loop carrier (DLC):** The equipment, including lines, that is used for digital multiplexing of telephone circuits, and that is provided by the network as part of the subscriber access. (188)

**digital milliwatt: 1.** In digital telephony, a test signal consisting of eight 8-bit words corresponding to one cycle of a sinusoidal signal approximately 1 kHz in frequency and one milliwatt, rms, in power. *Note 1:* The digital milliwatt is stored in ROM. A continuous signal of arbitrary length, *i.e.*, an indefinite number of cycles, may be realized by continually reading out and concatenating the stored information into a data stream to be converted into analog form. *Note 2:* The digital milliwatt is used in lieu of separate test equipment. It has the advantage of being tied in frequency and amplitude to the relatively stable digital clock signal and power (voltage) supply, respectively, that are used by the digital channel bank. **2.** A digital signal that is the coded representation of a 0-dBm, 1000-Hertz sine wave. [47CFR]

**digital modulation:** The process of varying one or more parameters of a carrier wave as a function of two or more finite and discrete states of a signal. (188)

**digital multiplexer:** A device for combining several digital signals into an aggregate bit stream. (188) *Note:* Digital multiplexing may be implemented by interleaving bits, in rotation, from several digital bit streams either with or without the addition of extra framing, control, or error detection bits.

**digital multiplex hierarchy:** A hierarchy consisting of an ordered repetition of tandem digital multiplexers that produce signals of successively higher data rates at each level of the hierarchy. (188) *Note 1:* Digital multiplexing hierarchies may

be implemented in many different configurations depending on (a) the number of channels desired, (b) the signaling system to be used, and (c) the bit rate allowed by the communications media. *Note 2:* Some currently available digital multiplexers have been designated as DI-, DS-, or M-series, all of which operate at T-carrier rates. *Note 3:* In the design of digital multiplex hierarchies, care must be exercised to ensure interoperability of the multiplexers used in the hierarchy.

**digital network:** See **integrated digital network**.

**digital phase-locked loop:** A phase-locked loop in which the reference signal, the controlled signal, or the controlling signal, or any combination of these, is in digital form.

**digital phase modulation:** Modulation in which the instantaneous phase of the modulated wave is shifted between a set of predetermined discrete values in accordance with the significant conditions of the modulating signal.

**digital primary patch bay:** A patch bay that provides (a) the first access of most local user digital circuits in a technical control facility and (b) patching, monitoring, and testing capabilities for both high-level and low-level digital circuits.

**digital selective calling (DSC):** A synchronous system developed by the International Radio Consultative Committee (CCIR), used to establish contact with a station or group of stations automatically by means of radio. The operational and technical characteristics of this system are contained in CCIR Recommendation 493. [47CFR]

**digital signal (DS):** A signal in which discrete steps are used to represent information. (188) *Note 1:* In a digital signal, the discrete steps may be further characterized by signal elements, such as significant conditions, significant instants, and transitions. *Note 2:* Digital signals contain m-ary significant conditions.

**digital signal 0 (DS0):** In T-carrier, a basic digital signaling rate of 64 kb/s, corresponding to the capacity of one voice-frequency-equivalent channel. *Note 1:* The DS0 rate forms the basis for the North American digital multiplex transmission hierarchy.

*Note 2:* The DS0 rate may support twenty 2.4-kb/s channels, or ten 4.8-kb/s channels, or five 9.67-kb/s channels, or one 56-kb/s channel, or one 64-kb/s clear channel.

**digital signal 1 (DS1):** A digital signaling rate of 1.544 Mb/s, corresponding to the North American and Japanese T1 designator.

**digital signal 1C (DS1C):** A digital signaling rate of 3.152 Mb/s, corresponding to the North American T1C designator.

**digital signal 2 (DS2):** A digital signaling rate of 6.312 Mb/s, corresponding to the North American and Japanese T2 designator.

**digital signal 3 (DS3):** **1.** A digital signal rate of 44.736 Mb/s, corresponding to the North American T3 designator. **2.** A digital signaling rate of 32.064 Mb/s, corresponding to the Japanese T3 designator.

**digital signal 4 (DS4):** **1.** A digital signal rate of 274.176 Mb/s, corresponding to the North American T4 designator. **2.** A digital signaling rate of 97.728 Mb/s, corresponding to the Japanese T4 designator.

**digital slip:** In the reception of a digital data stream, the loss of a bit, or the insertion by the receiver of a bit that was not transmitted, because of a difference in the bit rates of the incoming data stream and the local clock.

**digital speech interpolation (DSI):** In digital speech transmission, the use of periods of inactivity or constant signal level to increase the transmission efficiency by insertion of additional signals.

**digital subscriber line (DSL):** In Integrated Services Digital Networks (ISDN), equipment that provides full-duplex service on a single twisted metallic pair at a rate sufficient to support ISDN basic access and additional framing, timing recovery, and operational functions. (188) *Note:* The physical termination of the DSL at the network end is the line termination; the physical termination at the customer end is the network termination.

**digital switch:** A switch that performs time-division-multiplexed switching of digitized

signals. (188) *Note 1:* When used with analog inputs, analog-to-digital and digital-to-analog conversion are required. These functions may be performed by the digital switch. *Note 2:* Implementation is accomplished by the interchange of time slots between input and output ports on a sequential basis under the direction of control systems. The control systems may be automatic, semiautomatic, or manual.

**digital switching:** Switching in which digitized signals are switched without converting them to or from analog signals. (188)

**digital synchronization:** Synchronization based on the start of a transmitted digital data unit, such as a bit, character, block, or frame. (188)

**digital-to-analog (D-A) converter:** A device that converts a digital input signal to an analog output signal carrying equivalent information. (188)

**digital transmission group:** A group of digitized voice or data channels or both with bit streams that are combined into a single digital bit stream for transmission over communications media. (188) *Note:* Digital transmission groups usually are categorized by their maximum capacity, not by a specific number of channels. However, the maximum digital transmission group capacity must be equal to or greater than the sum of the individual multiplexer input channel capacities.

**digital transmission system:** A transmission system in which (a) all circuits carry digital signals and (b) the signals are combined into one or more serial bit streams that include all framing and supervisory signals. *Note:* A-D/D-A conversion, if required, is accomplished external to the system. (188)

**digital transport:** *See* **digital transmission system.**

**digital voice transmission:** Transmission of analog voice signals that have been converted into digital signals. *Note:* An example of digital voice transmission is transmission of pulse-code modulated (PCM) analog voice signals. (188)

**digitize:** To convert an analog signal into a digital signal carrying equivalent information. (188)

**digitizer: 1.** A device that converts an analog signal into a digital representation of the analog signal. (188) *Note:* A digitizer usually samples the analog signal at a constant sampling rate and encodes each sample into a numeric representation of the amplitude value of the sample. **2.** A device that converts the position of a point on a surface into digital coordinate data. (188)

**digit time slot:** In a digital data stream, a time interval that is allocated to a single digit and that can be uniquely recognized and defined. (188)

**digroup:** *Abbreviation for digital group.* In telephony, a basic digital multiplexing group. *Note 1:* In the North American and Japanese T-carrier digital hierarchies, each digroup supports 12 PCM voice channels or their equivalent in other services. The DS1 line rate (2 digroups plus overhead bits) is 1.544 Mb/s, supporting 24 voice channels or their equivalent in other services. *Note 2:* In the European hierarchy, each digroup supports 15 PCM channels or their equivalent in other services. The DS1 line rate (2 digroups plus overhead bits) is 2.048 Mb/s, supporting 30 voice channels or their equivalent in other services.

**DIN:** *Abbreviation for Deutsches Institut für Normung.*

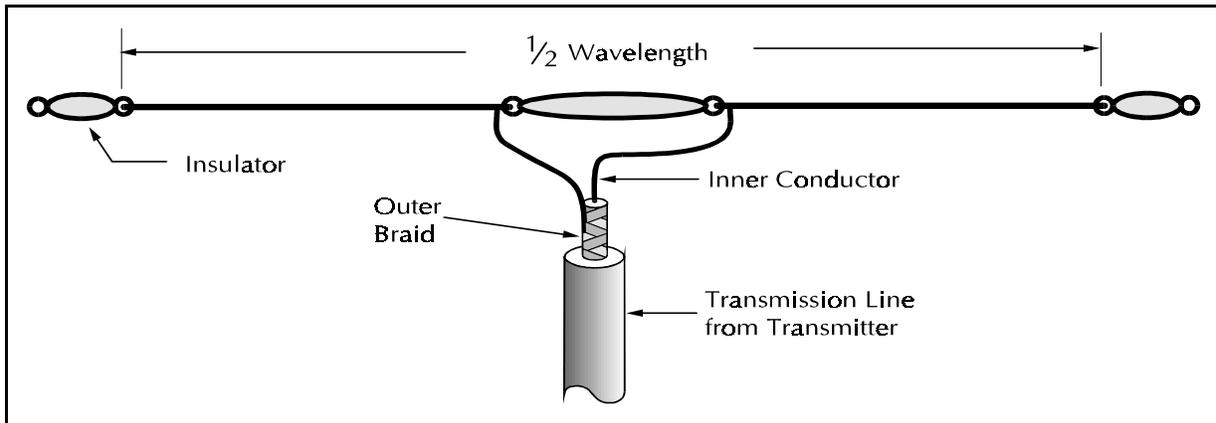
**diode laser:** *Synonym injection laser diode.*

**DIP:** *Abbreviation for dual in-line package.*

**diplexer:** A three-port frequency-dependent device that may be used as a separator or a combiner of signals. (188) *Note:* Duplex transmission through a diplexer is not possible.

**diplex operation:** The sharing of one common element, such as a single antenna or channel, for transmission or reception of two simultaneous, independent signals on two different frequencies. *Note:* An example of diplex operation is the use of one antenna for two radio transmitters on different frequencies. (188)

**dipole antenna:** Usually a straight, center-fed, one-half wavelength antenna. (188)



dipole antenna

**DIP switch:** A group of subminiature switches mounted in a package compatible with standard integrated-circuit sockets. *Note:* DIP switches are usually composed of rocker or slide-type switches.

**dipulse coding:** The coding of "1's" and "0's" in a message in which one full cycle of a square wave, *i.e.*, a positive pulse followed by a negative pulse in the same bit period, is transmitted when the message bit is a "1" and nothing is transmitted when the bit is a "0", or vice versa. *Note:* A dipulse signal can be generated by encoding the data into 50% return-to-zero (RZ) unipolar data and sending the bits through an AND gate with the system clock pulse. This RZ bit stream is then delayed one half-bit period and then added to the undelayed RZ stream. This produces the final dipulse waveform. The dipulse power spectrum is similar to that of the biphase coding power spectrum except dipulse coding produces a pulse-repetition rate equal to the bit rate. [From Weik '89]

**Dirac delta function:** *Synonym* unit impulse.

**direct access:** **1.** The capability to obtain data from a storage device, or to enter data into a storage device, in a sequence independent of their relative positions by means of addresses that indicate the physical location of the data. **2.** Pertaining to the organization and access method that must be used for a storage structure in which locations of records are determined by their keys, without reference to an index or to other records that may have been previously accessed.

**direct address:** In computing, an address that designates the storage location of an item of data to be treated as an operand.

**direct bond:** An electrical connection using continuous metal-to-metal contact between the members being joined. (188)

**direct-buried cable:** A communication cable manufactured or produced for the purpose of burial in direct contact with the earth. (188)

**direct call:** A facility-handled call in which the network interprets the call request signal as an instruction to establish a connection based on previously designated user information.

**direct connect:** **1.** In computer systems, a permanent communications link that connects directly to a mainframe computer through a terminal controller, usually at binary synchronous (bi-sync) transmission rates. **2.** In computer systems, a temporary connection between a microcomputer, *i.e.*, a desktop workstation, and a host bulletin board system or server.

**direct coupling:** *Synonym* conductive coupling.

**direct current signaling (DX signaling):** In telephony, a method whereby the signaling circuit E & M leads use the same cable pair(s) as the voice circuit and no filter is required to separate the control signals from the voice transmission. (188)

**direct detection:** *See detection (def. #1).*

**direct dialing service:** A service feature that permits a user to place information concerning credit card calls, collect calls, and special billing calls into the public telephone network without operator assistance.

**direct distance dialing (DDD):** A network-provided service feature in which a call originator may, without operator assistance, call any other user outside the local calling area. (188) *Note 1:* DDD extends beyond the boundaries of national public telephone networks. *Note 2:* DDD requires more digits in the number dialed than are required for calling within the local area.

**directed broadcast address:** An Internet Protocol address that specifies “all hosts” on a specified network. *Note:* A single copy of a directed broadcast is routed to the specified network, where it is broadcast to all terminals on that network.

**directed net:** A radio net in which no station other than the net control station may communicate with any other station without first obtaining permission from the net control station. *Note:* A directed net is established by the net control station. The net control station may restore the net to a free net. [From Weik '89]

**direct inward dialing (DID):** A service feature that allows inward-directed calls to a PBX to reach a specific PBX extension without human intervention. *Synonym network inward dialing.* (188)

**directional antenna:** An antenna in which the radiation pattern is not omnidirectional, *i.e.*, a nonisotropic antenna. (188)

**directional coupler:** A transmission coupling device for separately sampling (through a known coupling loss) either the forward (incident) or the backward (reflected) wave in a transmission line. (188) *Note:* A directional coupler may be used to sample either a forward or backward wave in a transmission line. A unidirectional coupler has available terminals or connections for sampling only one direction of transmission; a bidirectional coupler has available terminals for sampling both directions.

**directionalization:** The temporary conversion of a portion or all of a two-way trunk group to one-way trunks favoring traffic flowing away from a congested switch. *Note:* Adjacent nodes must cooperate to accomplish directionalization.

**direction finding:** A procedure for obtaining bearings of radio frequency emitters by using a highly directional antenna and a display unit on an intercept receiver or ancillary equipment. [JP1]

**direction of scanning:** In a facsimile transmitting apparatus, the scanning of the plane (developed in the case of a drum transmitter) of the message surface along lines running from right to left commencing at the top so that scanning commences at the top right-hand corner of the surface and finishes at the bottom left-hand corner; this is equivalent to scanning over a right-hand helix on a drum. *Note 1:* The orientation of the message on the scanning plane will depend upon its dimensions and is of no consequence. At the receiving apparatus, scanning takes place from right to left and top to bottom (in the above sense) for “positive” reception and from left to right and top to bottom (in the above sense) for “negative” reception. (188) *Note 2:* This is the CCITT Recommendation for phototelegraphic equipment.

**directive gain:** **1.** Of an antenna, the ratio of (a)  $4\pi$  times the radiance, *i.e.*, power radiated per unit solid angle (watts per steradian), in a given direction to (b) the total power, *i.e.*, the power radiated to  $4\pi$  steradians. (188) *Note 1:* The directive gain is usually expressed in dB. *Note 2:* The directive gain is relative to an isotropic antenna. *Note 3:* The power radiated to  $4\pi$  steradians is the total power radiated by the antenna because  $4\pi$  steradians constitute an entire sphere. **2.** Of an antenna, for a given direction, the ratio of the radiance, *i.e.*, the radiation intensity, produced in the given direction to the average value of the radiance in all directions. *Note 1:* If the direction is not specified, the direction of maximum radiance is assumed. *Note 2:* The directive gain is usually expressed in dB. (188)

**directivity pattern:** *Synonym radiation pattern.*

**direct orbit:** For a satellite orbiting the Earth, an orbit in which the projection of the satellite on the

equatorial plane revolves about the Earth in the same direction as the rotation of the Earth. (188)

**direct outward dialing (DOD):** An automated PBX service feature that provides for outgoing calls to be dialed directly from the user terminal. (188)  
*Synonym* **network outward dialing.**

**direct ray:** A ray of electromagnetic radiation that follows the path of least possible propagation time between transmitting and receiving antennas. (188)  
*Note:* The path of least propagation time is not always the shortest distance path.

**direct recording:** In facsimile systems, recording in which a visible record is produced, without subsequent processing, in response to received signals. (188)

**direct-sequence modulation:** In spread-spectrum systems, modulation in which a sequence of binary pulses is used directly to modulate a carrier, usually by phase-shift keying. *Synonym* **direct-spread modulation.** [From Weik '89]

**direct-sequence spread spectrum:** **1.** A system (a) for generating spread-spectrum transmissions by phase-modulating a sine wave pseudorandomly with a continuous string of pseudonoise code symbols, each of duration much smaller than a bit and (b) that may be time-gated, where the transmitter is keyed periodically or randomly within a specified time interval. **2.** A signal structuring technique utilizing a digital code sequence having a chip rate much higher than the information signal bit rate. Each information bit of a digital signal is transmitted as a pseudorandom sequence of chips. [NTIA]

**direct-spread modulation:** *Synonym* **direct-sequence modulation.**

**DISA:** *Abbreviation for Defense Information Systems Agency, formerly DCA* (Defense Communications Agency).

**disabling tone:** A tone, transmitted over a communications path, used to control equipment. (188) *Note:* An example of a disabling tone is a tone that places an echo suppressor in a nonoperative

condition during data transmission over a telephone circuit.

**disc:** *See* **diskette.**

**DISC:** *Abbreviation for disconnect command.*

**discone antenna:** *See* **biconical antenna.**

**disconnect:** In telephony, the disassociation or release of a switched circuit between two stations.

**disconnect command (DISC):** In Link-Layer protocols, such as high-level data link control (HDLC), synchronous data link control (SDLC), and advanced data communication control procedure (ADCCP), an unnumbered command used to terminate the operational mode previously set.

**disconnect signal:** In a switched telephone network, a supervisory signal transmitted from one end of a user line or trunk to indicate at the other end that the established connection should be disconnected. (188)

**disconnect switch:** In a power system, a switch used for closing, opening, or changing the connections in a circuit or system or for purposes of isolation. *Note:* It has no interrupting rating and is intended to be operated only after the circuit has been opened by some other means, such as by a circuit breaker or variable transformer. (188)

**discriminator:** The part of an FM receiver that extracts the desired signal from an incoming FM wave by changing frequency variations into amplitude variations. (188)

**disengagement attempt:** An attempt to terminate a telecommunications system access. *Note:* Disengagement attempts may be initiated by a user or the telecommunications system.

**disengagement denial:** After a disengagement attempt, a failure to terminate the telecommunications system access. *Note:* Disengagement denial is usually caused by excessive delay in the telecommunications system.

**disengagement-denial probability:** The ratio of disengagement attempts that result in disengagement

denial to the total disengagement attempts counted during a measurement period.

**disengagement failure:** Failure of a disengagement attempt to return a communication system to the idle state, for a given user, within a specified maximum disengagement time.

**disengagement originator:** The user or functional unit that initiates a disengagement attempt. *Note 1:* A disengagement originator may be the originating user, the destination user, or the communications system. *Note 2:* The communications system may deliberately originate the disengagement because of preemption or inadvertently because of system malfunction.

**disengagement phase:** In an information transfer transaction, the phase during which successful disengagement occurs. *Note:* The disengagement phase is the third phase of an information transfer transaction.

**disengagement request:** A control or overhead signal issued by a disengagement originator for the purpose of initiating a disengagement attempt.

**disengagement time:** **1.** The average value of elapsed time between the start of a disengagement attempt for a particular source or destination user and the successful disengagement of that user. **2.** Elapsed time between the start of a disengagement attempt and successful disengagement.

**diskette:** In computer technology, a small disk of flexible plastic, coated with a magnetizable material and enclosed in a protective jacket, used to store digital data. *Note:* A diskette is distinguished from a hard disk by virtue of the fact that it is flexible, and unlike most hard disks, is removable from its drive. *Synonyms flexible disk, floppy disk.*

**disk pack:** An assembly of magnetic disks that can be removed as a whole from a disk drive together with a container from which the assembly must be separated when operating.

**DISNET:** *Abbreviation for Defense Integrated Secure Network.*

**disparity:** In pulse-code modulation (PCM), the digital sum, *i.e.*, the algebraic sum, of a set of signal elements. *Note:* The disparity will be zero and there will be no cumulative or drifting polarization if there are as many positive elements (those that represent 1) as there are negative elements (those that represent 0).

**dispersion:** Any phenomenon in which the velocity of propagation of an electromagnetic wave is wavelength dependent. *Note 1:* In communication technology, “*dispersion*” is used to describe any process by which an electromagnetic signal propagating in a physical medium is degraded because the various wave components (*i.e.*, frequencies) of the signal have different propagation velocities within the physical medium. *Note 2:* In an optical fiber, there are several significant dispersion effects, such as material dispersion, profile dispersion, and waveguide dispersion, that degrade the signal. *Note 3:* In optical fiber communications, the incorrect terms “*multimode dispersion*” and “*intermodal dispersion*” should not be used as synonyms for the correct term “*multimode distortion*.” *Note 4:* In classical optics, “*dispersion*” is used to denote the wavelength dependence of refractive index in matter, ( $dn/d\lambda$ , where  $n$  is the refractive index and  $\lambda$  is the wavelength) caused by interaction between the matter and light. “*Dispersion*,” as used in fiber optic communications, should not be confused with “*dispersion*” as used by optical lens designers. *Note 5:* Three types of dispersion, relating to optical fibers, are defined as follows:

➤ **material dispersion:** In optical fiber communication, the wavelength dependence of the velocity of propagation (of the optical signal) on the bulk material of which the fiber is made. *Note 1:* Because every optical signal has a finite spectral width, material dispersion results in spreading of the signal. *Note 2:* Use of the redundant term “*chromatic dispersion*” is discouraged. *Note 3:* In pure silica, the basic material from which the most common telecommunication-grade fibers are made, material dispersion is minimum at wavelengths in the vicinity of 1.27  $\mu\text{m}$  (slightly longer in practical fibers).

➤ **profile dispersion:** In an optical fiber, that dispersion attributable to the variation of refractive

index contrast with wavelength. Profile dispersion is a function of the profile dispersion parameter.

➤ **waveguide dispersion:** Dispersion, of importance only in single-mode fibers, caused by the dependence of the phase and group velocities on core radius, numerical aperture, and wavelength. (188) *Note 1:* For circular waveguides, the dependence is on the ratio,  $a/\lambda$ , where  $a$  is the core radius and  $\lambda$  is the wavelength. *Note 2:* Practical single-mode fibers are designed so that material dispersion and waveguide dispersion cancel one another at the wavelength of interest.

**dispersion coefficient:** See **material dispersion coefficient**.

**dispersion-limited operation:** Operation of a communications link in which signal waveform degradation attributable to the dispersive effects of the communications medium is the dominant mechanism that limits link performance. (188) *Note 1:* The amount of allowable degradation is dependent on the quality of the receiver. *Note 2:* In fiber optic communications, “*dispersion-limited operation*” is often confused with “*distortion-limited operation*.”

**dispersion-shifted fiber:** A single-mode optical fiber that has its minimum-dispersion wavelength shifted, by the addition of dopants, toward its minimum-loss wavelength. *Synonym* **EIA Class IVb fiber**.

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

**dispersion-unshifted fiber:** A single-mode optical fiber that has a nominal zero-dispersion wavelength in the 1.3- $\mu\text{m}$  transmission window. *Synonyms* **dispersion-unmodified fiber, EIA Class IVa fiber, nonshifted fiber**.

**display device:** An output unit that gives a visual representation of data.

**distance learning:** *Synonym* **teletraining**.

**distance measuring equipment (DME):** In radio location systems, equipment that ascertains the distance between an interrogator and a transponder. [From Weik '89]

**distance training:** *Synonym* **teletraining**.

**distortion: 1.** In a system or device, any departure of the output signal waveform from that which should result from the input signal waveform's being operated on by the system's specified, *i.e.*, ideal, transfer function. (188) *Note:* Distortion may result from many mechanisms. Examples include nonlinearities in the transfer function of an active device, such as a vacuum tube, transistor, or operational amplifier. Distortion may also be caused by a passive component such as a coaxial cable or optical fiber, or by inhomogeneities, reflections, *etc.*, in the propagation path. **2.** In start-stop teletypewriter signaling, the shifting of the significant instants of the signal pulses from their proper positions relative to the beginning of the start pulse. *Note:* The magnitude of the distortion is expressed in percent of an ideal unit pulse length.

**distortion-limited operation:** The condition prevailing when distortion of a received signal, rather than its attenuated amplitude (or power), limits performance under stated operational conditions and limits. (188) *Note:* Distortion-limited operation is reached when the system distorts the shape of the waveform beyond specified limits. For linear systems, distortion-limited operation is equivalent to bandwidth-limited operation.

**distributed control:** Control of a network from multiple points. *Note:* Each point controls a portion of the network, using local information or information transmitted over the network from distant points.

**distributed database: 1.** A database that is not entirely stored at a single physical location, but rather is dispersed over a network of interconnected computers. **2.** A database that is under the control of a central database management system in which storage devices are not all attached to a common processor.

**distributed frame-alignment signal:** A frame-alignment signal in which the signal elements occupy digit positions that are not consecutive.

**distributed network:** A network structure in which the network resources, such as switching equipment and processors, are distributed throughout the

geographical area being served. (188) *Note:* Network control may be centralized or distributed.

**distributed processing:** Data processing in which an integrated set of functions is performed within multiple, physically separated devices. (188)

**distributed-queue dual-bus (DQDB) [network]:** A distributed multi-access network that (a) supports integrated communications using a dual bus and distributed queuing, (b) provides access to local or metropolitan area networks, and (c) supports connectionless data transfer, connection-oriented data transfer, and isochronous communications, such as voice communications.

**distributed switching:** Switching in which many processor-controlled switching units are distributed, usually close to concentrations of users, and operated in conjunction with a host switch. (188) *Note:* Distributed switching provides improved communications services for concentrations of users remote from the host switch, and reduces the transmission requirements, *i.e.*, the traffic, between such concentrations and the host switch.

**distribution:** In ISDN applications, the use of broadband transmission of audio or video information to the user without applying any post-production processing to the information. *Note:* “*Distribution*” is in contrast to “*contribution*.”

**distribution frame:** In communications, a structure with terminations for connecting the permanent wiring of a facility in such a manner that interconnection by cross-connections may readily be made. (188)

**distribution-quality television:** Television conforming to the NTSC standard, the SECAM standard, the PAL standard, or the PAL-M standard. *Synonym [in CCITT usage]* **existing-quality television.**

**distribution service:** In ISDN applications, a telecommunications service that allows one-way flow of information from one point in the network to other points in the network with or without user individual presentation control.

**distribution voltage drop:** The voltage drop between any two defined points of interest in a power distribution system. (188)

**distributor:** In data transmission, a device that accepts a data stream from one line and places a sequence of signals, one or more at a time, on several lines, thus performing a spatial multiplexing of the original stream. *Note:* Examples of a distributor are (a) a mechanical unit with input to a rotor and output through many contacts wiped by the rotor and (b) a set of combinational logic circuits, such as a series of AND gates, that are sequentially enabled by a set of pulses and that are all connected to a common bus carrying the input signals. [From Weik '89]

**disturbance voltage:** An unwanted voltage induced in a system by natural or man-made sources. *Note:* In telecommunications systems, the disturbance voltage creates currents that limit or interfere with the interchange of information. An example of a disturbance voltage is a voltage that produces (a) false signals in a telephone, (b) noise in a radio receiver, or (c) distortion in a received signal.

**diurnal phase shift:** The phase shift of electromagnetic signals associated with daily changes in the ionosphere. (188) *Note 1:* The major changes usually occur during the period of time when sunrise or sunset is present at critical points along the path. *Note 2:* Significant phase shifts may occur on paths wherein a reflection area of the path is subject to a large tidal range. *Note 3:* In cable systems, significant phase shifts can be occasioned by diurnal temperature variance.

**divergence:** *See beam divergence.*

**diversity:** The property of being made up of two or more different elements, media, or methods. *Note:* In communications, diversity is usually used to provide robustness, reliability, or security.

**diversity combiner:** A circuit or device for combining two or more signals carrying the same information received via separate paths or channels with the objective of providing a single resultant signal that is superior in quality to any of the contributing signals. (188)

**diversity factor:** The ratio of the sum of the individual maximum demands of the various parts of a power distribution system to the maximum demand of the whole system. *Note:* The diversity factor is always greater than unity. (188)

**diversity gain:** In radio communications, the ratio of the signal field strength obtained by diversity combining to the signal strength obtained by a single path. *Note:* Diversity gain is usually expressed in dB. [From Weik '89]

**diversity reception:** Radio reception in which a resultant signal is obtained by combining or selecting signals, from two or more independent sources, that have been modulated with identical information-bearing signals, but which may vary in their fading characteristics at any given instant. *Note 1:* Diversity reception is used to minimize the effects of fading. (188) *Note 2:* The amount of received signal improvement when using diversity reception is directly dependent on the independence of the fading characteristics.

**diversity transmission:** Radio communication using a reception technique in which a resultant signal is obtained by combining signals (a) that originate from two or more independent sources that have been modulated with identical information-bearing signals and (b) that may vary in their transmission characteristics at any given instant. (188) *Note 1:* Diversity transmission and reception are used to obtain reliability and signal improvement by overcoming the effects of fading, outages, and circuit failures. *Note 2:* When using diversity transmission and reception, the amount of received signal improvement depends on the independence of the fading characteristics of the signal as well as circuit outages and failures.

**divestiture:** The court-ordered separation of the Bell Operating Telephone Companies from AT&T.

**D layer:** See **D region, ionosphere.**

**DLE:** Abbreviation for **data link escape character.**

**DM:** Abbreviation for **delta modulation.**

**DO:** Abbreviation for **design objective.**

**DOD:** Abbreviation for **Department of Defense, direct outward dialing.**

**DOD master clock:** The master clock to which time and frequency measurements for the U.S. Department of Defense are referenced, *i.e.*, are traceable. *Note 1:* The U.S. Naval Observatory master clock is designated as the DOD Master Clock. (188) *Note 2:* The U.S. Naval Observatory master clock is one of the two standard time and frequency references for the U.S. Government in accordance with Federal Standard 1002-A. The other standard time and frequency reference for the U.S. Government is the National Institute of Standards and Technology (NIST) master clock.

**domain: 1.** The independent variable used to express a function. *Note:* Examples of domains are time, frequency, and space. **2.** In distributed networks, all the hardware and software under the control of a specified set of one or more host processors. [From Weik '89]

**domain name server:** A server that retains the addresses and routing information for TCP/IP LAN users.

**Domain Name System (DNS):** The online distributed database system that (a) is used to map human-readable addresses into Internet Protocol (IP) addresses, (b) has servers throughout the Internet to implement hierarchical addressing that allows a site administrator to assign machine names and addresses, (c) supports separate mappings between mail destinations and IP addresses, and (d) uses domain names that (i) consist of a sequence of names, *i.e.*, labels, separated by periods, *i.e.*, dots, (ii) usually are used to name Internet host computers uniquely, (iii) are hierarchical, and (iv) are processed from right to left, such as the host nic.ddn.mil has a name (nic — the Network Information Center), a subdomain (ddn — the Defense Data Network), and a primary domain (mil — the MILNET).

**domestic fixed public service:** A fixed service, the stations of which are open to public correspondence, for radiocommunications originating and terminating solely at points all of which lie within [. . . the entire United States and certain other geographic areas as specified in 47CFR].

**domestic public radio services:** The land mobile and domestic fixed public services, the stations of which are open to public correspondence. [47CFR]

**dominant mode:** In a waveguide that can support more than one propagation mode, the mode that propagates with the minimum degradation, *i.e.*, the mode with the lowest cutoff frequency. (188) *Note:* Designations for the dominant mode are  $TE_{10}$  for rectangular waveguides and  $TE_{11}$  for circular waveguides.

**D1:** *See* channel bank.

**dopant:** An impurity added to an optical medium to change its optical properties. *Note:* Dopants are used in optical fibers to control the refractive index profile and other refractive properties of the fiber. [FAA]

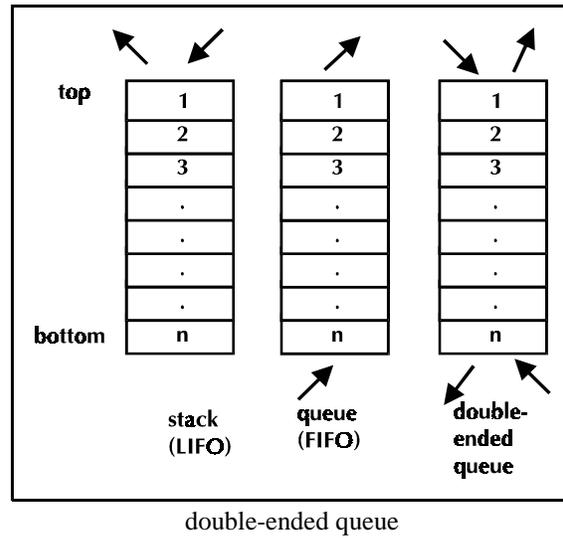
**doppler effect:** The change in the observed frequency (or wavelength) of a wave, caused by a time rate of change in the effective path length between the source and the point of observation.

**doppler shift:** The degree of observed change in frequency (or wavelength) of a wave due to the doppler effect.

**double-current transmission:** *Synonym* polar direct-current telegraph transmission.

**double-ended control:** *Synonym* double-ended synchronization.

**double-ended queue (dequeue):** A queue in which the contents may be changed by adding or removing items at either end.



**double-ended synchronization:** For two connected exchanges in a communications network, a synchronization control scheme in which the phase error signals used to control the clock at one exchange are derived by comparison with the phase of the incoming digital signal and the phase of the internal clocks at both exchanges. *Synonym* double-ended control.

**double-frequency shift keying (DFS):** Frequency-shift keying in which two telegraph signals are multiplexed and transmitted simultaneously by frequency shifting among four frequencies. (188)

**double modulation:** Modulation in which (a) a subcarrier is modulated with an information-bearing signal and (b) the resulting modulated subcarrier is then used to modulate another carrier that has a higher frequency. (188)

**double refraction:** *Synonym* birefringence.

**double-sideband reduced carrier (DSB-RC) transmission:** Transmission in which (a) the frequencies produced by amplitude modulation are symmetrically spaced above and below the carrier and (b) the carrier level is reduced for transmission at a fixed level below that which is provided to the modulator. *Note:* In DSB-RC transmission, the carrier is usually transmitted at a level suitable for use as a reference by the receiver, except for the case

in which it is reduced to the minimum practical level, *i.e.*, the carrier is suppressed.

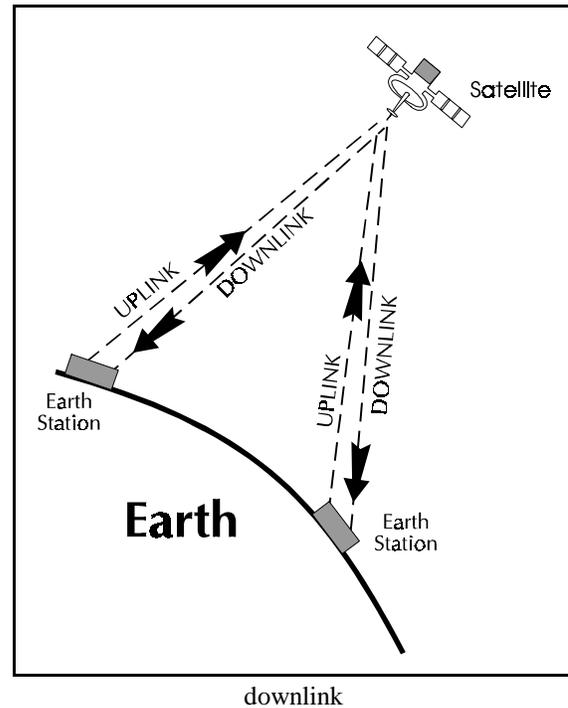
**double-sideband suppressed-carrier (DSB-SC) transmission:** Transmission in which (a) frequencies produced by amplitude modulation are symmetrically spaced above and below the carrier frequency and (b) the carrier level is reduced to the lowest practical level, ideally completely suppressed. (188) *Note:* DSB-SC transmission is a special case of double-sideband reduced carrier transmission.

**double-sideband (DSB) transmission:** AM transmission in which both sidebands and the carrier are transmitted. (188)

**doubly clad fiber:** A single-mode fiber that has two claddings. *Note 1:* Each cladding has a refractive index that is lower than that of the core. Of the two claddings, inner and outer, the inner cladding has the lower refractive index. *Note 2:* A doubly clad fiber has the advantage of very low macrobending losses. It also has two zero-dispersion points, and low dispersion over a much wider wavelength range than a singly clad fiber. *Synonyms* **depressed-cladding fiber, depressed-inner-cladding fiber, W-profile fiber** (from the fact that a symmetrical plot of its refractive index profile superficially resembles the letter W).

**down-converter:** A device for performing frequency translation in such a manner that the output frequencies are lower in the spectrum than the input frequencies. (188)

**downlink:** **1.** A data link from a satellite or other spacecraft to a terrestrial terminal. (188) **2.** A data link from an airborne platform to a ground-based terminal.



**downstream:** **1.** In communications, the direction of transmission flow from the source toward the sink. **2.** With respect to the flow of data in a communications path: at a specified point, the direction toward which data are received later than at the specified point.

**downtime:** The interval during which a functional unit is inoperable. (188)

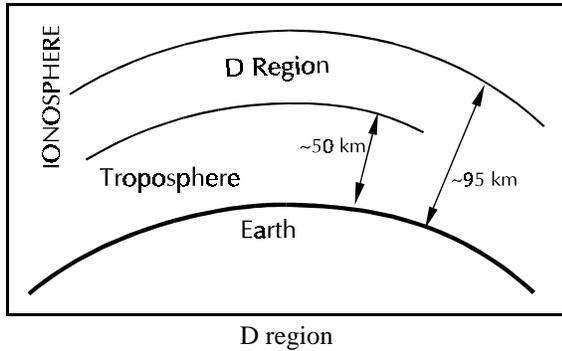
**DPCM:** *Abbreviation for differential pulse-code modulation.*

**DPSK:** *Abbreviation for differential phase-shift keying.*

**DQDB:** *Abbreviation for distributed-queue dual-bus.*

**D region:** That portion of the ionosphere existing approximately 50 to 95 km above the surface of the Earth. (188) *Note:* Attenuation of radio waves, caused by ionospheric free-electron density generated by solar radiation, is pronounced during daylight hours. Because solar radiation is not

present at night, ionization ceases, and hence attenuation of radio waves ceases.



**drift:** A comparatively long-term change in an attribute or value of a system or equipment operational parameter. (188) *Note 1:* The drift should be characterized, such as “diurnal frequency drift” and “output level drift.” *Note 2:* Drift is usually undesirable and unidirectional, but may be bidirectional, cyclic, or of such long-term duration and low excursion rate as to be negligible.

**drop:** **1.** In a communications network, the portion of a device directly connected to the internal station facilities, such as toward a switchboard or toward a switching center. (188) **2.** The central office side of test jacks. (188) **3.** A wire or cable from a pole or cable terminus to a building. (188) **4.** To delete, intentionally or unintentionally, or to lose part of a signal, such as dropping bits from a bit stream. (188)

**drop and insert:** In a multichannel transmission system, a process that diverts (drops) a portion of the multiplexed aggregate signal at an intermediate point, and introduces (inserts) a different signal for subsequent transmission in the same position, *e.g.*, time slot or frequency band, previously occupied by the diverted signal. (188) *Note 1:* Signals not of interest at the drop-and-insert point are not diverted. *Note 2:* The diverted signal may be demodulated or reinserted into another transmission system in the same or another time slot or frequency band. *Note 3:* The time slot or frequency band vacated by the diverted signal need not necessarily be reoccupied by another signal. Likewise, a previously unoccupied time slot or frequency band may be occupied by a signal inserted at the drop-and-insert point.

**drop channel operation:** Operation in which one or more channels of a multichannel system are terminated, *i.e.*, dropped, at an intermediate point between the end terminals of the system.

**dropout:** **1.** In a communications system, a momentary loss of signal. *Note:* Dropouts are usually caused by noise, propagation anomalies, or system malfunctions. (188) **2.** A failure to read properly a binary character from data storage. *Note:* A dropout is usually caused by a defect in the storage medium or by a malfunction of the read mechanism. **3.** In magnetic tape, disk, card, or drum systems, a recorded signal with an amplitude less than a predetermined percentage of a reference signal. (188)

**drop repeater:** In a multichannel communications system, a repeater that has the necessary equipment for the local termination, *i.e.*, the dropping, of one or more channels. (188)

**drum factor:** **1.** In facsimile systems in which drums are used, the ratio of drum length to drum diameter. **2.** In facsimile systems in which drums are not used, the ratio of (a) the page width to (b) the page length divided by  $\pi$ . (188)

**drum speed:** In facsimile systems, the rotation rate of the facsimile transmitter or recorder drum. *Note:* Drum speed is usually expressed in revolutions per minute. (188)

**DS:** *Abbreviation for digital signal.*

**DSA:** *Abbreviation for dial service assistance.*

**DSA board:** A local dial office switchboard at which are handled assistance calls, intercepted calls, and calls from miscellaneous lines and trunks. It may also be employed for handling certain toll calls. [47CFR]

**DSB:** *Abbreviation for double sideband. See double-sideband transmission.*

**DSB board:** A switchboard of a dial system for completing incoming calls received from manual offices. [47CFR]

**DSB-SC:** *Abbreviation for double-sideband suppressed carrier. See double-sideband suppressed-carrier transmission.*

**DSC:** *Abbreviation for digital selective calling.*

**DSE:** *Abbreviation for data switching exchange.*

**DSI:** *Abbreviation for digital speech interpolation.*

**DS0:** *Abbreviation for digital signal 0.*

**DS1 . . . DS4:** *Abbreviations for digital signal 1 . . . digital signal 4.*

**DS1C:** *Abbreviation for digital signal 1C.*

**DSN:** *Abbreviation for Defense Switched Network.*

**DSR:** *Abbreviation for data signaling rate.*

**D-Star(D\*):** *Synonym specific detectivity.*

**DSU:** *Abbreviation for data service unit.*

**DTE:** *Abbreviation for data terminal equipment.*

**1.** An end instrument that converts user information into signals for transmission or reconverts the received signals into user information. (188) **2.** The functional unit of a data station that serves as a data source or a data sink and provides for the data communication control function to be performed in accordance with link protocol. *Note 1:* The data terminal equipment (DTE) may be a single piece of equipment or an interconnected subsystem of multiple pieces of equipment that perform all the required functions necessary to permit users to communicate. *Note 2:* A user interacts with the DTE, or the DTE may be the user. The DTE interacts with the data circuit-terminating equipment (DCE).

**DTE clear signal:** A call control signal sent by data terminal equipment (DTE) to initiate clearing.

**DTE waiting signal:** A call control signal, sent by the data-circuit-terminating-equipment/data-terminal-equipment (DCE/DTE) interface, that indicates that the DTE is waiting for a call control signal from the DCE.

**DTMF:** *Abbreviation for dual-tone multifrequency (signaling).*

**D2:** *See channel bank.*

**D3:** *See channel bank.*

**D-type patch bay:** A patch bay designed for patching and monitoring of unbalanced data circuits at rates up to 1 Mb/s. (188)

**dual access:** **1.** The connection of a user to two switching centers by separate access lines using a single message routing indicator or telephone number. **2.** In satellite communications, the transmission of two carriers simultaneously through a single communication satellite repeater. (188)

**dual bus:** A pair of parallel buses arranged such that the direction of data flow in one bus is opposite to the direction of data flow in the other bus.

**dual diversity:** The simultaneous combining of (or selection from) two independently fading signals, so that the resultant signal can be detected through the use of space, frequency, angle, time, or polarization characteristics. (188)

**dual homing:** The connection of a terminal so that it is served by either of two switching centers. *Note:* In dual homing, a single directory number or a single routing indicator is used. (188)

**dual in-line package (DIP):** An electronic package with a rectangular housing and a row of pins along each of two opposite sides. *Note:* DIP packages may be used for integrated circuits, or for discrete components, such as resistors or toggle switches. An example of a DIP is a microcircuit package with two rows of seven vertical leads that is specially designed for mounting on a printed circuit board.

**dual in-line package switch:** *See DIP switch.*

**dual-precedence message:** A message that contains two precedence designations. *Note:* Usually the higher precedence message is for all action addressees and the lower for all information addressees. [From Weik '89]

**dual-tone multifrequency (DTMF) signaling:** In telephone systems, multifrequency signaling in which standard set combinations of two specific voice band frequencies, one from a group of four low frequencies and the other from a group of four higher frequencies, are used. (188) *Synonyms multifrequency pulsing, multifrequency signaling.* *Note 1:* DTMF signals, unlike dial pulses, can pass through the entire connection to the destination user, and therefore lend themselves to various schemes for remote control after access, *i.e.*, after the connection is established. *Note 2:* Telephones using DTMF usually have 12 keys. Each key corresponds to a different pair of frequencies. Each pair of frequencies corresponds to one of the ten decimal digits, or to the symbol “#” or “\*”, the “\*” being reserved for special purposes. *Note 3:* The standard signal frequency pairs transmitted by DTMF equipment used by the public exchange carriers are as follows:

Button or Digit	Frequencies (Hz)
1	697/1209
2	697/1336
3	697/1477
4	770/1209
5	770/1336
6	770/1477
7	852/1209
8	852/1336
9	852/1477
0	941/1336
*	941/1209
#	941/1477

*Note 4:* Tactical telephones have 16 keys, the extra 4 being used for precedence. For DSN (Defense Switched Network) the signal frequency pairs transmitted for the ten decimal digits and the \* and #

are the same as those used by the public exchange carriers. The additional four keys, corresponding to four different frequency pairs and the precedence, are as follows:

Button or Key	Frequencies (Hz)
FO (Flash Override)	697/1633
F (Flash)	770/1633
I (Immediate)	852/1633
P (Priority)	941/1633

**dual-use access line:** A user access line normally used for analog voice communication, but which has special conditioning for use as a digital transmission circuit. (188)

**duct: 1.** In interfacility cabling, a conduit, which may be direct-earth buried or encased in concrete, used to enclose communications or power cables. *Note:* For maximum resistance to rodent attack, direct-earth-buried conduit should have an outside diameter equal to or greater than 6 cm (2.25 in.). **2.** See **atmospheric duct.**

**ducting:** The propagation of radio waves within an atmospheric duct. (188)

**dumb terminal:** An asynchronous terminal that (a) does not use a transmission control protocol and (b) sends or receives data sequentially one character at a time. *Note:* Dumb terminals usually handle ASCII characters.

**dummy load:** A dissipative impedance-matched network, usually used at the end of a transmission line to absorb all incident energy. *Note:* The dummy load usually converts the incident energy to thermal energy. (188)

**duobinary signal:** A pseudobinary-coded signal in which a “0” (“zero”) bit is represented by a zero-level electric current or voltage; a “1” (“one”) bit is represented by a positive-level current or voltage if the quantity of “0” bits since the last “1” bit is even,

and by a negative-level current or voltage if the quantity of “0” bits since the last “1” bit is odd. (188) *Note 1:* Duobinary signals require less bandwidth than NRZ. *Note 2:* Duobinary signaling also permits the detection of some errors without the addition of error-checking bits.

**duplex cable:** A fiber-optic cable that contains two optical fibers. [After FAA]

**duplex circuit:** A circuit that permits transmission in both directions. *Note:* For simultaneous two-way transmission, *see* **full-duplex circuit**.

**duplexer:** In radar systems, a device that isolates the receiver from the transmitter while permitting them to share a common antenna. *Note 1:* A duplexer must be designed for operation in the frequency band used by the receiver and transmitter, and must be capable of handling the output power of the transmitter. *Note 2:* A duplexer must provide adequate rejection of transmitter noise occurring at the receive frequency, and must be designed to operate at, or less than, the frequency separation between the transmitter and receiver. *Note 3:* A duplexer must provide sufficient isolation to prevent receiver desensitization.

**duplex operation:** Operating method in which transmission is possible simultaneously, in both directions of a telecommunication channel. [NTIA] [RR] (188) *Note 1:* This definition is not limited to radio transmission. *Note 2:* In general, duplex operation and semi-duplex operation require two frequencies in radiocommunication; simplex operation may use either one or two. *Synonyms* **full-duplex operation, two-way simultaneous operation.**

**duty cycle: 1.** In an ideal pulse train, *i.e.*, one having rectangular pulses, the ratio of the pulse duration to the pulse period. (188) *Note:* For example, the duty cycle is 0.25 for a pulse train in which the pulse duration is 1  $\mu$ s and the pulse period is 4  $\mu$ s. **2.** The ratio of (a) the sum of all pulse durations during a specified period of continuous operation to (b) the total specified period of operation. **3.** In a continuously variable slope delta (CVSD) modulation converter, the mean proportion of binary “1” digits at the converter output in which each “1” indicates a run of a specified number of consecutive

bits of the same polarity in the digital output signal. (188) **4.** In a periodic phenomenon, the ratio of the duration of the phenomenon in a given period to the period. *Note:* In a piece of electrical equipment, *e.g.*, an electric motor, the period for which it may be operated without deleterious effects, *e.g.*, from overheating.

**dwelt time:** The period during which a dynamic process remains halted in order that another process may occur.

**DX signaling:** *Abbreviation for direct current signaling.*

**DX signaling unit:** A duplex signaling unit that repeats “E” and “M” lead signals into a cable pair(s) via “A” and “B” leads. These signals are transmitted on the same cable pair(s) that transmit(s) the message. (188)

**dynamically adaptive routing:** In route determination for packet-switched networks, adaptive routing in which an algorithm is used that (a) automatically routes traffic around congested, damaged, or destroyed switches and trunks and (b) allows the system to continue to function over the remaining portions of the network.

**dynamicizer:** *See parallel-to-serial conversion.*

**dynamic range: 1.** In a system or device, the ratio of (a) a specified maximum level of a parameter, such as power, current, voltage, or frequency to (b) the minimum detectable value of that parameter. *Note:* The dynamic range is usually expressed in dB. **2.** In a transmission system, the ratio of (a) the overload level, *i.e.*, the maximum signal power that the system can tolerate without distortion of the signal, to (b) the noise level of the system. *Note:* The dynamic range of transmission systems is usually expressed in dB. (188) **3.** In digital systems or devices, the ratio of maximum and minimum signal levels required to maintain a specified bit error ratio.

**dynamic variation:** A short-term variation (as opposed to long-term drift) in the characteristics of power delivered to electrical equipment. *Note:* Dynamic variations indicate a short-term departure from steady-state conditions. (188)

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