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Communications Standard Dictionary

Communications Standard Dictionary

Third Edition

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in both magnitude and direction at the given point and given instant. *See* **elemental current moment**. *See also* **effective height**.

current patch bay: *See* **direct current patch bay**.

current position: **1.** In display systems, the present position of a display element, display group, or display image, such as a display group that represents an object in space, in the display space of a display device. *Note:* The current position usually is expressed in user coordinates, device coordinates, or real world coordinates. **2.** The present position of an object, such as a target, in space. *Note:* The current position is expressed in spatial real world coordinates, such as slant range, elevation angle, and azimuth. *See also* **device coordinate, display element, display group, real world coordinate**.

current spreadsheet: In a personal computer with spreadsheet software in effect, the specific version of a spreadsheet that (a) has been called up from a diskette or a disk, (b) now resides in the computer, (c) is displayed on a display device, i.e., on a monitor, (d) can be worked on, i.e., is ready to be changed, edited, deleted, or printed, and (e) indicates the latest entries, calculations, and commands.

current telegraph system: *See* **neutral direct current telegraph system**.

current telegraph transmission: *See* **polar direct current telegraph transmission**.

cursor: A movable, visible mark that (a) is used to indicate a position of interest on a display surface, (b) has a specific fixed or controllable shape, such as an underline, a rectangle, or a pointer, and (c) usually indicates where (i) the next character or graphic will be entered or revised or (ii) the next selection is to be made.

curvature: In the measurement or specification of lenses, the amount of departure from a flat surface, i.e., a plane surface. *Note:* Curvature is expressed as the reciprocal of the radius of curvature.

curvature loss: In an optical fiber or a fiber optic cable, the light energy loss attributed to macrobending of the fiber or the cable. *Note:* Power will radiate away from an optical fiber if the radius of the bend is less than the critical radius. *Synonyms* **bend loss, macrobending loss, macrobend loss**. *See also* **fiber optics, macrobending, microbending, microbend loss, modal loss**.

curve: *See* **absolute luminosity curve, bathtub curve, bell curve, luminosity curve, spectral loss curve**.

curve-fitting compaction: Data compaction accomplished by substituting an analytical expression for the data to be stored or transmitted. *Note:* Examples of curve fitting compaction are (a) the breaking of a continuous curve into a series of straight-line segments and specifying the slope, intercept, and range for each segment and (b) using a mathematical expression, such as a polynomial or a trigonometric function, and a single point on the corresponding curve instead of storing or transmitting the entire graphic curve or a series of points on it. *See also* **compaction, data compaction**.

curve generator: A functional unit, such as a display device or a computer program, that generates curves, usually consisting of a connected sequence of dots or of very short vectors or line segments, that are either tangent to the smoothed curve or are cords to the smoothed curve. *Note:* A vector generator might produce the tangent line segments or short cords. *See also* **functional unit, vector generator**.

custodian: *See* **security custodian**.

custom local area signaling service (CLASS): In a communications network, a network-provided service feature that is one of an identified group of network-provided enhanced services. *Note:* Examples of custom local area signaling service (CLASS) offerings are incoming call identification, call trace, call blocking, automatic return of the most recent incoming call, call redial, and selective forwarding and programming to permit distinctive ringing for incoming calls. *See also* **call forwarding, calling line identification signal**.

customer: In communications systems, the ultimate entity for which a communications system was installed, i.e., the ultimate user of a communications service. *Note 1:* Customers include individuals, activities, organizations, positions, functions, offices, or units that are associated with a communications system directory entry and that are approved by the proper authority. *Note 2:* Customers use end instruments, such as telephones, modems, facsimile machines, computers, and remote terminals, that are connected via a loop to a central office. *Note 3:* Customers usually are subject to tariff. *Note 4:* Customers do not include communications systems management, administrative, operating, and maintenance personnel except for their personal terminals. *Synonym* **subscriber**.

customer access: In Integrated Services Digital Networks (ISDNs), the portion of the ISDN access that a

fiber distribution box: *See* optical fiber interconnection box.

fiber distribution frame: *See* fiber optic distribution frame.

fiber distribution panel: *See* optical fiber distribution panel.

fiber distribution system: *See* protected fiber distribution system.

fiber dosimeter: *See* fiber optic dosimeter.

fiber drawing: *See* optical fiber drawing.

fiber drawing machine: *See:* optical fiber pulling machine.

fiber end-to-end separation sensor: *See* fiber optic end-to-end separation sensor.

fiber faceplate: *See* fiber optic faceplate.

fiber global attenuation rate characteristic: *See* optical fiber global attenuation rate characteristic.

fiber global dispersion characteristic: *See* optical fiber global dispersion characteristic.

fiber global loss characteristic: *See:* optical fiber global attenuation rate characteristic.

Fiberguide™: An optical fiber produced by Times Fiber Communications, Inc.

fiber gyroscope: *See* fiber optic gyroscope.

fiber hazard: *See* optical fiber hazard.

fiber identifier: *See* optical fiber identifier.

fiber jacket: *See* optical fiber jacket.

fiber jumper: *See* fiber optic jumper.

fiber junction: *See* optical fiber junction.

fiber laser: *See* optical fiber laser.

fiber light source: *See* fiber optic light source.

fiber lightguide: *Synonym* optical fiber.

fiber link: *See* television fiber optic link.

fiber longitudinal compression sensor: *See* fiber optic longitudinal compression sensor.

fiber loop: *See* fiber optic loop.

fiber loop multiplexer: *See* fiber optic loop multiplexer.

fiber loss: *See* source to fiber loss.

fiber mandrel: *See* optical fiber mandrel.

fiber merit figure: *See* optical fiber merit figure.

fiber mixer: *See* fiber optic mixer.

fiber multiplexer: *See* fiber optic multiplexer (active).

fiber net: *See* fiber optic net.

fiber nuclear hardening: *See* optical fiber nuclear hardening.

fiber optic: Pertaining to systems, subsystems, equipment, and components in which optical fibers are used. *Note:* The optical fibers (a) may be used for transmission, sensing, telemetering, amplification, illumination, and signaling and (b) may have cross sections other than round, such as elliptical, rectangular, and thin film cross sections. *See also* **fiber optics**, **optical fiber**.

fiber optic acoustic sensor: A sensor (a) that is highly sensitive, (b) that senses sound waves by allowing them to impinge upon a length of optical fiber, (c) in which the waves cause variations in the refractive indices of the materials in the fiber, (d) in which the variation of refractive indices is used to modulate lightwaves, usually from a laser, that are propagating in the fiber on their way to a photodetector, and (e) in which the spatial distribution of the fiber determines the directional capability of the sensor, such as (i) if the fiber is wound in the shape of a sphere, the sensor will be omnidirectional, (ii) if the fiber is distributed in a plane, it will be unidirectional, and (iii) if the fiber is shaped in the form of a rod, it will be cylindrically directional. *Synonym* **optical fiber acoustic sensor**.

fiber optic active connector: A fiber optic connector that (a) has a built-in active device, such as a light-emitting diode (LED) or a laser as a transmitter, a photodetector as a receiver, or both, usually built into one of the mating elements of the connector, usually in the form of a semiconductor chip with an optical fiber pigtail for connection to a fiber, (b) improves the fiber-to-fiber or fiber-to-pigtail coupling efficiency over that of a fiber optic passive connector, such as 50 times normal coupling efficiency at 30 Mbps (megabits per second) over a 1-km (kilometer) length and apertures of the semiconductor element of about 0.20 mm (millimeter) for a 0.20-mm-diameter core with a numerical aperture of 0.48, (c) is adaptable for bulkhead or printed circuit board mounting and electromagnetic interference (EMI) and radio frequency (rf) interference (RFI) shielding, and (d) serves as a repeater. *Synonyms* **active fiber optic connector**, **optical fiber active connector**.

directly, it can be measured directly. If the optical fiber is wound on a bobbin and pressure is applied to the inside of the bobbin to cause it to expand, the fiber will be subjected to tension and thereby elongated. The magnitude of the pressure and the variation in pressure as a function of time can be measured.

fiber optic terminus: The part of a fiber optic connector into which the optical fiber is inserted and attached by mechanical means or by adhesives. *See also terminus.*

fiber optic test method (FOTM): A general description of the overall approach to the testing of fiber optic systems and components, identifying (a) the system or the component to be tested, (b) the type and the nature of the test, (c) the parameters to be measured, and (d) the environmental conditions under which the test is to be conducted. *Note:* The fiber optic test method (FOTM) does not explicitly describe in every detail the exact steps to be taken during the conduct of the test. Engineering analysis is required, and one or more fiber optic test procedures (FOTPs) must be prepared before the FOTM can be executed. *See also fiber optic test procedure.*

fiber optic test procedure (FOTP): A detailed, highly explicit, unambiguous, stand-alone, step-by-step sequence of actions, or the document describing them, for testing fiber optic systems and components, each step precisely described, with all dimensions, instrument settings, apparatus, structures, parameters to be measured, environmental conditions, exact action to be taken at each step, and data to be taken clearly described for each part or run of the test. *Note:* A fiber optic test procedure (FOTP) can be executed without additional engineering analysis. FOTPs are usually prepared from or based on previously prepared fiber optic test methods (FOTMs). *See also fiber optic test method.*

fiber optic transceiver: A fiber optic receiver-transmitter, that consists of (a) a photodetector that receives optical signals and converts them to electrical signals, (b) a light source, such as a laser, that converts electrical signals to optical signals, and (b) is housed in a single unit with appropriate electrical and optical connectors. *Synonym optical transceiver. See also home fiber optic transceiver.*

fiber optic transimpedance: In a fiber optic transmission system, the ratio of (a) the output voltage at the photodetector to (b) the input current at the light source. *See also optical transimpedance.*

fiber optic transmission system (FOTS): A transmission system in which fiber optic links are used to

transmit messages by means of modulated lightwaves. *See also fiber optic link.*

fiber optic transmitter: A device that (a) accepts an electrical signal as its input, (b) processes this signal, (c) uses the result of the processing to modulate an optoelectronic source, such as a light-emitting diode (LED) or an injection laser diode, to produce an optical signal, and (d) couples the optical signal into a fiber optic cable for transmission via the fiber optic cable. *See also fiber optics, optical link, optical transmitter.*

fiber optic transverse compression sensor: A fiber optic sensor in which (a) the optical attenuation is a function of the longitudinally applied pressure, i.e., the pressure is uniformly applied radially against the outside of an optical fiber, and (b) a length of cabled fiber, a not necessarily coherent or monochromatic light source, and a photodetector usually are required. *See fiber optic longitudinal compression sensor.*

fiber optic video trunk: A video signal trunk in which (a) optical fibers, fiber optic bundles, and fiber optic cables are used for the transmission of video signals, (b) color multiplexing is used over the full visible spectrum from infrared to ultraviolet inclusive, and (c) dispersion is used to separate the colors prior to detection and further processing in the video receiver. *Synonym optical fiber video trunk. See also dispersion, fiber optic bundle, multiplexing, trunk, video signal, visible spectrum.*

fiber optic visible/infrared spin-scan radiometer: A device that (a) measures and records the intensity of visible and infrared electromagnetic radiation from many directions sequentially, (b) uses optical fibers to conduct the received radiation from the scanned directions, (c) may be fixed or tilting, and (d) may be used in a satellite to create a terrestrial map based on infrared radiation received from the Earth.

fiber optic waveguide: A waveguide that (a) guides lightwaves and (b) consists of one or more optical fibers. *See also optical waveguide.*

fiberoptronics: The branch of science and technology devoted to exploiting the advantages obtained by combining optical fibers, other active and passive optical devices, and electronic circuits into useful systems. *Note 1:* An example of the application of fiberoptronics is electronically modulating a light source in order to impress information on its output light beam, guiding the beam through a fiber optic cable to a photodetector, and recovering the impressed information in electronic form. *Note 2:* "Fiberoptronics" is an abbrev-

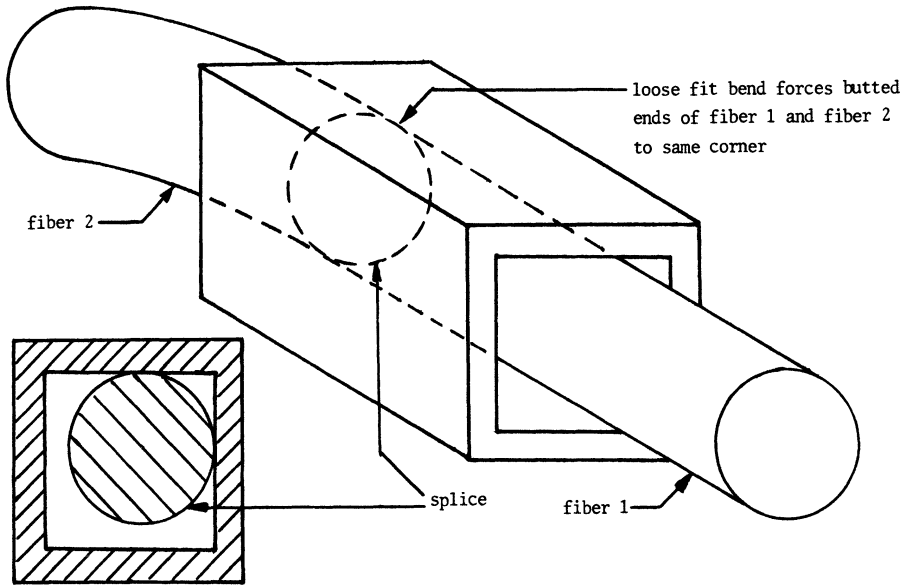


Fig. L-7. A loose tube splicer for butt-coupling optical fibers.

axis, i.e., at $r = 0$, and n_2 is the refractive index of the homogeneous cladding, i.e., the refractive index of the cladding is given by the relation $n_r = n_2$ for $r \geq a$ where r is the radial distance from the optical axis of the fiber and a is the radius of the core, and (b) in which skew rays entering the fiber at angles less than the acceptance angle, thus satisfying the critical angle criterion for total internal reflection, will travel a helical path within the fiber. *Note:* A skew ray is a ray that is neither a meridional ray nor an axial ray. If the value of Δ is appropriately selected, all the helical rays will arrive at the end of the fiber at the same time. However, this profile will then not permit the meridional rays and the axial rays to arrive at the end at the same time as the helical rays.

LORO: lobe on receive only.

LOS: line of sight.

LOS propagation: line of sight propagation.

loss: 1. In communications systems, the amount of electrical or optical attenuation in a circuit. 2. The power consumed in an electrical or optical circuit or component. 3. The energy dissipated without accomplishing useful work or purpose. *Note:* Loss usually is expressed in watts or dB. 4. In directed signal and power transmission, the difference between power or energy that is dispatched and that which is received. *Note:* An example of loss in a fiber optic data link is the signal power that is absorbed, reflected, scattered, or radiated from a fiber optic cable between the trans-

mitter and the receiver. Thus, the loss is the transmitted power minus the received power. *See* absorption loss, angular misalignment loss, antenna dissipative loss, aperture to medium coupling loss, area loss, balance return loss, bending loss, bridging loss, connector-induced optical conductor loss, connector insertion loss, coupler loss, coupler excess loss, coupling loss, curvature loss, extrinsic coupling loss, fiber optic cable facility loss, free-space loss, Fresnel reflection loss, gap loss, insertion loss, intermodulation noise loss, intrinsic coupling loss, isotropic space loss, lateral offset loss, light leakage loss, microbend loss, mismatch of core radii loss, modal loss, net loss, packing fraction loss, numerical aperture loss, path loss, receiver location loss, reference loss, reflection loss, refractive index profile mismatch loss, return loss, scattering loss, shadow loss, source-coupler loss, source to optical fiber loss, splice loss, statistical fiber optic cable facility loss, transmission loss, via net loss. *See also* attenuation, circuit, dB, power. *Refer to* Figs. L-8 and L-9.

loss budget: In a link, such as a fiber optic link, the distribution of the total loss among the components of a system that can be tolerated in order that the received signal be above the threshold of sensitivity of the receiver, including allowance for a power margin. *Note:* The loss is distributed among the components of the system, such as cables, couplers, and splices, in an optimum fashion so as to design for minimum cost at tolerable bit error ratios (BERs) for digital data systems.

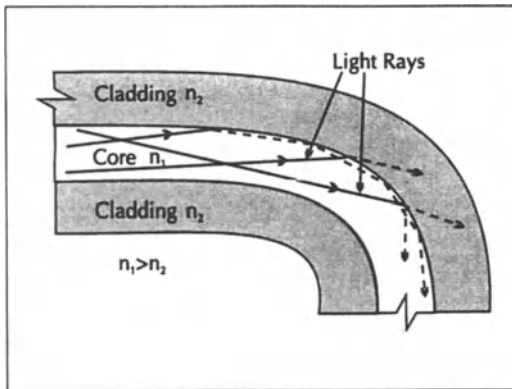


Fig. L-8. A curvature loss that occurs in light rays propagating in an optical fiber, which is bent so that at the bend (a) many of the rays strike the core-cladding interface surface at angles less than the critical angle and (b) the surface waves, i.e., evanescent waves and leaky waves, at the outside curve of the bend cannot travel faster than the speed of light and therefore become uncoupled with modes inside the core and radiate away. Thus, an optical fiber bent to the critical radius will glow at the bend if the light is in the visible spectrum.

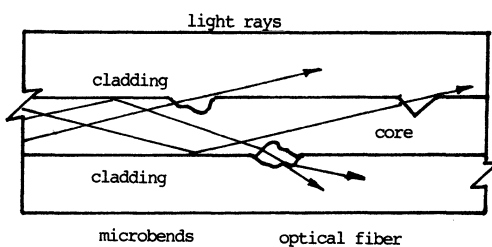


Fig. L-9. A microbend loss that occurs in light rays propagating in an optical fiber. The loss occurs because, at the microbends, some rays encounter a core-cladding interface surface such that the incidence angle is less than the critical angle at that microscopic point of incidence.

Required transmitted power, receiver sensitivity, intervening losses, and safety margins are all considered in the distribution, i.e., in the budgeting, of the losses.

loss budget constraint: In the design of a fiber optic station/regenerator section, a constraint (a) such that the terminal/regenerator system gain is equal to or larger than the sum of all of the optical power losses in the optical fiber path between terminal/regenerator

spliced interfaces and (b) is given by the relation $G > L$ where G is the terminal/regenerator system gain given by the relation $G = P_T - P_R - P_D - R_P - M - U_{wdm} - l_{sm}U_{sm} - N_{con}U_{con}$ where P_T is the transmitter power, P_R is the receiver sensitivity (power), P_D is the dispersion power penalty, R_P is the reflection power penalty, M is the overall safety power margin, U_{wdm} is the worst case value of all losses associated with wavelength division multiplexing equipment at both ends, l_{sm} is the fiber length in the stations, U_{sm} is the worst case end of life loss (dB/km) of the single mode cable at both stations, N_{con} is the number of fiber optic connectors within the stations (inside plants), and U_{con} is the loss (dB) per connector. *Note:* G is used to overcome all the losses, L , in the optical cable facility (outside plant) of the station/regenerator section, given by the relation $L = l_t(U_c + U_{cT} + U_\lambda) + N_s(U_s + U_{ST})$ where l_t is the total sheath, i.e., jacket, length of spliced fiber optic cable (km), U_c is the worst case end of life cable attenuation rate (dB/km) at the transmitter nominal central wavelength, U_λ is the largest increase in cable attenuation rate that occurs over the transmitter central wavelength range, U_{cT} is the effect of temperature on the end of life cable attenuation rate at the worst case temperature conditions over the cable operating temperature range, N_s is the number of splices in the length of the cable in the fiber optic cable facility, including the splice at the station facility on each end and allowances for cable repair splices, U_s is the loss (dB/splice) for each splice, and U_{ST} is the maximum additional loss (dB/splice) caused by temperature variation. L must be equal to or less than the fiber optic terminal/regenerator system gain, G , for the station/regenerator section to operate satisfactorily. *See also optical fiber global attenuation rate characteristic, statistical loss budget constraint.*

loss characteristic: *See optical fiber global loss characteristic.*

loss curve: *See spectral loss curve.*

loss distance: *See transmission loss distance.*

lossless half-wave dipole antenna: A theoretical half-wave dipole antenna that (a) has a directive gain of 2.15 dB over an isotropic antenna and (b) when used as a gain reference, has an antenna power gain of 0 dB. *See also antenna power gain, directive gain, half-wave dipole antenna, isotropic antenna.*

loss probability: *See block loss probability.*

loss ratio: *See block loss ratio.*

loss test set: *See optical loss test set.*

loss time: *See environmental loss time.*

guage before they can be executed by a processor. **2.** A computer oriented language that (a) has instruction codes that are executed directly by a machine, i.e., a computer, (b) usually is based on or is a part of the internal electronic circuitry, i.e., the internal hardware, of a computer, (c) a programmer need not necessarily be aware of, (d) is an artificial language, (e) is designed and written for a specific computer, and (f) is used by the computer to compile an executable program from the high level language instructions cited by the application programmer. *Note:* Machine languages usually are used by computer designers rather than computer users. They usually are not suited for use by programmers who prepare application programs. *See also* **assembly language, compile, computer, computer language, computer oriented language, high level language.**

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

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

machine-readable: Pertaining to the characteristic of being able to be sensed by a device, usually by a device that has been designed and built specifically to perform sensing or reading functions. *Note:* Machine-readable data are data that have been stored on tapes, cards, diskettes, drums, and other media that can be automatically sensed.

machine-readable medium: **1.** A medium capable of storing data in a form that can be accessed by an automated sensing device. **2.** A medium that (a) usually is recorded on a data medium and (b) can convey data to a given sensing device. *Note:* Examples of machine-readable media are (a) magnetic disks, cards, tapes, and drums on which data have been recorded, (b) punched cards and punched paper tapes, (c) optical disks on which data have been recorded, and (d) paper on which magnetic ink characters have been recorded. *Synonym* **automated data medium, data medium.**

machine system: *See* **man-machine system.**

machine translation (MT): The translation of natural languages by programmed computers.

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

mach number: A number used to express the speed of a body moving in a given medium relative to the medium in which the body is moving, given by the relation $M = v_b/v_s$ where M is the mach number, v_b is the actual speed of the body relative to the medium in

which it is moving, and v_s is the speed sound would travel in the same medium under the same conditions, such as temperature, pressure, and humidity. *Note 1:* When expressed as $v_b = Mv_s$, the mach number expresses the number of times the speed of sound that a body is traveling in a given medium at the stated conditions. *Note 2:* The speed of a body traveling at 2160 ft/s (feet per second) in dry air at 0°C at sea level would be moving at mach 2 because the speed of sound in air under those conditions is 1080 ft/s. There is about a 1 ft/s increase in the speed of sound in air at sea level for each kelvin above 0°C. Thus, the body would have to move faster in warmer air if it were to remain at mach 2. *Note 2:* Speeds less than mach 0.8 are subsonic. Speeds between mach 0.8 and mach 1.2 are transonic. Speeds above mach 1.2 are supersonic. Speeds above mach 10 have been called hypersonic. *Synonym* **mach.**

Mach-Zehnder fiber optic sensor: An interferometric sensor in which (a) an electromagnetic wave, such as a lightwave, is split in half, and (i) the halves each propagate around half a loop in opposite directions, one half via a beam splitter and a fixed mirror and the other half via a movable mirror and a beam splitter, and (ii) both halves recombine in an optical fiber or on the sensitive surface of a photodetector where their relative phases can enhance or cancel each other, (b) the movable mirror is used to modulate the resultant irradiance, i.e., the field intensity, at the photodetector, (c) displacements as short as 10^{-13} m (meter) can be measured, and (d) optical fibers may be used for the light paths.

macro: *Synonym* **macroinstruction.**

macrobend: **1.** In an optical fiber, a macroscopic deviation of the fiber axis from a straight line. *Note 1:* Macrobends are distinguished from microbends. *Note 2:* In optical fibers, macrobend radii must be greater than both the minimum bend radius, i.e., the radius less than which the fiber will break, and the critical radius, i.e., the radius less than which substantial radiation will occur. **2.** A relatively large radius bend in an optical fiber, such as might be found in a splice organizer tray or a fiber optic cable that has been bent. *Note:* A macrobend will not cause a significant radiation loss if it is of sufficiently large radius, the loss depending on the radius and the type of optical fiber. Single mode (SM) fibers have a low numerical aperture (NA), usually less than 0.15, and thus are more susceptible to bend losses than other types. Usually an SM fiber will not tolerate a critical radius (CR) of less than 6 cm (centimeters). Certain specialized SM fibers can tolerate a shorter CR without appreciable loss. A graded index multimode (MM) fiber having a core

diameter of 50 μm (microns) and an NA of 0.20 will usually tolerate a CR of not less than 3.8 cm. The fibers usually used in customer premises applications (62.5- μm core) usually have a relatively high NA (0.27) and can tolerate a bend radius less than an inch (2.5 cm). **2.** In an optical waveguide, a macroscopic deviation of the optical axis from a straight line. *See also* **curvature loss, macrobending, microbending, microbend loss.**

macrobend attenuation: In a dielectric waveguide, such as an optical fiber, the power lost to radiation at a macrobend. *Note:* Evanescent waves, cladding modes, and high order leaky modes in the core become decoupled from the core propagating modes because of phase shifts and velocity differences at the bend. For macrobend radii less than the critical radius, most of the propagating optical power is radiated laterally from the waveguide. *See also* **curvature loss, dielectric waveguide.**

macrobending: In an optical fiber, the creating of macroscopic deviations of the fiber axis from a straight line. *Note 1:* Macrobending is distinguished from microbending. *Note 2:* In optical fibers, macrobend radii must be greater than both the minimum bend radius, i.e., the radius less than which the fiber will break, and the critical radius, i.e., the radius less than which substantial radiation will occur. *See also* **curvature loss, microbending, microbend loss.**

macrobending loss: *Synonym* curvature loss.

macrobend loss: *Synonym* curvature loss.

macrofiber: *Synonym* jumbofiber.

macrogenerator: A computer program that (a) is written with macroinstructions in a source language and (b) replaces them with specific sequences of instructions in the same source language. *See also* **computer program, macroinstruction, source language.**

macroinstruction: A computer instruction that (a) can be replaced by a specific sequence of instructions in the same language, (b) usually provides the parameters that are required for its own execution, and (c) may also designate the machine language instructions for performing a specified task. *Synonym* **macro.** *See also* **computer instruction, machine language.**

macroprocessor: A processor that (a) allows a programmer to define and use macroinstructions and (b) usually is a portion of an assembler. *See also* **assembler, macroinstruction, processor, programmer.**

magic cube: A three-dimensional storage unit that (a) is shaped like a cube about 0.5 in (inch) on an

edge, (b) is capable of storing 1 Tb (terabit, 10^{12} bits) of data, or the equivalent of about 2.4 million floppy disks, (c) has a random access capability, (d) consists of optical integrated circuits (OICs), (e) may be incorporated into computer boards, and (f) is sponsored by the U.S. Air Force.

MAGNAPhone®M: A satellite telephone, i.e., a sat-phone, produced by Magnavox.

magnetic: **1.** Pertaining to the phenomenon that causes certain materials, some of which are found in nature and some of which have been synthesized by humans, to attract or repel one another independently of their electric attraction or repulsion and independently of their gravitational attraction. **2.** Pertaining to a force field that (a) exhibits polarity and (b) can be created by electric currents consisting of moving electric charges, such as electrons and ions. *Note:* Strong magnetic fields can be created by passing an electric current through many turns of wire wrapped around an iron core. *See* **transverse magnetic.** *See also* **core, magnetic field.**

magnetic bearing: **1.** A bearing with respect to the local measured magnetic direction, such as might be measured with a magnetic compass in the field. **2.** A bearing with respect to magnetic north, which differs from true north by the declination stated on maps and charts of the area. *Note:* Magnetic north is not spatially or temporally constant.

magnetic card: A card with a magnetizable layer on which data can be stored and from which stored data can be retrieved. *See also* **band, magnetic tape.**

magnetic card storage: Storage (a) in which data may be stored on magnetic coatings placed on cards that are selected and moved manually or by electro-mechanical devices in order to store data and retrieve the stored data, and (b) that usually consists of magnetic material coated on a nonmagnetic substrate in the form of a card, such as a plastic, fiberboard, laminate, or cardboard card.

magnetic circuit: **1.** The complete closed path taken by magnetic lines of flux. **2.** A region of ferromagnetic material, such as the core of a transformer or a solenoid, that contains essentially all of the magnetic flux. *Note:* Every line of magnetic flux must close on itself. If a low reluctance path, i.e., high permeability path, is provided, the flux will follow that path, i.e., that circuit.

magnetic core: A configuration of magnetizable material, such as iron, ferrite, or iron oxide, (a) that is placed in proximity to current-carrying conductors such that the polarity of its magnetization can be re-

metering device: *See* **telephone traffic metering device.**

metering pulse: A pulse sent periodically over a telephone line to determine the duration of a call and the toll charges by counting the number of such pulses sent between (a) the instant that the call is completed, i.e., the call receiver answers, and (b) the instant that the call is finished, i.e., the instant that the call originator or the call receiver hangs up. *See also* **call originator, call receiver, completed call, finished call, hang up, pulse, toll.**

method: *See* **actuation method, alternative test method, broadcast communications method, fiber optic test method, frequency code method, Fresnel reflection method, image method, inductive assertion method, intercept communications method, maximal-ratio-square diversity combining method, Monte Carlo method, radiotelegraph operating method, receipt communications method, reference test method, relay communications method, refracted ray method, transverse scattering method.**

metric radar: A radar set that operates in the 1 m (meter) to 10 m wavelength band, i.e., that has a frequency that lies in the range that (a) extends from 30 MHz (megahertz) to 300 MHz, (b) has the letter designation VHF (very high frequency), and (c) has the numerical designation 8. *See also* **frequency, frequency spectrum designation, wavelength.**

metric system: A decimal system of weights and measures based on the meter, the kilogram, and the second, i.e., on the MKS system. *Note:* The latest version of this system uses the International System of Units (Système International d'Unités). *Refer to* **Table 3, Appendix B.**

metric wave: An electromagnetic wave with a wavelength that is between 1 m (meter) and 10 m, i.e., that has a frequency that lies in the range that (a) extends from 30 MHz (megahertz) to 300 MHz, (b) has the letter designation VHF (very high frequency), and (c) has the numerical designation 8. *See also* **frequency, frequency spectrum designation, wavelength.**

metropolitan area network (MAN): A network that usually (a) covers an area larger than a local area network (LAN) and smaller than a wide area network (WAN), (b) interconnects two or more LANs, (c) covers an entire metropolitan area, such as a large city and its suburbs, (d) operates at a higher speed than a WAN, (e) crosses administrative, i.e., political, boundaries, and (f) uses multiple access methods. *Note:* The Washington, DC, metropolitan area network (MAN) includes parts of the 301 (Maryland) and 703 (Virginia)

area codes and all of the 202 (District of Columbia) area code. *See also* **communications, local area network, medium interface connector, medium interface point, wide area network.**

MF: medium frequency.

MFD: mode field diameter.

MFJ: Modification of Final Judgment.

MFSK: multiple frequency shift keying.

MHD: magnetohydrodynamics.

MHS: message handling system.

MHz: megahertz.

MIC: medium interface connector.

Michelson fiber optic sensor: A high resolution interferometric sensor in which (a) an electromagnetic wave, such as monochromatic light, is split, one-half reflected from a fixed mirror and back through the splitter to a photodetector, the other half passed directly through the splitter to a movable mirror that reflects it back to the splitter where it is reflected to the same photodetector, (b) the two waves can enhance or cancel each other, thereby modulating the irradiance, i.e., the light intensity, at the photodetector in accordance with an input signal in the form of a displacement of the movable mirror, such as might be produced by a sound wave or a pressure, strain, or temperature variation, (c) if an optical fiber is used, the ends of the fiber form the reflecting surfaces, (d) moving one end relative to the other produces the same effect as moving the mirror, and (e) displacements less than 10^{-13} m (meter) can be measured when narrow spectral width, i.e., monochromatic, laser sources are used.

MICR: magnetic ink character recognition.

microbend: In an optical waveguide, such as an optical fiber, a small deviation, dent, or recurring variation at intervals of a few millimeters, either in the core-cladding interface of the guide or in sudden deviation of the optical axis of the guide, resulting in sharp curvatures in the core-cladding interface surface or local displacements of the longitudinal axis. *Note 1:* Undulated core-cladding interface surfaces with large numbers of microbends per unit length are often created by the trauma that occurs during the cabling process in manufacturing fiber optic cables, in applying coatings, in winding cables on spools and reels, in passing cables around capstans, and in packaging, shipping, and installing cables. Microbends can be created in fiber optic cables under hydrostatic pressure, particularly

when buffering is inadequate or strength members are improperly positioned. Simply bending a cable can introduce microbends because of stress differentials imposed on the fiber at the inside and outside radii of the bend. *Note 2:* The size of microbends may vary from a fraction of a micron to several microns in the direction of the optical axis or a fraction of a micron in the depth of a transverse dent. *Note 3:* A waviness of the optical axis, up to several millimeters in wavelength, is also considered to be microbends. *Note 4:* Light-waves striking a microbend will escape from the core if the critical angle at the microbend becomes less than that required for total (internal) reflection. *Note 5:* Microbends can cause significant or excessive radiative loss and intermodal coupling. *Note 6:* Microbends are distinguished from microcracks. *See also critical radius, curvature loss, macrobending, microbending, microcrack, minimum bend radius.*

microbending: In an optical waveguide, the introduction of minute curves with small radii in the optical axis of the guide or the core-cladding interface surface, at which incidence angles of light rays propagating in the guide are, or tend to become, less than the critical angle so that some of the radiant power in the ray escapes from the waveguide core into the cladding and out of the guide. *Note:* When microbends in an optical fiber axis are large enough, they may be considered macrobends, such as will occur when the cable containing the fiber is bent around a curve in a race-way, duct, or trench, possibly resulting in a curvature loss. Care must be taken in installing fiber optic cables so that (a) microbending is not excessive, and (b) the macrobend radius is greater than both the minimum bend radius and the critical radius. *See also critical radius, curvature loss, macrobend, microbend, minimum bend radius.*

microbending loss: *Synonym microbend loss.*

microbend loss: In an optical fiber, the optical power loss caused by a microbend, i.e., a small bend, kink, or abrupt discontinuity in the direction of the optical axis of fibers, in the core-cladding interface surface, or both, usually caused by cabling, wrapping the fiber around drums and capstans, and winding the fiber on reels. *Note:* The microbend losses result from (a) the coupling of guided modes among themselves and among the radiation modes, and (b) rays escaping from the core into the cladding at a microbend because the critical angle requirement for total (internal) reflection at the core-cladding interface is violated. *Synonym microbending loss. See also core, cladding, critical angle, curvature loss, microbend, total internal reflection. Refer to Fig. L-9 (536).*

microbend sensor: A fiber optic sensor in which (a) an optical fiber is passed between toothed plates, i.e., between serrated plates, (b) a force or pressure is applied to the plates thereby squeezing the fiber, causing microbends in the fiber, (c) an electromagnetic wave, such as a lightwave, propagating in the fiber escapes at the bends, ejecting light into the cladding at each point at which the incidence angle at the core-cladding interface is greater than the critical angle for total (internal) reflection, (d) the attenuation of the main beam in the fiber increases, because of the loss of light into the cladding as pressure is applied to the plates, (e) the resulting light is detected by a photodetector that decreases its output as the pressure increases, and (f) the output signal of the photodetector is a function of the applied force or pressure.

microcircuit: 1. *Synonym integrated circuit.* 2. *See also chip, large-scale integrated circuit, wafer.*

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

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

microcrack: In optical fibers, a minute crack or a partial break, that (a) usually is along the outer surface of the cladding, but may be deep enough to enter the core, (b) may become enlarged by exposure to adverse environmental conditions, such as moisture, bending, twisting, tensile stress, thermal gradients, vibration, shock, and corrosive atmospheres, and (c) will reflect, refract, and scatter incident light, usually causing the light to escape from the fiber. *Note 1:* Tensile testing of optical fibers under tension, i.e., tensile proofing, enlarges microcracks. If the cracks become sufficiently large, the fiber ruptures under the applied tension and must be spliced. However, proofing is done anyway, even if splicing is required, to reduce the possibility of a fiber rupturing (a) when it is not under tension or (b) when it is under small tensile stresses. *Note 2:* Microcracks are distinguished from microbends. *See also microbend.*

microcrack model: *See Griffith microcrack model.*

microcylindrical lens: An extremely small lens that (a) usually is made by an etching and crystal-growing process, (b) is attached to a light source or a photodetector on a monolithic basis, such as by attaching a cylindrical lens on an integral lens light-emitting

optic supporting structure: *See* **fiber optic supporting structure.**

optic switch: *See* **fiber optic switch.**

optic telecommunications cable: *See* **fiber optic telecommunications cable.**

optic telemetry system: *See* **fiber optic telemetry system.**

optic terminus: *See* **fiber optic terminus.**

optic test method: *See* **fiber optic test method.**

optic test procedure: *See* **fiber optic test procedure.**

optic transceiver: *See* **fiber optic transceiver.**

optic transimpedance: *See* **fiber optic transimpedance.**

optic transmission system: *See* **fiber optic transmission system.**

optic transmitter: *See* **fiber optic transmitter.**

optimum traffic frequency: *Synonym* **optimum transmission frequency.**

optimum transmission frequency (FOT): **1.** The highest frequency that is predicted to be available for skywave transmission over a particular path at a particular hour for 90% of the days of the month. *Note 1:* The abbreviation "FOT" is derived from "frequency of optimum traffic." *Note 2:* The optimum transmission frequency (FOT) usually is just below the maximum usable frequency (MUF). **2.** The most effective frequency for ionospheric reflection of radio waves between two specified points. *Note:* In the prediction of useful frequencies, the optimum transmission frequency is usually taken as 15% below the monthly median value of the maximum usable frequency (MUF) for the specified time and path. *Synonyms* **frequency of optimum traffic, frequency of optimum transmission, ionospheric reflection, optimum traffic frequency, optimum working frequency.** *See also* **frequency, path.**

optimum working frequency: *Synonym* **optimum transmission frequency.**

option: *See* **revised interconnection protocol security option.**

optoacoustics: *Synonym* **acoustooptics.**

optoacoustic transducer: A device that converts audio frequency-modulated lightwaves into a sound tone by causing a crystal to vibrate at the audio modulation frequency of the lightwave. *See also* **acoustooptic transducer.** *See also* **modulation.**

optocoupler: *Synonym* **fiber optic link.**

optoelectrical cable: A cable that contains optical waveguides, such as optical fibers, and electrical conductors.

optoelectronic: **1.** Pertaining to devices that (a) contain both optical and electronic components, (b) usually convert optical power or energy into electrical power or energy, such as the conversion of an optical signal into an electrical signal, or vice versa, representing the same information, (c) must have at least one electrical port, and (d) respond to, emit, or modify optical radiation, or use optical radiation for internal operation. **2.** Pertaining to (a) the class of devices that function as electrical to optical or optical to electrical transducers or (b) instruments in which such devices are used. *Note 1:* Examples of optoelectronic devices commonly used in fiber optic communications systems are photodiodes, light-emitting diodes (LEDs), injection laser diodes, and optical integrated circuit (IOC) elements. *Note 2:* "Electro-optical" and "electrooptical" are often erroneously used as synonyms for "optoelectronic." *See also* **electrooptic, electrooptic effect, optical detector, optical source.**

optoelectronic detector: **1.** A device that detects radiation and uses the influence of light to form an electrical signal. **2.** A device that (a) accepts an optical signal, (b) converts the optical signal into an electrical signal that has the same information content as the optical signal, and (c) emits the electrical signal. **3:** A device that detects or measures optical power by using incident light on a photosensitive surface to generate or control an electrical current by the use of the photoconductive, photoemissive, or photovoltaic effect. *See also* **information content, signal.**

optoelectronic device: **1.** A device that (a) accepts and uses, (b) modifies and emits, and (c) neither accepts nor emits, but uses within for its internal operation, coherent or incoherent electromagnetic radiation in the visible, infrared, or ultraviolet regions of the electromagnetic frequency spectrum, i.e., in the optical spectrum. *Note:* The wavelengths currently handled by optoelectronic devices range from approximately 0.3 μm (micron) to 30 μm . **2.** An electronic device that (a) is associated with light and (b) usually serves as a light source, a processor of lightwaves, or a photodetector. *Synonym* **optic-electronic device.** *See also* **light.**

optoelectronic directional coupler: A directional coupler in which the coupling function is electronically controllable, usually with a photodetector that permits an electronic circuit to be driven by the coupler by tap-

is perpendicular to a wavefront and in the direction of the Poynting vector at each point in a propagation medium. *See also* **geometric optics**, **Poynting vector**.

optical reader: A device that (a) is capable of sensing, interpreting, and transmitting encoded handwritten, typed, or printed characters by being able to distinguish their shape as a distinct pattern of light areas, i.e., reflective areas, and dark areas, i.e., nonreflective (absorptive) areas, for each character, on a data medium. *Note 1:* Examples of optical readers are (a) the reader in optical character recognition equipment used for computer input and (b) the device that reads the data on an optical disk. *Note 2:* Scanning and transmitting an image, such as in facsimile, radio-photo, and phototelegraphy systems, is not considered as optical reading. *See also* **optical scanner**.

optical receiver: A device that (a) detects optical signals, (b) converts them to electrical signals, and (c) processes the electrical signals for subsequent use. *See also* **fiber optic receiver**, **fiber optics**, **photodetector**.

optical receiver maximum input power: The maximum input optical power (dBm) coupled to an optical receiver, as measured by using specified standard procedures, from the line side of the receiver fiber optic connector when operated under standard or extended operating conditions, that the receiver will accept and still (a) not exceed the manufacturer-specified bit error ratio (BER) in digital systems or (b) operate in a linear nonsaturated mode in analog systems.

optical reflection: *See* **maximum optical reflection**.

optical regenerative repeater: *Synonym* **optical repeater**.

optical regenerator: *Synonym* **optical repeater**.

optical repeater: An optoelectronic device or module that receives an optical signal, amplifies it, or, in the case of a digital signal, also reshapes, retimes, or otherwise reconstructs it, and retransmits it as an optical signal representing the same information as the input signals. *Note:* The optical repeater is inserted at a point in a propagation medium, such as a long fiber optic cable or a stage in an optical integrated circuit (OIC), to overcome the effects of attenuation and dispersion. *Synonyms* **optical regenerative repeater**, **optical regenerator**. *See also* **fiber optic repeater**, **fiber optics**.

optical repeater power: **1.** In optical systems, the power required to operate an optical repeater. *Note:* Optical repeater power may be delivered to the repeater by various means, such as (a) an electrical con-

ductor in the cable that also contains the optical waveguides, i.e., a hybrid cable, (b) a separate electrical wire or cable, (c) a solar cell, (d) a local battery, primary or secondary, such as a seawater battery, (e) an electrical power system local power outlet, (f) an optical power cable separate from the optical signal cable or a fiber optic bundle in the same cable with the signal waveguides, or (f) a tap of the signal power contained in the signals in the optical fibers without disturbing the information content of the signals and without excessive attenuation of the signals. **2.** The electrical power or the optical power delivered to an optical repeater. **3.** The optical power output of an optical repeater. *See also* **fiber optic repeater**, **optical repeater**, **signal path**.

optical rotation: **1.** The angular displacement of the polarization plane of an electromagnetic wave, such as a lightwave propagating in a propagation medium. **2.** The azimuthal displacement of the field of view achieved through the use of a rotating prism. *See also* **electromagnetic wave**, **polarization plane**.

optical scanner: A device in which (a) a light source emits a beam that illuminates objects, such as images, marks, codes, and characters, (b) the beam sweeps over the objects, and (c) a reflection sensor develops digital or analog electrical signals that represent the images, marks, codes, and characters that are sensed. *Note:* Examples of optical scanners are (a) devices that are held like a writing pen and moved across marks on a display surface, (b) oscillating scanning heads that scan an entire page, line by line, (c) hand-held devices that emit a beam that is swept across coded patterns, such as bar codes on labels and packages, and (d) flat surface scanners that emit a beam from within that is reflected back through glass to read patterns, such as the scanners used at grocery and merchandise checkout counters and shipping centers. *See also* **optical reader**.

optical scanning: The scanning of objects, such as images, marks, bar codes, and letters, in which a light source illuminates the objects, and a reflection sensor develops coded electrical signals that represent the objects sensed. *See also* **optical scanner**.

optical sensitivity: *See* **receiver optical sensitivity**.

optical serrodyne: A modulator in which the phase of a coherent lightwave is modulated by controlling the transit time.

optical signal: A signal that (a) contains optical power and (b) is transmitted in an optical waveguide, such as an optical fiber, slab dielectric waveguide, or optical

optical system: A group of interrelated parts and equipment that (a) accepts, processes, and utilizes electromagnetic waves in the optical spectrum, (b) transmits and guides the waves for the most part in material media, such as lenses, prisms, optical fibers, filters, multiplexers, couplers, connectors, mixers, and various waveguides, and (c) accomplishes such functions as communications, illumination, inspection (endoscopy), sensing, and display. *Note:* Examples of optical systems are fiber optic links, telemetry systems, optical gyrocompasses, telescopes, microscopes, and aligned bundles of optical fibers. *See* **off-axis optical system**.

optical system power margin: A system power margin for an optical system, such as a fiber optic link. *See also* **system power margin**.

optical taper: An optical fiber that (a) has an increasing or decreasing diameter that is a linear function of its length in a longitudinal direction, and (b) can be used (i) to increase or decrease the size of an image in an aligned bundle and (ii) as a transition fiber to splice fibers with different diameters. *Synonyms* **fiber optic taper, tapered optical fiber**.

optical tapoff: *Synonym* **optical tapping**.

optical tapping: The removal or the extraction of some of the radiant power, i.e., the optical power, from electromagnetic waves, such as lightwaves, that are propagating in an optical waveguide, such as an optical fiber, fiber optic bundle, fiber optic cable, slab dielectric waveguide, or waveguide in an optical integrated circuit (OIC). *Note:* Optical tapping usually is accomplished by using connectors, couplers, taps, and branches. *Synonym* **optical tapoff**.

optical thickness: **1.** The physical thickness times the refractive index of an optical element consisting of an isotropic propagation medium. **2.** The total optical path length through (a) an optical element, such as an optical fiber, optical filter, or lens system, or (b) a series of elements. *See also* **optical path length**.

optical thin film: A thin layer of an optical propagation medium, usually deposited or formed on a substrate, with a geometric shape and refractive quality that enable control, transmission, and guidance of lightwaves for specific purposes, usually to accomplish logical functions by forming optical switches and gates. *Note:* An example of an optical thin film is a thin layer of transparent material used to guide lightwaves in an optical integrated circuit (OIC). *See also* **optical integrated circuit**. *Refer to* **Figs. P-2 and P-3 (708), R-8 (834), S-12 (917)**.

optical thin-film storage: Storage that (a) stores data in the form of light and dark spots, and (b) usually is read by a scanning light beam or by movement of the film past an optical reading head. *See also* **optical disk**.

optical time domain reflectometer (OTDR): A measurement device used to characterize an optical fiber by (a) launching an optical pulse into the fiber and measuring the resulting light that is scattered and reflected back to the input, i.e., back to the reflectometer, as a function of time. *Note:* In an optical fiber, the optical time domain reflectometer (OTDR) can be used to (a) estimate the optical attenuation coefficient as a function of distance, (b) identify defects, (c) determine localized losses, such as connector and splice insertion losses, (d) measure fiber length, and (e) determine the distance from the reflectometer to a break. *See also* **fiber optics, optical time domain reflectometry**.

optical time domain reflectometry (OTDR): The field of science and technology devoted to the characterization of an optical fiber, in which an optical pulse is transmitted through the fiber and the resulting light that is scattered and reflected back to the input is measured as a function of time. *Note:* Optical time domain reflectometry (OTDR) is useful in (a) estimating the optical attenuation coefficient as a function of distance, (b) identifying defects, (c) determining localized losses, such as connector and splice insertion losses, (d) measuring optical fiber length, and (e) measuring the distance to a break in a fiber. *Synonym* **backscattering technique**. *See also* **fiber optics, optical time domain reflectometer**.

optical transceiver: *Synonym* **fiber optic transceiver**.

optical transimpedance: In an optical transmission system, the ratio of (a) the output voltage at the photodetector to (b) the input current at the light source. *See also* **fiber optic transimpedance, transimpedance**.

optical transmission: The transmission of an optical signal in an optical propagation medium for the purpose of transferring information from one point to another. *See also* **optical signal, optical transmitter, propagation medium, visual transmission**.

optical transmittance: *Synonym* **transmittance**.

optical transmitter: **1.** A light source that (a) is capable of being internally modulated or that emits light that is externally modulated, and (b) is coupled to a propagation medium, such as an optical fiber or an optical integrated circuit (OIC). **2.** A device that (a) accepts an electrical signal as its input, (b) processes this signal, and (c) uses the result of the processing to modulate an optoelectronic device, such as a light-emitting

diode (LED) or an injection laser diode, to produce an optical signal capable of being transmitted via an optical propagation medium. *See also* **fiber optics, fiber optic transmitter, optical link, optical transmission.**

optical video disk (OVD): A disk on whose surface digital data may be recorded at high packing densities in concentric circles, or in a spiral, by using a laser beam to record spots that are read by means of a reflected laser beam of lower irradiance, i.e., lower intensity, than the recording intensity. *Note:* Up to 10^{13} bits may be recorded on a single disk at rates of 1 Mbps (megabits per second), making optical video disks suitable for many hours of television programming playback.

optical waveguide: Any structure that guides the flow of optical energy along a path parallel to its axis and, at the same time, contains the energy within, or adjacent to, its surface. *Note 1:* An optical waveguide is not necessarily an all-dielectric waveguide. *Note 2:* In communications systems, optical waveguides may be (a) optical fibers or (b) thin-film deposits used in optical integrated circuits (OICs), both used to transmit signals. *See* **diffused optical waveguide, graded index optical waveguide, single mode optical waveguide, step index optical waveguide, thin film optical waveguide.** *See also* **fiber optic waveguide, optical fiber.** *Refer to* **Figs. P-2 and P-3 (708).**

optical waveguide connector: A device that (a) transfers optical power from one optical waveguide to another and (b) can be connected and disconnected repeatedly.

optical waveguide coupler: **1.** A device that distributes optical power to two or more ports. **2.** A device that couples optical power between a waveguide and either a light source or a photodetector. *See also* **fiber optic coupler.**

optical waveguide splice: A permanent joint that couples optical power from one waveguide to another. *See also* **fiber optic splice.**

optical waveguide termination: The point in an optical waveguide at which optical power propagating along the waveguide leaves the waveguide and continues in a nonwaveguide mode of propagation. *Note:* In most applications, care must be taken to prevent leakage, losses, and reflection at a termination.

optic amplifier: *See* **fiber optic amplifier,**

optic arteriovenous oximeter: *See* **fiber optic arteriovenous oximeter.**

optic attenuator: *See* **fiber optic attenuator.**

optic axis: In an anisotropic medium, a direction of lightwave propagation in which orthogonal polarizations have the same phase velocity. *See also* **optical axis, optical fiber axis.**

optic blood flow meter: *See* **fiber optic blood flow meter.**

optic borescope: *See* **fiber optic borescope.**

optic branching device: *See* **fiber optic branching device.**

optic breakout cable: *See* **fiber optic breakout cable.**

optic breakout kit: *See* **fiber optic breakout kit.**

optic bundle: *See* **fiber optic bundle.**

optic cable: *See* **bidirectional fiber optic cable, fiber optic cable, fiber optic cable core, special fiber optic cable, station fiber optic cable, TEMPEST proofed fiber optic cable.**

optic cable assembly: *See* **fiber optic cable assembly.**

optic cable driver: *See* **fiber optic cable driver.**

optic cable facility: *See* **fiber optic cable facility.**

optic cable facility loss: *See* **fiber optic cable facility loss, statistical fiber optic cable facility loss.**

optic cable feed through: *See* **fiber optic cable feed through.**

optic cable pigtail: *See* **fiber optic cable pigtail.**

optic choledochoscope: *See* **fiber optic choledochoscope.**

optic communications: *See* **fiber optic communications.**

optic concentrator: *See* **fiber optic concentrator.**

optic connector: *See* **fiber optic connector, fixed fiber optic connector, free fiber optic connector.**

optic connector variation: *See* **fiber optic connector variation.**

optic coupler: *See* **fiber optic coupler.**

optic cross connection: *See* **fiber optic cross connection.**

optic data link: *See* **fiber optic data link.**

optic data transfer network: *See* **fiber optic data transfer network.**

optic delay line: *See* **fiber optic delay line.**

traffic list: A list containing a serial number followed by the appropriate call sign and date-time group for each message to be transmitted by a station. *Note:* A station might transmit the traffic list prior to transmission of the messages identified in the traffic list in the order in which they are identified on the list. A broadcast serial number might consist of station letters or figures followed by a serial number from the series of numbers assigned consecutively to individual messages by an area broadcast station during a month.

traffic load: The total traffic carried by a trunk or a trunk group during a specified time interval. *See also* **busy hour, connections per circuit hour, erlang, group busy hour, level alignment, line load control, saturation, switch busy hour, traffic capacity, traffic intensity.** *Refer to* **Fig. B-10 (101).**

traffic metering device: *See* **telephone traffic metering device.**

traffic monitor: In a communications network, a network feature that provides basic statistics on the amount and the type of traffic handled by the network or a component of the network. *See also* **monitoring, service feature, station message detail recording, switch, traffic load, traffic usage recorder.**

traffic overflow: **1.** In a communications system, a condition in which (a) the traffic offered to a portion of the system exceeds its capacity, and (b) the excess traffic may be blocked or may be provided with alternate routing. **2.** The excess traffic that is blocked or provided with alternate routing when traffic offered to a portion of a communications system exceeds the capacity of that portion of the system. *See also* **alternate routing, overflow.**

traffic overload protection: *See* **automatic traffic overload protection.**

traffic register: In a communications system, a register that records specified events that occur in the system, such as (a) the number of call attempts that did not result in access, (b) the number of calls handled by a given trunk, (c) the number of ringing signals sent to a call receiver end instrument, that number being used to initiate a time-out signal, or (d) the number of abandoned calls. *See also* **register.**

traffic service position system (TSPS): A stored-program electronic system, i.e., a computerized system, that (a) is associated with one or more toll, i.e., long-distance, switching systems, and (b) at one location, provides centralized traffic service position functions for several central offices (COs).

traffic unit: *Synonym* **erlang.**

traffic usage recorder: A device for measuring and recording the amount of traffic, particularly telephone, telegraph, data, and facsimile traffic, carried by a line, a trunk, a switch, a trunk group, or several groups of switches or trunks. *See also* **monitoring, peg count, traffic monitor.**

traffic usage register: A device that is used to indicate, record, or both, the usage time of system components, such as the total cumulative time of usage, over an extended period, of communications system components, such as lines, circuits, trunks, and switches, particularly for telephone, telegraph, and facsimile equipment. *Note:* Usage time is recorded in convenient units, such as hundred call second (CCS) units.

traffic volume: *See* **communications traffic volume.**

trail: *See* **audit trail.**

trailer: *See* **magnetic tape trailer.**

train: *See* **pulse train, switch train.**

trajectory: *See* **ray trajectory.**

transaction: *See* **information transfer transaction, interactive data transaction.**

transaction routing: In communications systems operations, the routing of messages individually according to processed keys, destination names, or other data placed in the message heading by the originator, source user, or originating office.

transceiver: **1.** The combination of transmitting and receiving equipment (a) that is in a common housing, and (b) that (i) usually is portable or mobile, (ii) uses common circuit components for both transmitting and receiving, and (iii) usually provides half-duplex operation. **2.** A device that performs telecommunications transmitting and receiving functions within one chassis. *See* **facsimile transceiver, fiber optic transceiver, home fiber optic transceiver.**

transceiver dispersion: *See* **maximum transceiver dispersion.**

transcoding: The direct digital-to-digital conversion of signals from one encoding scheme, such as voice Linear Predictive Coding 10 (LPC-10), to a different encoding scheme without returning the signals to analog form. *Note:* The transcoded signals, i.e., the digital representations of analog signals, may be any digital representation of any analog signal, such as voice, facsimile, or quasi-analog signals.

transducer: A simple device or component that converts energy from one form to another, usually with such fidelity that if the original energy represents in-

formation, the transformed energy represents the same information, its time derivative, or its time integral. *Note:* Examples of transducers are (a) microphones that convert sound waves to corresponding electrical currents, (b) modulated lasers that convert electrical currents to modulated lightwaves, (c) photodetectors that convert modulated lightwaves to electrical currents, and (d) piezoelectric crystals that produce voltages proportional to the time derivatives of the pressure waves that are applied to them and conversely produce pressure waves proportional to the time derivatives of the applied voltages. *See* **acoustooptic transducer, optoacoustic transducer, orthomode transducer.** *See also* **interface, optoelectronic.** *Refer to* **Fig. T-6 (1013).**

transfer: In communications systems, to send data from one location and to receive the data at another location. *See* **block transfer, call transfer, information transfer, peripheral transfer, successful block transfer, system failure transfer, technology transfer.**

transfer attempt: *See* **block transfer attempt.**

transfer characteristic: In a system, subsystem, or equipment, an intrinsic parameter that enables full or partial determination of the output when the input is known. *Note:* If the input, all the transfer characteristics, and their relationships are known, the output can be fully determined. *See also* **transfer function.**

transfer circuit: **1.** A circuit that transfers message traffic from (a) a system that is operated by one nation or group of nations to (b) a system that is operated by another nation or group of nations. **2.** A circuit used to transfer a message from one network to another via a terminal port, gateway, or bridge. *Note:* An example of a transfer circuit is a circuit used to transfer a message from a network that serves the originator, i.e., the source user, to a network that serves the message addressee, i.e., the destination user, perhaps via intermediate networks. *See also* **bridge, brouter, gateway, router.**

transfer failure: *See* **block transfer failure.**

transfer function: **1.** A mathematical statement that describes the transfer characteristics of a system, subsystem, or equipment. **2.** The relationship between the input and the output of a system, subsystem, or equipment in terms of the transfer characteristics. *Note 1:* When the transfer function operates on the input, the output is obtained. Given any two of these three entities, the third can be obtained. *Note 2:* Examples of simple transfer functions are voltage gains, reflection coefficients, transmission coefficients, and efficiency ratios. An example of a complex transfer function is

envelope delay distortion. *Note 3:* For an optical fiber, the transfer function may be the ratio of the output optical power to the input optical power as a function of modulation frequency. *Note 4:* For a feedback circuit, the transfer function, T , is given by the relation $T = e_o/e_i = G/(1 + GH)$ where e_o is the output, e_i is the input, G is the forward gain, and H is the backward gain, i.e., the fraction of the output that is fed back and combined with the input in a subtractor. Whether the feedback is positive or negative depends on the sign, or phase, of H . If H is considered positive, i.e., in phase, the feedback is negative because of the subtractor, resulting in stability. If H is negative, the subtractor will make the feedback positive, resulting in instability. If $GH = -1$, the system will be completely unstable and possibly self-destruct if there are no limiting conditions. In mathematics, it produces a pole. *Note 5:* For a linear system, the transfer function and the impulse response are related through the Fourier transform pair, commonly given by the relations $H(f) = \int_{-\infty}^{+\infty} h(t)e^{i\omega t} dt$ where $H(f)$ is the ratio of output optical power to the input optical power as a function of modulation frequency, f is the frequency, t is time, and $h(t)$ is given by the relation $h(t) = \int_{-\infty}^{+\infty} H(f)e^{-i\omega t} df$ where $\omega = 2\pi f$. $H(f)$ is often normalized to $H(0)$ and $h(t)$ is normalized to the relation $h_n(t) = \int_{-\infty}^{+\infty} h(t) dt$ which, by definition, is $H(0)$. *Synonyms* **baseband response function, frequency response function, response function.** *See* **closed loop transfer function, complex transfer function, fiber optic bundle transfer function, modulation transfer function, optical fiber transfer function.** *See also* **insertion loss versus frequency characteristic, transfer characteristic.** *Refer to* **Fig. T-7.**

transfer impedance: In a device or a circuit, the ratio of (a) the input voltage to (b) the output current. *Synonym* **transimpedance.**

transfer index: *See* **radiation transfer index.**

transfer lock: To change lock-on from one object, i.e., from one target, to another when a tracking device, such as a radar, sonar, optical tracker, or direction finder, is tracking an object. *See also* **lock-on, relock, track, tracking.**

transfer mode: In an integrated services digital network (ISDN), the transmitting, multiplexing, and switching of data. *See* **Asynchronous Transfer Mode, circuit transfer mode, deterministic transfer mode, packet transfer mode, synchronous transfer mode.**

transfer network: *See* **data transfer network, fiber optic data transfer network.**

transfer part: *See* **message transfer part.**