微而特光电（上海）有限公司
VALDE FIBEROPTICS(SHANGHAI), LTD.
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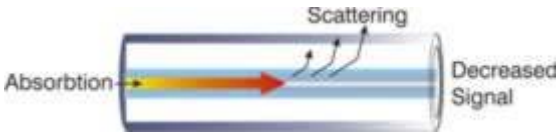
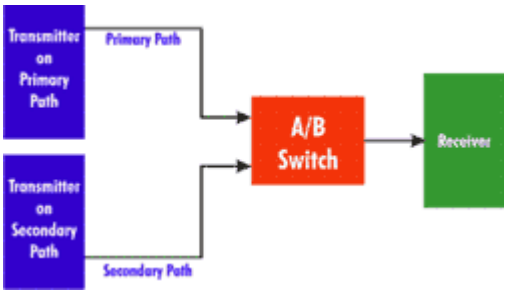
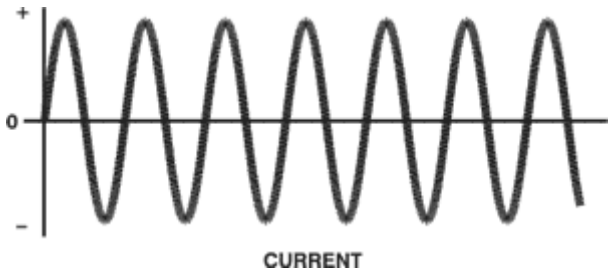
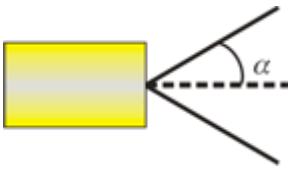
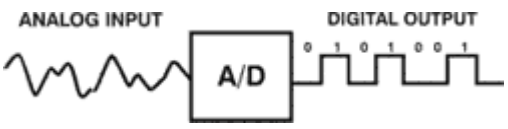
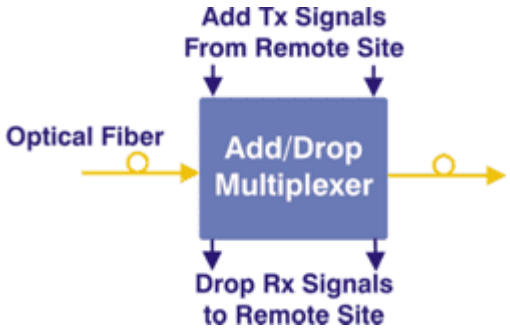
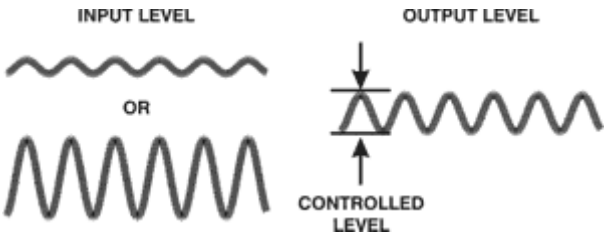
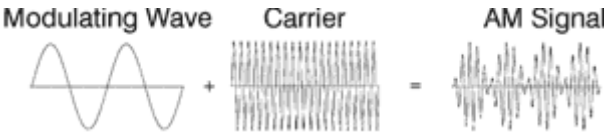
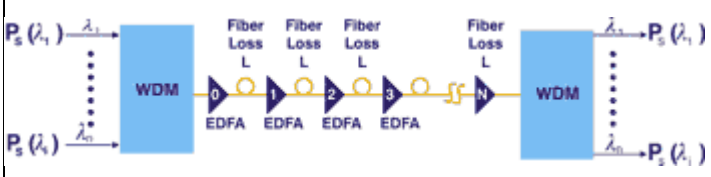
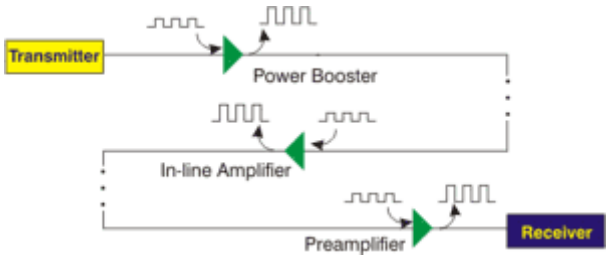
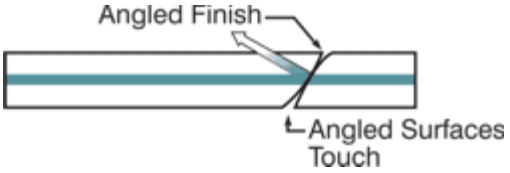
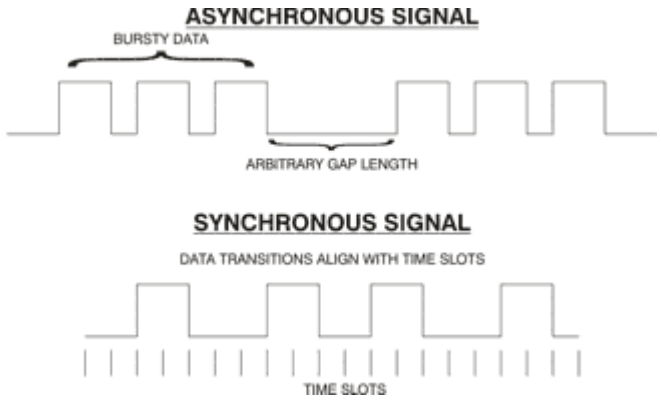
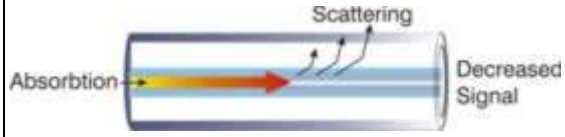
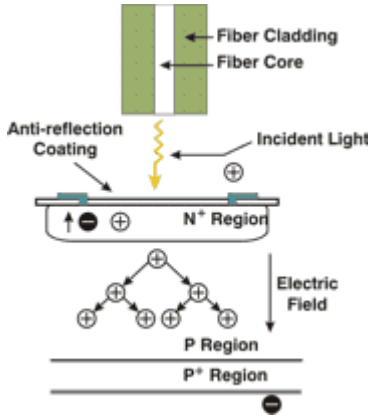
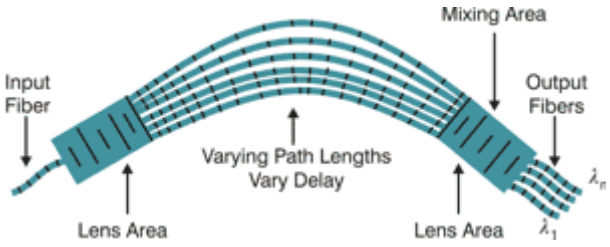
A

Absorption: That portion of optical attenuation in optical fiber resulting from the conversion of optical power to heat. Caused by impurities in the fiber such as hydroxyl ions.	
A/B Switch: A device that accepts inputs (optical or electrical) from a primary path and a secondary path to provide automatic or manual switching in the event that the primary path signal is broken or otherwise disrupted. In optical A/B switches, optical signal power thresholds dictate whether the primary path is functioning and signals a switch to the secondary path until optical power is restored to the primary path.	
AC: Abbreviation for alternating current. An electric current that reverses its direction at regularly recurring intervals.	
Acceptance Angle: The half-angle of the cone (α) within which incident light is totally internally reflected by the fiber core. It is equal to $\sin^{-1}$(NA).	
Active Device: A device that requires a source of energy for its operation and has an output that is a function of present and past input signals. Examples include controlled power supplies, transistors, LEDs, amplifiers, and transmitters.	
A/D or **ADC:** Abbreviation for analog-to-digital converter. A device used to convert analog signals to digital signals.	
Add/Drop Multiplexing: a multiplexing function offered in connection with SONET that allows lower level signals to be added or dropped from a high-speed optical carrier in a wire center.	

The connection to the add/drop multiplexer is via a channel to a central office port at a specific digital speed (DS3, DS1, etc.)	
ADM: Abbreviation for add-drop multiplexer. A device which adds or drops signals from a communications network.	
ADSL: Abbreviation for asynchronous digital subscriber line. See DSL.	
Aerial Plant: Cable that is suspended in the air on telephone or electric utility poles.	
AGC: Abbreviation for automatic gain control. A process or means by which gain is automatically adjusted in a specified manner as a function of input level or another specified parameter.	
AM: Abbreviation for amplitude modulation. A transmission technique in which the amplitude of the carrier varies in accordance with the signal.	
Amplified Spontaneous Emission (ASE): A background noise mechanism common to all types of erbium-doped fiber amplifiers (EDFAs). It contributes to the noise figure of the EDFA which causes loss of signal-to-noise ratio (SNR).	

Amplifier: A device, inserted within a transmission path, that boosts the strength of an electronic or optical signal. Amplifiers may be placed just after the transmitter (power booster), at a distance between the transmitter and the receiver (in-line amplifier), or just before the receiver (preamplifier).	
Analog: A continuously variable signal. Opposite of digital.	
Angular Misalignment: Loss at a connector due to fiber end face angles being misaligned.	
ANSI: Abbreviation for American National Standards Institute. An organization that administers and coordinates the U.S. voluntary standardization and conformity assessment system.	http://www.ansi.org/
APC: Abbreviation for angled physical contact. A style of fiber optic connector with a 5°-15° angle on the connector tip for the minimum possible backreflection.	
APD: See avalanche photodiode.	
APL: Abbreviation for average picture level. A video quality parameter.	
AR Coating: Antireflection coating. A thin, dielectric or metallic film applied to an optical surface to reduce its reflectance and thereby increase its transmittance.	
Armor: A protective layer, usually metal, wrapped around a cable.	
ASCII: Abbreviation for American standard code for information interchange. An encoding scheme used to interface between data processing systems, data communication systems, and associated equipment.	
ASIC: Abbreviation for application-specific integrated circuit. A custom-designed integrated circuit.	

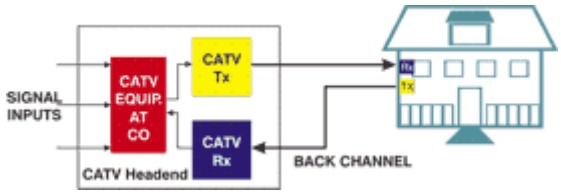
ASTM: Abbreviation for American Society for Testing and Materials. An organization that provides a forum for the development and publication of voluntary consensus standards for materials, products, systems, and services that serve as a basis for manufacturing, procurement, and regulatory activities.	http://www.astm.org/
Asynchronous: Data that is transmitted without an associated clock signal. The time spacing between data characters or blocks may be of arbitrary duration. Opposite of synchronous.	
Asynchronous Transfer Mode (ATM): A transmission standard widely used by the telecom industry. A digital transmission switching format with cells containing 5 bytes of header information followed by 48 data bytes. Part of the B-ISDN standard.	
ATE: Abbreviation for automatic test equipment. Test equipment computer programmed to perform a number of test measurements on a device without the need for changing the test setup. Especially useful in testing components and PCB assemblies.	
ATSC: Abbreviation for Advanced Television Systems Committee. Formed to establish technical standards for advanced television systems, including digital high definition television (HDTV).	http://www.atsc.org
Attenuation: The decrease in signal strength along a fiber optic waveguide caused by absorption and scattering. Attenuation is usually expressed in dB/km.	
Attenuation-Limited Operation: The condition in a fiber optic link when operation is limited by the power of the received signal (rather than by bandwidth or distortion).	

Attenuator: 1) In electrical systems, a usually passive network for reducing the amplitude of a signal without appreciably distorting the waveform. 2) In optical systems, a passive device for reducing the amplitude of a signal without appreciably distorting the waveform.	
Avalanche Photodiode (APD): A photodiode that exhibits internal amplification of photocurrent through avalanche multiplication of carriers in the junction region.	
Average Power: The average level of power in a signal that varies with time.	
AWG (Arrayed Waveguide Grating): A device, built with silicon planar lightwave circuits (PLC), that allows multiple wavelengths to be combined and separated in a dense wavelength-division multiplexing (DWDM) system.	
Axial Propagation Constant: For an optical fiber, the propagation constant evaluated along the axis of a fiber in the direction of transmission.	
Axis: The center of an optical fiber.	

B

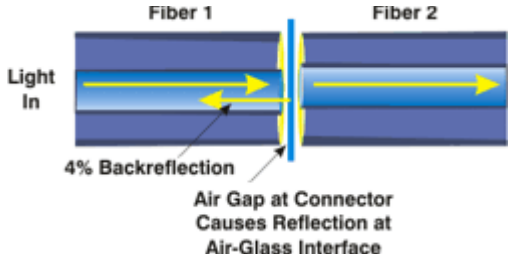
B: See bel.

Back Channel: A means of communication from users to content providers. Examples include a connection between the central office and the end user, an Internet connection using a modem, or systems where content providers transmit interactive television (analog or digital) to users while users can connect through a back channel to a web site, for example.



BB-I: Abbreviation for broadband interactive services. The delivery of all types of interactive video, data, and voice services over a broadband communications network.

Backreflection (BR): A term applied to any process in the cable plant that causes light to change directions in a fiber and return to the source. Occurs most often at connector interfaces where a glass-air interface causes a reflection.



Backscattering: The return of a portion of scattered light to the input end of a fiber; the scattering of light in the direction opposite to its original propagation.

Bandwidth (BW): The range of frequencies within which a fiber optic waveguide or terminal device can transmit data or information.

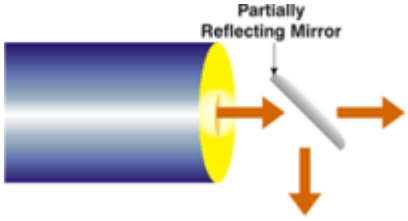
Bandwidth•Distance Product: Of an optical fiber, under specified launching and cabling conditions, at a specified wavelength, a figure of merit equal to the product of the fiber's length and the 3 dB bandwidth of the optical signal. The bandwidth•distance product is usually stated in megahertz • kilometer (MHz•km) or gigahertz•kilometer (GHz•km). It is a useful figure of merit for predicting the effective fiber bandwidth for other lengths, and for concatenated fibers.

Bandwidth-limited Operation: The condition in a fiber optic link when bandwidth, rather than received optical power, limits performance. This condition is reached when the signal becomes distorted, principally by dispersion, beyond specified limits.

Baseband: A method of communication in which a signal is transmitted at its original frequency without being impressed on a carrier.

Baud: A unit of signaling speed equal to the number of signal symbols per second, which may or may not be equal to the data rate in bits per second.

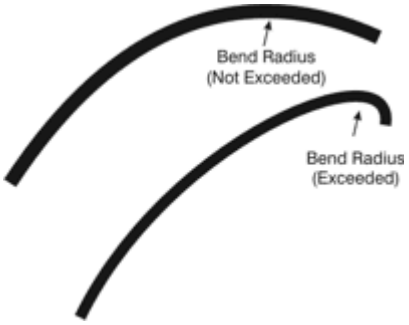
Beamsplitter: An optical device, such as a partially reflecting mirror, that splits a beam of light into two or more beams. Used in fiber optics for directional couplers.



Bel (B): The logarithm to the base 10 of a power ratio, expressed as: $B = \log_{10}(P_1/P_2)$, where P_1 and P_2 are distinct powers. The decibel, equal to one-tenth bel, is a more commonly used unit.

Bending Loss: Attenuation caused by high-order modes radiating from the outside of a fiber optic waveguide which occur when the fiber is bent around a small radius. See also macrobending, microbending.

Bend Radius: The smallest radius an optical fiber or fiber cable can bend before excessive attenuation or breakage occurs.



BER (Bit Error Rate): The fraction of bits transmitted that are received incorrectly. The bit error rate of a system can be estimated as follows:

$$BER = Q\left[\sqrt{\frac{I_{MIN}^2}{4 \cdot N_0 \cdot B}}\right]$$

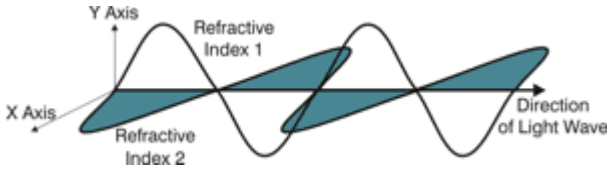
Where N_0 = Noise power spectral density (A^2/Hz).
I_{MIN} = Minimum effective signal amplitude (Amps).
B = Bandwidth (Hz).
Q(x) = Cumulative distribution function (Gaussian distribution).

BIDI: Abbreviation for bidirectional transceiver, a device that sends information in one direction and receives information from the opposite direction.

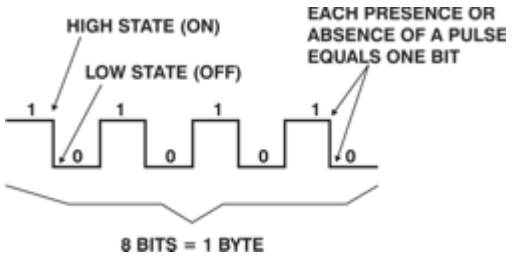
Bidirectional: Operating in both directions. Bidirectional couplers operate the same way regardless of the direction light passes through them. Bidirectional transmission sends signals in both directions, sometimes through the same fiber.

Binary: Base two numbers with only two possible values, 0, or 1. Primarily used by communication and computer systems.

Birefringent: Having a refractive index that differs for light of different polarizations.



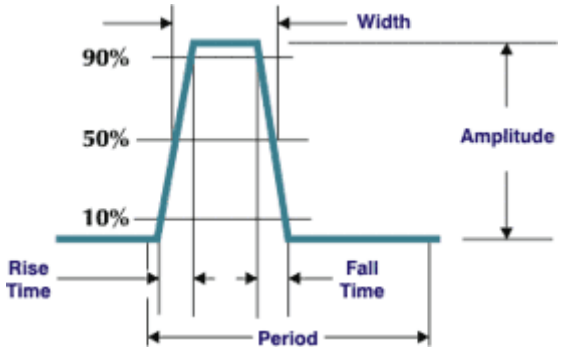
Bit: The smallest unit of information upon which digital communications are based; also an electrical or optical pulse that carries this information.



Bit Depth: The number of levels that a pixel might have, such as 256 with an 8-bit depth or 1,024 with a 10-bit depth.

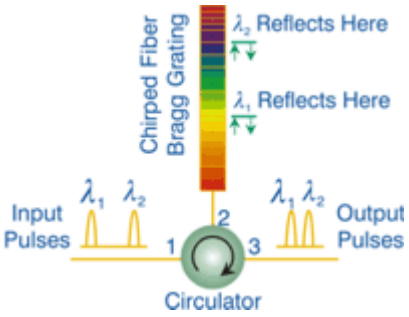
BITE: Abbreviation for built-in test equipment. Features designed into a piece of equipment that allow on-line diagnosis of failures and operating status. Status LEDs are one example.

Bit Period (T): The amount of time required to transmit a logical one or a logical zero.



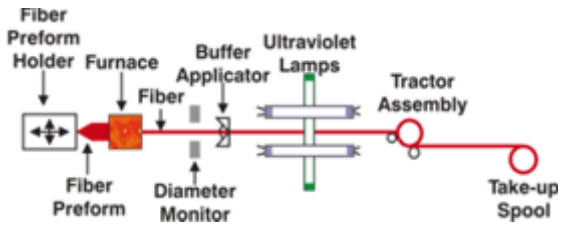
BNC: Popular coax bayonet style connector, Often used for baseband video.

Bragg Grating: A technique for building optical filtering functions directly into a piece of optical fiber based on interferometric techniques. Usually this is accomplished by making the fiber photosensitive and exposing the fiber to deep UV light through a grating. This forms regions of higher and lower refractive indices in the fiber core.

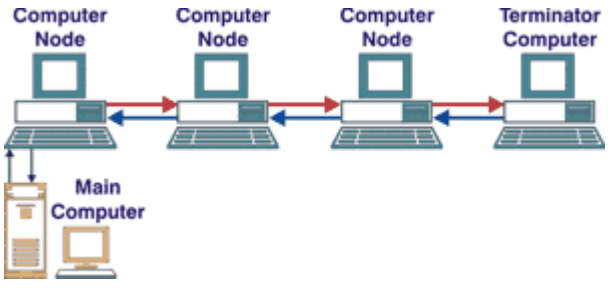


Broadband: A method of communication where the signal is transmitted by being impressed on a high-frequency carrier.

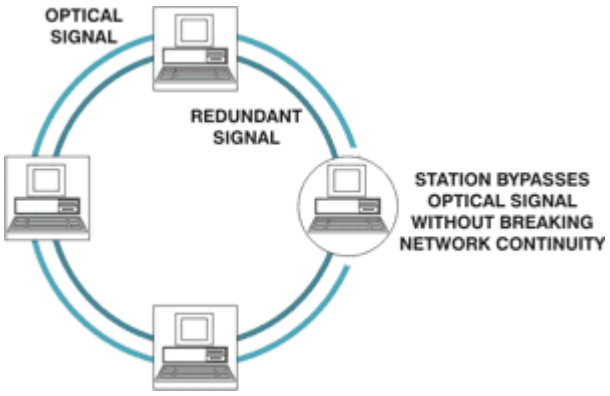
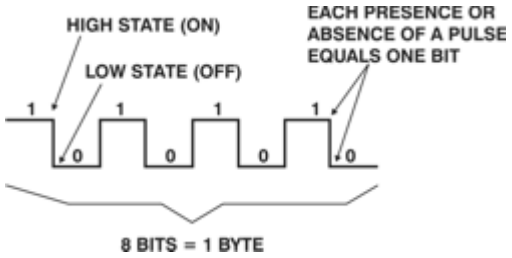
Buffer: 1) In optical fiber, a protective coating applied directly to the fiber (illustrated). 2) A routine or storage used to compensate for a difference in rate of flow of data, or time of occurrence of events, when transferring data from one device to another.



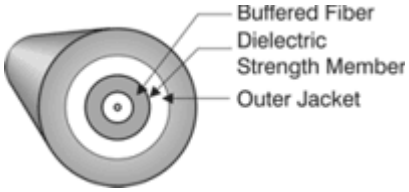
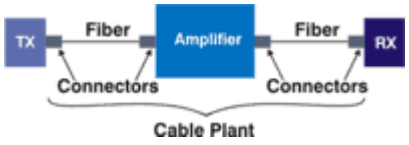
Bus Network: A network topology in which all terminals are attached to a transmission medium serving as a bus. Also called a daisy-chain configuration.

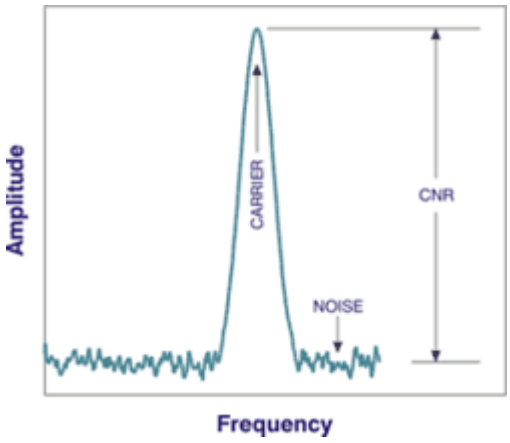
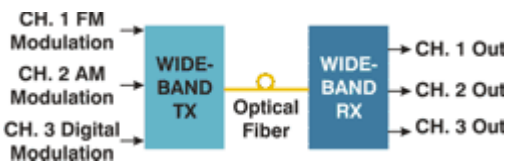


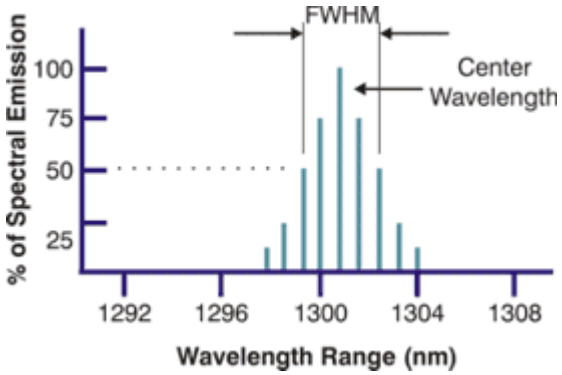
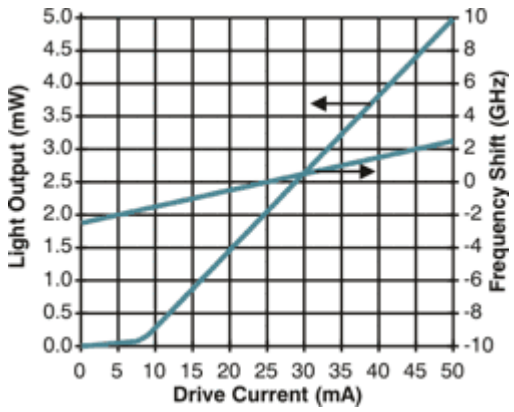
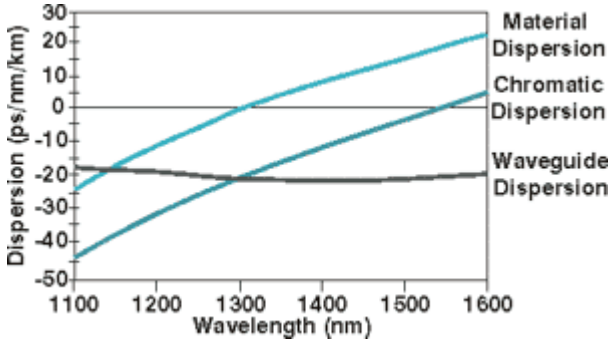
Butt Splice: A joining of two fibers without optical connectors arranged end-to-end by means of a coupling. Fusion splicing is an example.

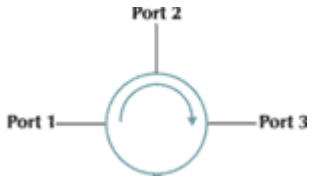
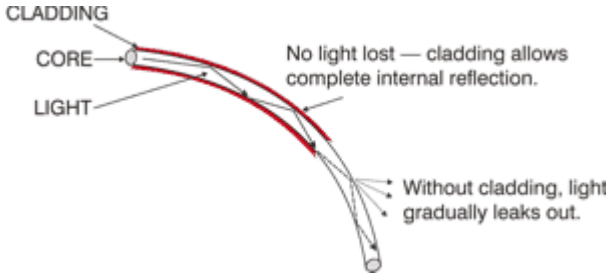
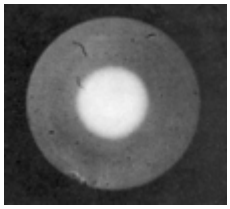
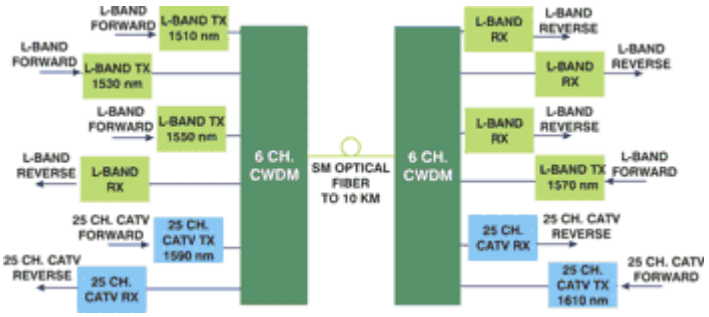
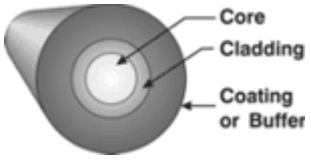
Bypass: The ability of a station to isolate itself optically from a network while maintaining the continuity of the cable plant.	
Byte: A unit of eight bits.	

C

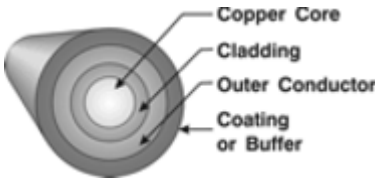
c: Abbreviation for the speed of light. 299,792.5 km per second in a vacuum.	
C: Abbreviation for Celsius. Measure of temperature where pure water freezes at 0° and boils at 100°.	
Cable: One or more optical fibers enclosed, with strength members, in a protective covering.	
Cable Assembly: A cable that is connector terminated and ready for installation.	
Cable Plant: The cable plant consists of all the optical elements including fiber, connectors, splices, etc. between a transmitter and a receiver.	
Cable Television: Communications system that distributes broadcast and non-broadcast signals as well as a multiplicity of satellite signals, original programming and other signals by means of a coaxial cable and/or optical fiber.	

Carrier-to-Noise Ratio (CNR): The ratio, in decibels, of the level of the carrier to that of the noise in a receiver's IF bandwidth before any nonlinear process such as amplitude limiting and detection takes place.	
CATV: Originally an abbreviation for community antenna television; the term now typically refers to cable television.	
C-Band: The wavelength range between 1530 nm and 1562 nm used in some CWDM and DWDM applications.	
CCIR: Abbreviation for Consultative Committee on Radio. Replaced by ITU-R.	http://www.itu.int/publications/itur.html
CCITT: Abbreviation for Consultative Committee on Telephony and Telegraphy. Replaced by ITU-T.	http://www.itu.int/publications/itu-t/list-t-intro.html
CCTV: Abbreviation for closed-circuit television. An arrangement in which programs are directly transmitted to specific users and not broadcast to the general public.	
CD: Abbreviation for compact disk. Often used to describe high-quality audio, CD-quality audio, or short-wavelength lasers; CD Laser.	
CDMA: Abbreviation for code-division multiple access. A coding scheme in which multiple channels are independently coded for transmission over a single wideband channel using an individual modulation scheme for each channel.	

Center Wavelength: In a laser, the nominal value central operating wavelength. It is the wavelength defined by a peak mode measurement where the effective optical power resides (see illustration). In an LED, the average of the two wavelengths measured at the half amplitude points of the power spectrum.	
Central Office (CO): A common carrier switching office in which users' lines terminate. The nerve center of a communications system.	
CGA: Abbreviation for color graphics adapter. A low-resolution color standard for computer monitors.	
Channel: A communications path or the signal sent over that path. Through multiplexing several channels, voice channels can be transmitted over an optical channel.	
Channel Capacity: Maximum number of channels that a cable system can carry simultaneously.	
Channel Coding: Data encoding and error correction techniques used to protect the integrity of data. Typically used in channels with high bit error rates such as terrestrial and satellite broadcast and videotape recording.	
Chirp: In laser diodes, the shift of the laser's center wavelength during single pulse durations.	
Chromatic Dispersion: Reduced fiber bandwidth caused by different wavelengths of light traveling at different speeds down the optical fiber. Chromatic dispersion occurs because the speed at which an optical pulse travels depends on its wavelength, a property inherent to all optical fiber. May be caused by material dispersion, waveguide dispersion, and profile dispersion.	

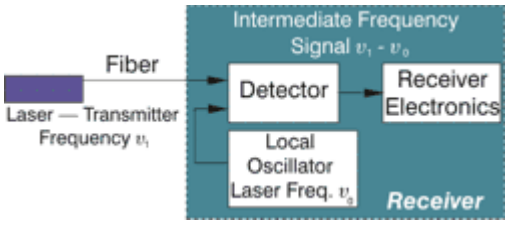
Circulator: Passive three-port devices that couple light from Port 1 to 2 and Port 2 to 3 and have high isolation in other directions.	
Cladding: Material that surrounds the core of an optical fiber. Its lower index of refraction, compared to that of the core, causes the transmitted light to travel down the core.	
Cladding Mode: A mode confined to the cladding; a light ray that propagates in the cladding.	
Cleave: The process of separating an optical fiber by a controlled fracture of the glass, for the purpose of obtaining a fiber end, which is flat, smooth, and perpendicular to the fiber axis.	
cm: Abbreviation for centimeter. Approximately 0.4 inches.	
CMOS: Abbreviation for complementary metal oxide semiconductor. A family of IC's. Particularly useful for low-speed or low-power applications.	
CMTS: Abbreviation for cable modem termination system.	
Coarse Wavelength-division Multiplexing (CWDM): CWDM allows eight or fewer channels to be stacked in the 1550 nm region of optical fiber, the C-Band.	 Click to enlarge image.
Coating: The material surrounding the cladding of a fiber. Generally a soft plastic material that protects the fiber from damage.	

Coaxial Cable: 1) A cable consisting of a center conductor surrounded by an insulating material and a concentric outer conductor and optional protective covering. 2) A cable consisting of multiple tubes under a single protective sheath. This type of cable is typically used for CATV, wideband, video, or RF applications.



Coder: A device, also called an encoder that converts data by the use of a code, frequently one consisting of binary numbers, in such a manner that reconversion to the original form is possible.

Coherent Communications: In fiber optics, a communication system where the output of a local laser oscillator is mixed optically with a received signal, and the difference frequency is detected and amplified.



Color Subcarrier: The 3.58 MHz signal which carries color information in a TV signal.

Composite Second Order (CSO): An important distortion measure of analog CATV systems. It is mainly caused by second-order distortion in the transmission system.

Composite Sync: A signal consisting of horizontal sync pulses, vertical sync pulses, and equalizing pulses only, with a no-signal reference level.

Composite Triple Beat (CTB): An important distortion measure of analog CATV systems. It is mainly caused by third-order distortion in the transmission system.

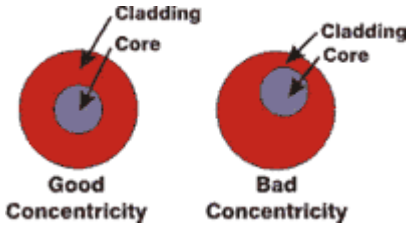
Composite Video: A signal which consists of the luminance (black and white), chrominance (color), blanking pulses, sync pulses, and color burst.

Compression: A process in which the dynamic range or data rate of a signal is reduced by controlling it as a function of the inverse relationship of its instantaneous value relative to a specified reference level. Compression is usually accomplished by separate devices called compressors and is used for many purposes such as: improving signal-to-noise ratios, preventing overload of succeeding elements of a system, or matching the dynamic ranges of two devices. Compression can introduce distortion, but it is usually not objectionable.

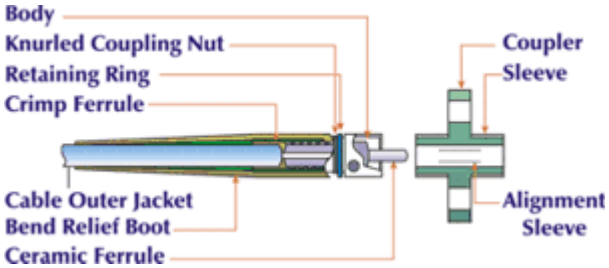
Concatenation: The process of connecting pieces of fiber together.

Concentrator: 1) A functional unit that permits a common path to handle more data sources than there are channels currently available within the path. Usually provides communication capability between many low-speed, asynchronous channels and one or more high-speed, synchronous channels. 2) A device that connects a number of circuits, which are not all used at once, to a smaller group of circuits for economy.

Concentricity: The measurement of how well-centered the core is within the cladding.

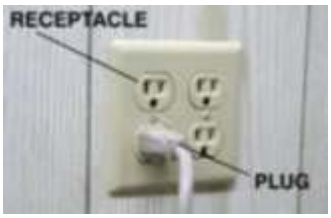


Connector: A mechanical or optical device that provides a demountable connection between two fibers or a fiber and a source or detector.



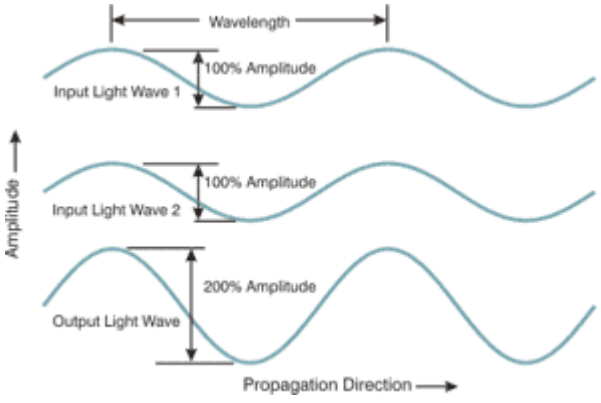
Connector Plug: A device used to terminate an electrical cable (illustrated) or an optical cable.

Connector Receptacle: The fixed or stationary half of a connection that is mounted on a panel/bulkhead. Receptacles mate with plugs.



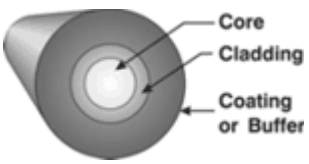
Connector Variation: The maximum value in dB of the difference in insertion loss between mating optical connectors (e.g., with remating, temperature cycling, etc.). Also called optical connector variation.

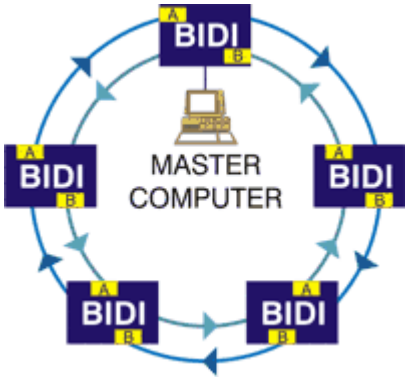
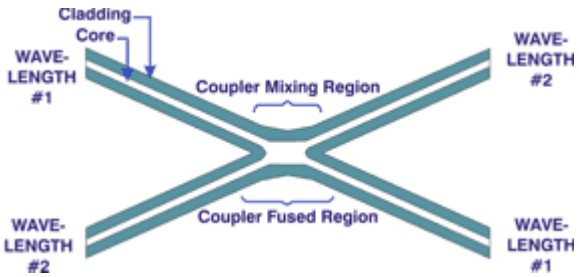
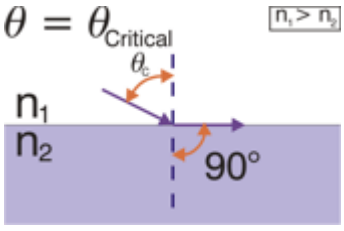
Constructive Interference: Any interference that increases amplitude of the resultant signal. For example, when the wave forms are in phase, they can create a resultant wave equal to the sum of multiple light waves.



Converter: Device that is attached between the television set and the cable system that can increase the number of channels available on the TV set, enabling it to accommodate the multiplicity of channels offered by cable TV. Converter boxes are becoming obsolete as old model televisions requiring a converter are replaced by modern televisions, which incorporate a converter into the television directly. Also called a set-top box.

Core: The light-conducting central portion of an optical fiber, composed of material with a higher index of refraction than the cladding. The



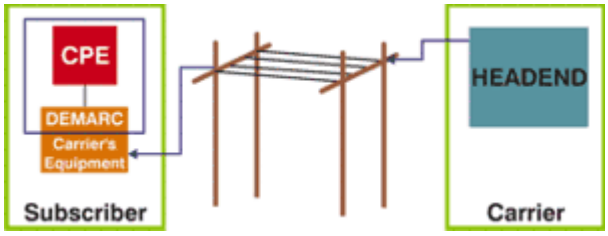
portion of the fiber that transmits light.	
Counter-Rotating: An arrangement whereby two signal paths, one in each direction, exist in a ring topology.	
Coupler: An optical device that combines or splits power from optical fibers.	
Coupling Ratio/Loss (C_R, C_L): The ratio/loss of optical power from one output port to the total output power, expressed as a percent. For a 1 x 2 WDM or coupler with output powers O_1 and O_2, and O_i representing both output powers:	$C_R(\%) = (O_i/(O_1 + O_2))$ x 100% and $C_R(\%) = -10 \bullet \mathrm{Log}_{10}(O_i/(O_1 + O_2))$.
Critical Angle: In geometric optics, at a refractive boundary, the smallest angle of incidence at which total internal reflection occurs.	
Cross-connect: Connections between terminal blocks on the two sides of a distribution frame or between terminals on a terminal block (also called straps). Also called cross-connection or jumper.	
Cross-gain Modulation (XGM): A technique used in wavelength converters where gain saturation effects in an active optical device, such as a semiconductor optical amplifier (SOA), allow the conversion of the optical wavelength. Better at shorter wavelengths (e.g. 780 nm or 850 nm).	
Cross-phase Modulation (XPM): A fiber nonlinearity caused by the nonlinear index of refraction of glass. The index of refraction varies with optical power level which causes different optical signals to interact.	

Crosstalk (XT): 1) Undesired coupling from one circuit, part of a circuit, or channel to another. 2) Any phenomenon by which a signal transmitted on one circuit or channel of a transmission system creates and undesired effect in another circuit or channel.

CSMA/CD: Abbreviation for carrier sense multiple access with collision detection. A network control protocol in which (a) a carrier sensing is used and (b) while a transmitting data station that detects another signal while transmitting a frame, stops transmitting that frame, waits for a jam signal, and then waits for a random time interval before trying to send that frame again.

CTS: Abbreviation for clear to send. In a communications network, a signal from a remote receiver to a transmitter that it is ready to receive a transmission.

Customer Premises Equipment (CPE): Terminal, associated equipment, and inside wiring located at a subscriber's premises and connected with a carrier's communication channel(s) at the demarcation point (demarc), a point established in a building or complex to separate customer equipment from telephone company equipment.



Cutback Method: A technique of measuring optical fiber attenuation by measuring the optical power at two points at different distances from the test source.

Cutoff Wavelength: In single-mode fiber, the wavelength below which the fiber ceases to be single-mode.

CW: Abbreviation for continuous wave. Usually refers to the constant optical output from an optical source when it is biased (i.e., turned on) but not modulated with a signal.

CWDM: see Coarse-Wavelength-division-Multiplexing.

D

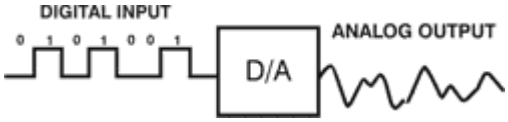
D1: A format for component digital video tape recording working to the ITU-R 601, 4:2:2 standard using 8-bit sampling.

D2: The VTR standard for digital composite (coded) NTSC or PAL signals that uses data conforming to SMPTE 244M.

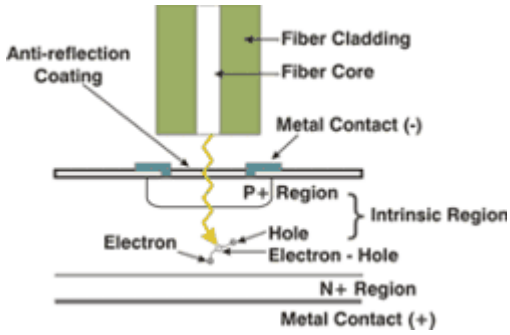
D3: A composite digital video recording format that uses data conforming to SMPTE 244M.

D5: An uncompressed tape format for component digital video which has provisions for HDTV recording by use of 4:1 compression.

D/A or **DAC:** Abbreviation for digital-to-analog converter. A device used to convert digital signals to analog signals.



Dark Current: The induced current that exists in a reversed biased photodiode in the absence of incident optical power. It is better understood to be caused by the shunt resistance of the photodiode. A bias voltage across the diode (and the shunt resistance) causes current to flow in the absence of light.



Data Dependent Jitter: Also called data dependent distortion. Jitter related to the transmitted symbol sequence. DDJ is caused by the limited bandwidth characteristics, non-ideal individual pulse responses, and imperfections in the optical channel components.

Data Rate: The number of bits of information in a transmission system, expressed in bits per second (b/s or bps), and which may or may not be equal to the signal or baud rate.

dBc: Abbreviation for decibel relative to a carrier level.

dBμ: Abbreviation for decibel relative to microwatt.

dBm: Abbreviation for decibel relative to milliwatt.

DBS: Abbreviation for digital broadcast system. An alternative to cable and analog satellite reception that uses a fixed 18-inch dish focused on one or more geostationary satellites. DBS units receive multiple channels of multiplexed video and audio signals as well as programming information, and related data. Also known as digital satellite system.

DC: Abbreviation for direct current. An electric current flowing in one direction only and substantially constant in value.

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 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 of a channel into the DTE.

DCD: See Duty Cycle Distortion Jitter.

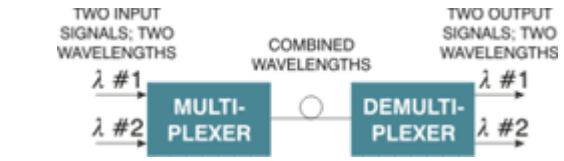
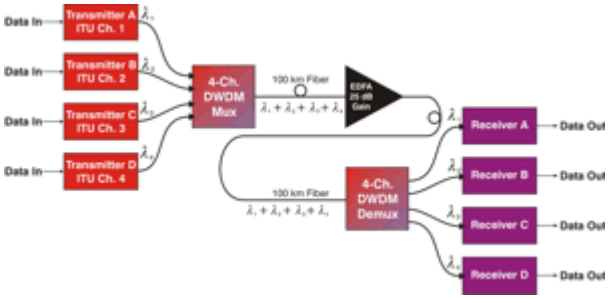
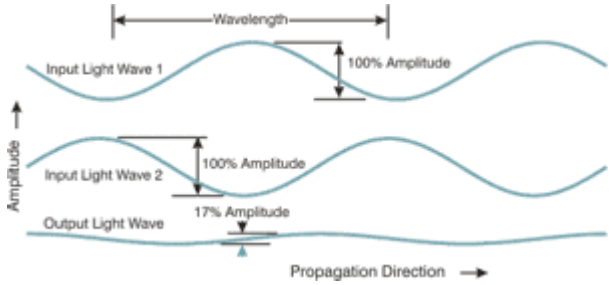
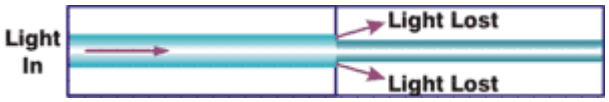
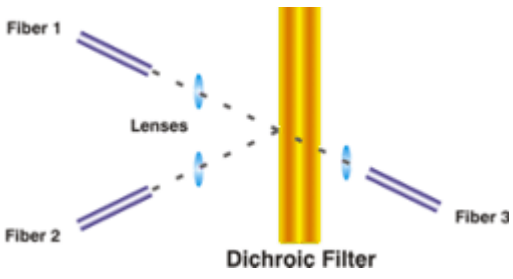
DCT: See discrete-cosine transform.

DDJ: See Data Dependent Jitter.

Decibel (dB): A unit of measurement indicating relative power on a logarithmic scale. Often expressed in reference to a fixed value, such as dBm or dBμ.

$$dB = 10 \cdot Log_{10} (P_1/P_2)$$

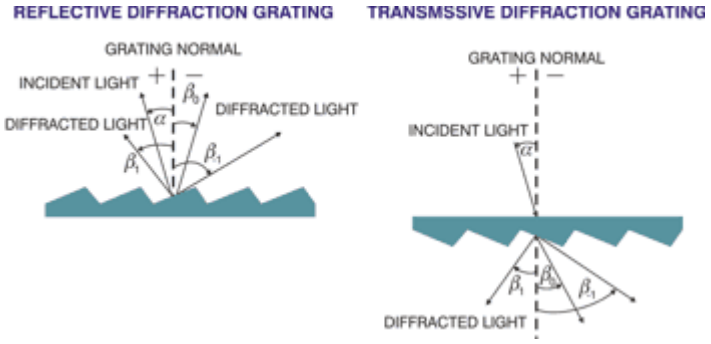
Decoder: A device used to convert data by reversing the effect of previous coding.

Demultiplexer: A module that separates two or more signals previously combined by compatible multiplexing equipment.	
Dense Wavelength-division Multiplexing (DWDM): The transmission of many of closely spaced wavelengths in the 1550 nm region over a single optical fiber. Wavelength spacings are usually 100 GHz or 200 GHz which corresponds to 0.8 nm or 1.6 nm. DWDM bands include the C-Band, the S-Band, and the L-Band.	 Click to enlarge image.
Destructive Interference: Any interference that decreases the desired signal. For example, two light waves that are equal in amplitude and frequency, and out of phase by 180°, will negate one another.	
Detector: An opto-electric transducer used to convert optical power to electrical current. Usually referred to as a photodiode.	
DFB: See distributed feedback laser.	
Diameter-mismatch Loss: The loss of power at a joint that occurs when the transmitting fiber has a diameter greater than the diameter of the receiving fiber. The loss occurs when coupling light from a source to fiber, from fiber to fiber, or from fiber to detector.	
Dichroic Filter: An optical filter that transmits light according to wavelength. Dichroic filters reflect light that they do not transmit. Used in bulk optics wavelength-division multiplexers.	
Dielectric: Any substance in which an electric field may be maintained with zero or near-zero power dissipation. This term usually refers to non-metallic materials.	
Differential Gain (DG): A type of distortion in a video signal that causes the brightness information to be	

incorrectly interpreted.

Differential Phase (DP): A type of distortion in a video signal that causes the color information to be incorrectly interpreted.

Diffraction Grating: An array of fine, parallel, equally spaced reflecting or transmitting lines that mutually enhance the effects of diffraction to concentrate the diffracted light in a few directions determined by the spacing of the lines and by the wavelength of the light.



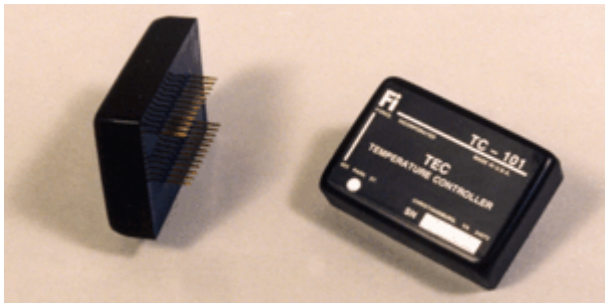
Digital: A signal that consists of discrete states. A binary signal has only two states, 0 and 1. Antonym of analog.

Digital Compression: A technique for converting digital video to a lower data rate by eliminating redundant information.

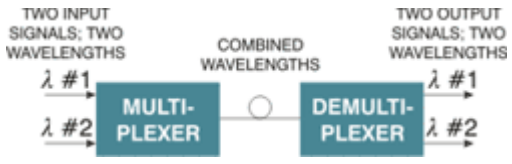
Diode: An electronic device that lets current flow in only one direction. Semiconductor diodes used in fiber optics contain a junction between regions of different doping. They include light emitters (LEDs and laser diodes) and detectors (photodiodes).

Diode Laser: Synonymous with injection laser diode.

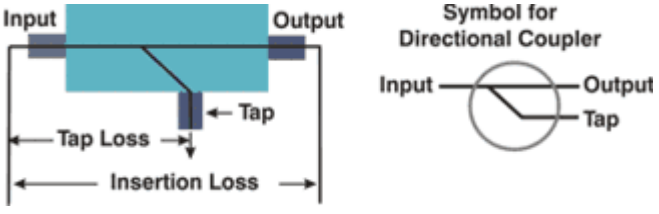
DIP: Abbreviation for dual in-line package. An electronic package with a rectangular housing and a row of pins along each of two opposite sides.



Diplexer: A device that combines two or more types of signals into a single output. Usually incorporates a multiplexer at the transmit end and a demultiplexer at the receiver end.



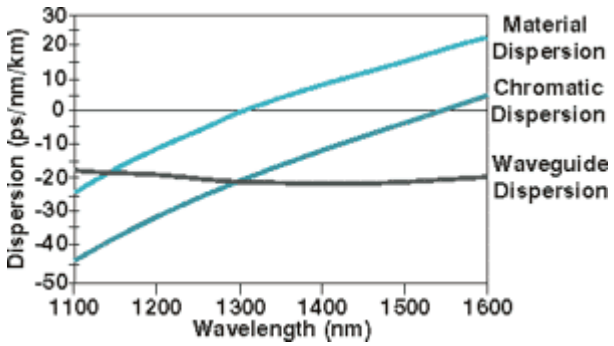
Directional Coupler: A coupling device for separately sampling (through a known coupling loss) either the forward (incident) or the backward (reflected) wave in a transmission line.



Directivity: See near-end crosstalk.

Discrete-cosine Transform (DCT): A widely used method of data compression of digital video pictures that resolves blocks of the picture (usually 8 x 8 pixels) into frequencies, amplitudes, and colors. JPEG and DV depend on DCT.

Dispersion: The temporal spreading of a light signal in an optical waveguide caused by light signals traveling at different speeds through a fiber either due to modal or chromatic effects.

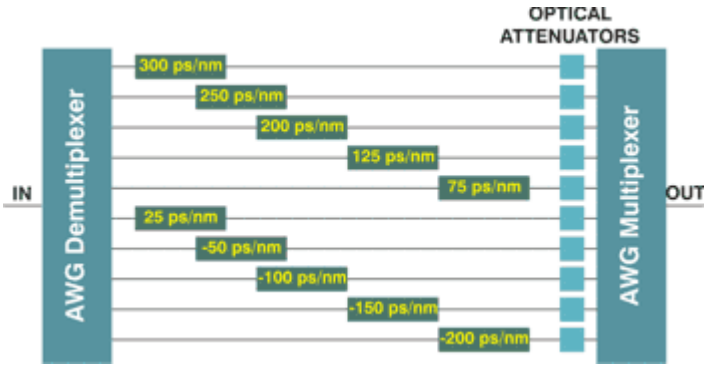


Dispersion-compensating Fiber (DCF): A fiber that has the opposite dispersion of the fiber being used in a transmission system. It is used to nullify the dispersion caused by that fiber.

Dispersion-compensating Module (DCM): This module has the opposite dispersion of the fiber being used in a transmission system. It is used to nullify the dispersion caused by that fiber. It can be either a spool of a special fiber or a grating based module.

Dispersion-shifted Fiber (DSF): A type of single-mode fiber designed to have zero dispersion near 1550 nm. This fiber type works very poorly for DWDM applications because of high fiber nonlinearity at the zero-dispersion wavelength.

Dispersion Management: A technique used in a fiber optic system design to cope with the dispersion introduced by the optical fiber. A dispersion slope compensator (illustrated) is one dispersion management technique.



Dispersion Penalty: The result of dispersion in which pulses and edges smear making it difficult for the receiver to distinguish between ones and zeros. This results in a loss of receiver sensitivity compared to a short fiber and measured in dB. The equations for calculating dispersion penalty are as follows:

$$\tau = \omega \bullet D_\lambda \qquad \text{ps/km}$$

$$f = 1\eta\ (4)/(\tau \bullet \pi) \qquad \text{Hz} \bullet \text{km}$$

$$F_F = f/L \qquad \text{Hz}$$

$$\eta_L = c \bullet (F_R/F_F)^2$$

$$dB_L = 10 \bullet \text{Log}\ (1+\eta)_L \qquad \text{dB}$$

Where:

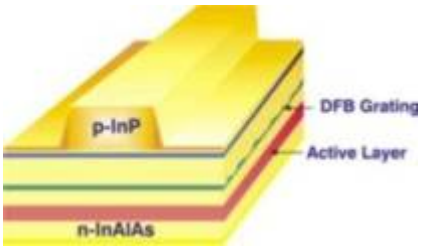
ω = Laser spectral width (nm)

D_λ = Fiber dispersion (ps/nm/km)

τ = System dispersion (ps/km)

f = Bandwidth-distance product of the fiber (Hz • km)

L = Fiber length (km)

	F_F = Fiber bandwidth (Hz) C = A constant equal to 0.5 F_R = Receiver data rate (b/s) dB_L = Dispersion penalty (dB)
Distortion: nonlinearities in a unit that cause harmonics and beat products to be generated.	
Distortion-limited Operation: Generally synonymous with bandwidth-limited operation.	
Distributed Feedback Laser (DFB): An injection laser diode which has a Bragg reflection grating in the active region in order to suppress multiple longitudinal modes and enhance a single longitudinal mode.	
Distribution System: Part of a cable system consisting of trunk and feeder cables used to carry signals from headend to customer terminals.	
Dominant Mode: The mode in an optical device spectrum with the most power.	
Dope: Thick liquid or paste used to prepare a surface or a varnish-like substance used for waterproofing or strengthening a material.	
Dopant: An impurity added to an optical medium to change its optical properties. EDFAs use erbium as a dopant for optical fiber.	
Double-window Fiber: 1) Multimode fibers optimized for 850 nm and 1310 nm operation. 2) Single-mode fibers optimized for 1310 nm and 1550 nm operation.	
DSL: Abbreviation for digital subscriber line. In an integrated systems digital network (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. See also ISDN.	
DSR: Abbreviation for data signaling rate. The aggregate rate at which data pass a point in the transmission path of a data transmission system expressed in bits per second (bps or b/s).	
DST: Abbreviation for dispersion supported transmission. In electrical TDM systems, a transmission system that would allow data rates at 40 Gb/s by incorporating devices such as SOAs.	
DSx: A transmission rate in the North American digital telephone hierarchy. Also called T-carrier.	
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. 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.	
DTR: Abbreviation for data terminal ready. In a communications network, a signal from a remote transmitter that the transmitter is clear to receive data.	
DTV: Abbreviation for digital television. Any technology, using any of several digital encoding schemes, used in connection with the transmission and reception of television signals. Depending on the transmission medium, DTV often uses some type of digital compression to	

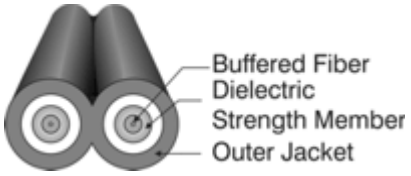
reduce the required digital data rate. Except for artifacts of the compression, DTV is more immune (than analog television) to degradation in transmission, resulting in a higher quality of both audio and video, to the limits of signal reception.

Dual Attachment Concentrator: A concentrator that offers two attachments to the FDDI network which are capable of accommodating a dual (counter-rotating) ring.

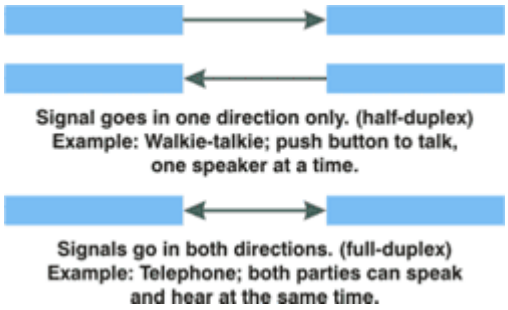
Dual Attachment Station: A station that offers two attachments to the FDDI network which are capable of accommodating a dual (counter-rotating) ring.

Dual Ring (FDDI Dual Ring): A pair of counter-rotating logical rings.

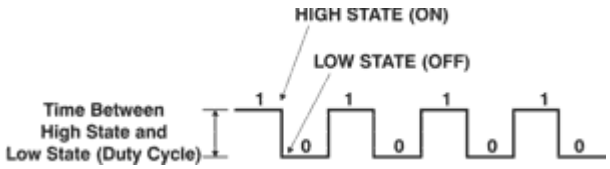
Duplex Cable: A two-fiber cable suitable for duplex transmission.



Duplex Transmission: Transmission in both directions, either one direction at a time (half-duplex) or both directions simultaneously (full-duplex).



Duty Cycle: In a digital transmission, the fraction of time a signal is at the high level.



Duty Cycle Distortion Jitter: Distortion usually caused by propagation delay differences between low-to-high and high-to-low transitions. DCD is manifested as a pulse width distortion of the nominal baud time.

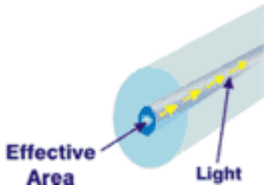
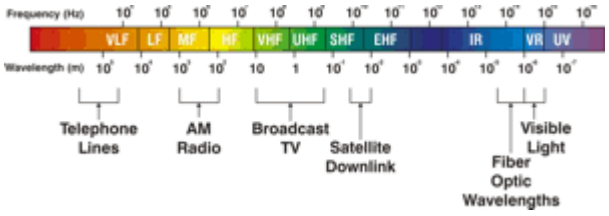
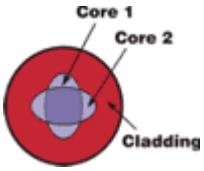
DVB-ASI: Abbreviation for digital video broadcast-asynchronous serial interface. An interface used to transport MPEG-2 files. The interface consolidates multiple MPEG-2 data streams onto a single circuit and transmits them at a data rate of 270 Mb/s.

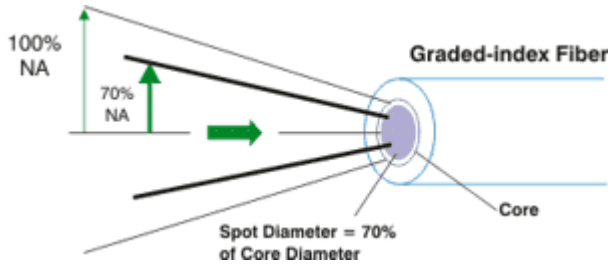
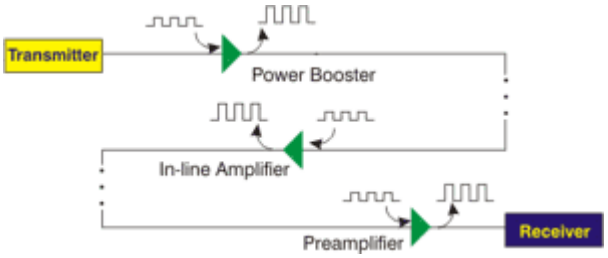
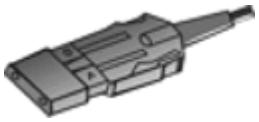
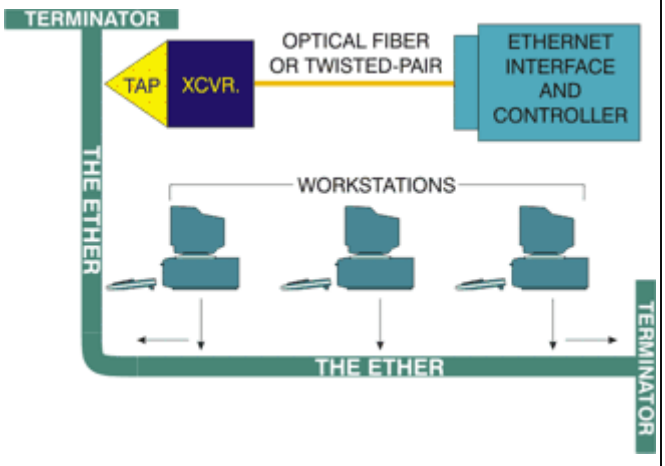
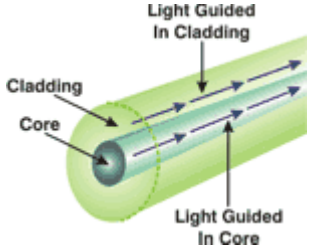
DWDM: See dense wavelength-division multiplexing.

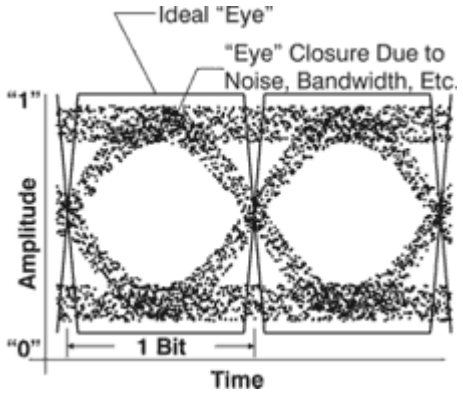
E

ECL: Abbreviation for emitter-coupled logic. A high-speed logic family capable of GHz rates.

EDFA: See Erbium-doped fiber amplifier.

Edge-emitting Diode: An LED that emits light from its edge, producing more directional output than surface-emitting LED's that emit from their top surface.	
Effective Area: The area of a single-mode fiber that carries the light.	
EGA: Abbreviation for enhanced graphics adapter. A medium-resolution color standard for computer monitors.	
EIA: Abbreviation for Electronic Industries Association. An organization that sets video and audio standards.	http://www.eia.org/
EMI (Electromagnetic Interference): Any electrical or electromagnetic interference that causes undesirable response, degradation, or failure in electronic equipment. Optical fibers neither emit nor receive EMI.	
EMP (Electromagnetic Pulse): A burst of electromagnetic radiation that creates electric and magnetic fields that may couple with electrical/electronic systems to produce damaging current and voltage surges.	
EMR (Electromagnetic Radiation): Radiation made up of oscillating electric and magnetic fields and propagated with the speed of light. Includes gamma radiation, X-rays, ultraviolet, visible, and infrared radiation, and radar and radio waves.	
Electromagnetic Spectrum: The range of frequencies of electromagnetic radiation from zero to infinity.	 Click to enlarge image.
ELED: See edge-emitting diode.	
Ellipticity: Describes the fact that the core or cladding may be elliptical rather than circular.	
EM: Abbreviation for electromagnetic.	
Endoscope: A fiber optic bundle used for imaging and viewing inside the human body.	
E/O: Abbreviation for electrical-to-optical converter. A device that converts electrical signals to optical signals, such as a laser	

diode.	
Equilibrium Mode Distribution (EMD): The steady modal state of a multimode fiber in which the relative power distribution among modes is independent of fiber length.	
Erbium-doped Fiber Amplifier (EDFA): Optical fibers doped with the rare earth element, erbium, which can amplify light in the 1550 nm region when pumped by an external light source.	
Error Correction: In digital transmission systems, a scheme that adds overhead to the data to permit a certain level of errors to be detected and corrected.	
Error Detection: Checking for errors in data transmission. A calculation based on the data being sent; the results of the calculation are sent along with the data. The receiver then performs the same calculation and compares its results with those sent. If the receiver detects an error, it can be corrected, or it can simply be reported.	
ESCON: Abbreviation for enterprise systems connection. A duplex optical connector used for computer-to-computer data exchange.	
Ethernet: A standard protocol (IEEE 802.3) for a 10-Mb/s baseband local area network (LAN) bus using carrier sense multiple access with collision detection (CSMA/CD) as the access method. Ethernet is a standard for using various transmission media, such as coaxial cables, unshielded twisted pairs, and optical fibers.	
Evanescent Wave: Light guided in the inner part of an optical fiber's cladding rather than in the core, i.e. the portion of the light wave in the core that penetrates into the cladding.	

Excess Loss: In a fiber optic coupler, the optical loss from that portion of light that does not emerge from the nominal operation ports of the device.	
External Modulation: Modulation of a light source by an external device that acts like an electronic shutter.	
Extinction Ratio: The ratio of the low, or OFF optical power level (P_L) to the high, or ON optical power level (P_H):	Extinction Ratio (%) = (P_L/P_H) x 100
Extrinsic Loss: In a fiber interconnection, that portion of loss not intrinsic to the fiber but related to imperfect joining of a connector or splice.	
Eye Pattern: A diagram that shows the proper function of a digital system. The "openness" of the eye relates to the BER that can be achieved.	

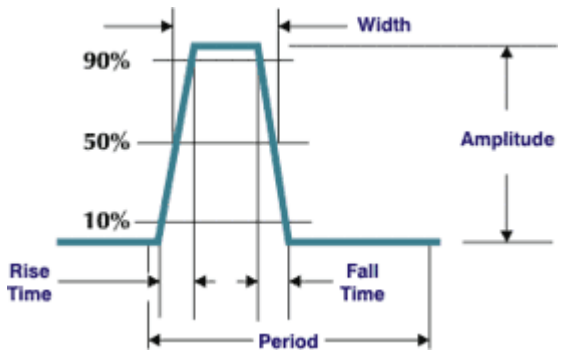
F

F: Abbreviation for Fahrenheit. Measure of temperature where pure water freezes at 32° and boils at 212°.

Fabry Perot: See FP.

Failure Rate: See FIT Rate.

Fall Time: Also called turn-off time. The time required for the trailing edge of a pulse to fall from 90% to 10% of its amplitude; the time required for a component to produce such a result. Typically measured between the 90% and 10% points or alternately the 80% and 20% points.



FAR: Abbreviation for federal acquisition regulation. The guidelines by which the U.S. government purchases goods and services. Also the criteria that must be met by the vendor in order to be considered as a source for goods and services purchased by the U.S. government.

Faraday Effect: A phenomenon that causes some materials to rotate the polarization of light in the presence of a magnetic field parallel to the direction of propagation. Also called magneto-optic effect.

Far-End Crosstalk: See wavelength isolation.

FBG: Abbreviation for fiber Bragg gratings. See Bragg grating.

FCC: Abbreviation for Federal Communications Commission. The U.S. Government board of five presidential appointees that has the authority to regulate all non-Federal Government interstate telecommunications as well as all international communications that originate or terminate in the United States.

http://www.fcc.gov

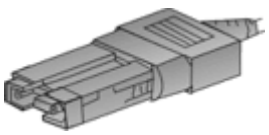
FC/PC: See FC. A threaded optical connector that uses a special curved polish on the connector for very low backreflection. Good for single-mode or multimode fiber.

FCS: Abbreviation for frame check sequence. An error-detection scheme that (a) uses parity bits generated by polynomial encoding of digital signals, (b) appends those parity bits to a digital signal, and (c) uses decoding algorithms that detect errors in the received digital signal.

FDA: Abbreviation for Food and Drug Administration. Organization responsible for, among other things, laser safety.

http://www.fda.gov

FDDI: Abbreviation for fiber distributed data interface. 1) A dual counter-rotating ring local area network. 2) A connector used in a dual counter-rotating ring local area network (illustrated).



FDM: See frequency-division multiplexing.

FEC: See forward error correcting.

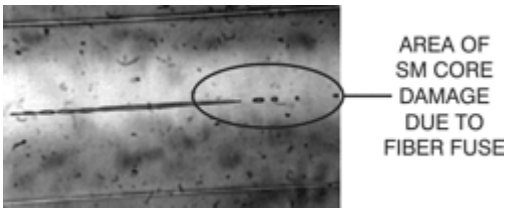
Feeder: 1) Supplies the input of a system, subsystem, or equipment, such as a transmission line or antennae. 2) A coupling device between an antennae and its transmission line. 3) A transmission facility between either the point of origin of the signal or at the head-end of a distribution facility.

Ferrule: A rigid tube that confines or holds a fiber as part of a connector assembly.

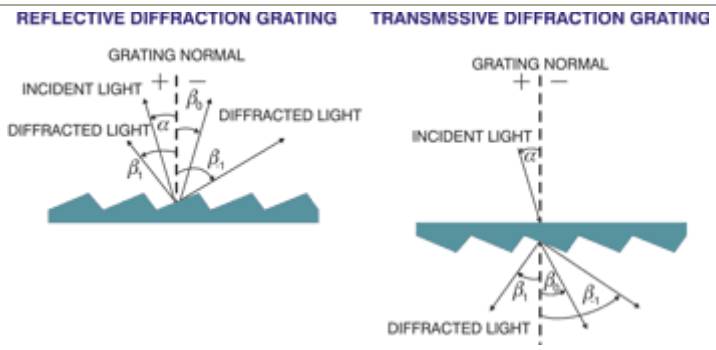
FET: Abbreviation for field-effect transistor. A semiconductor so named because a weak electrical signal coming in through one electrode creates an electrical field through the rest of the transistor. This field flips from positive to negative when the incoming signal does, and controls a second current traveling through the rest of the transistor. The field modulates the second current to mimic the first one, but it can be substantially larger.

Fiber Fuse: A mechanism whereby the core of a single-mode fiber can be destroyed at high optical power levels.

(Photo courtesy of Dr. D.D.Davis.)



Fiber Grating: An optical fiber in which the refractive index of the core varies periodically along its length, scattering light in a way similar to a diffraction grating, and transmitting or reflecting certain wavelengths selectively.



Fiber-in-the-loop (FITL): Fiber optic service to a node that is located in a neighborhood.

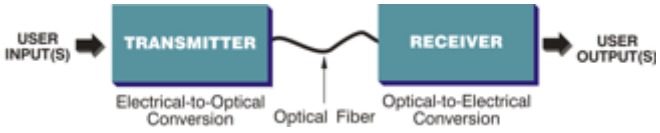
Fiber Optic Attenuator: A component installed in a fiber optic transmission system that reduces the power in the optical signal. It is often used to limit the optical power received by the photodetector to within the limits of the optical receiver. A fiber optic attenuator may be an external device, separate from the receiver, or incorporated into the receiver design as illustrated (far

left). (Photo courtesy of Force, Inc.)

Fiber Optic Cable: A cable containing one or more optical fibers.

Fiber Optic Communication System: The transfer of modulated or unmodulated optical energy through optical fiber media which terminates in the same or different media.

Fiber Optic Link: A transmitter, receiver, and cable assembly that can transmit information between two points.



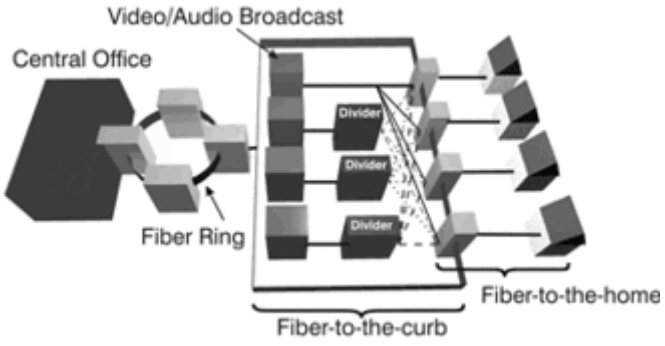
Fiber Optic Span: An optical fiber/cable terminated at both ends which may include devices that add, subtract, or attenuate optical signals.

Fiber Optic Subsystem: A functional entity with defined bounds and interfaces which is part of a system. It contains solid state and/or other components and is specified as a subsystem for the purpose of trade and commerce.

(Photo of Model 2678 courtesy of Force, Inc.)

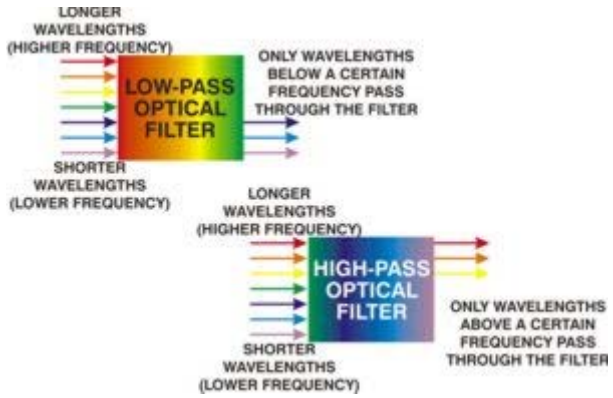
Fiber-to-the-Curb (FTTC): Fiber optic service to a node connected by wires to several nearby homes, typically on a block.

Fiber-to-the-Home (FTTH): Fiber optic service to a node located inside an individual home.



Fibre Channel: An industry-standard specification that originated in Great Britain which details computer channel communications over fiber optics at transmission speeds from 132 Mb/s to 1062.5 Mb/s at distances of up to 10 kilometers.

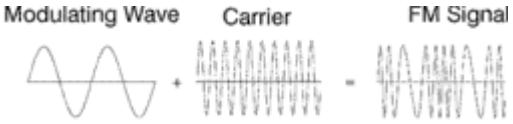
Filter: A device which transmits only part of the incident energy and may thereby change the spectral distribution of energy.



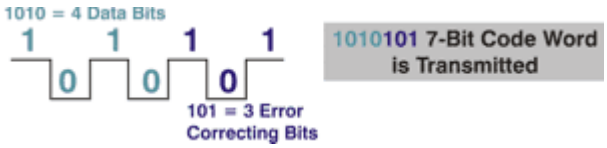
FIT Rate: Number of device failures in one billion device hours.

Fluoride Glasses: Materials that have the amorphous structure of glass but are made of fluoride compounds (e.g., zirconium fluoride) rather than oxide compounds (e.g., silica). Suitable for very long wavelength transmission. This material tends to be destroyed by water, limiting its use.

FM (Frequency Modulation): A method of transmission in which the carrier frequency varies in accordance with the signal.

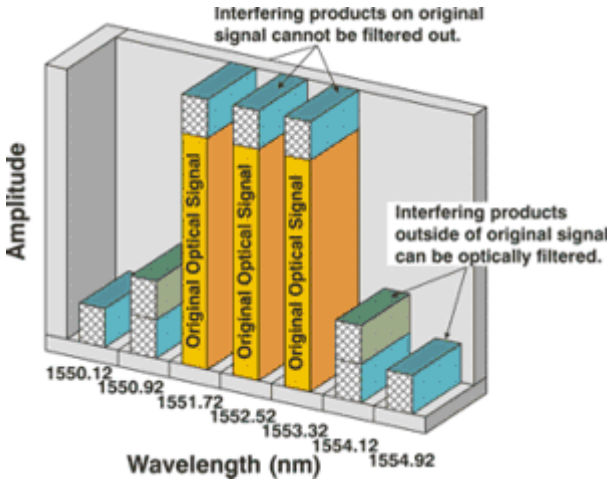


Forward Error Correcting (FEC): A communication technique used to compensate for a noisy transmission channel. Extra information is sent along with the primary data payload to correct for errors that occur in transmission.



FOTP (Fiber Optic Test Procedure): Standards developed and published by the Electronic Industries Association (EIA) under the EIA-RS-455 series of standards.

Four Wave Mixing (FWM): A nonlinearity common in DWDM systems where multiple wavelengths mix together to form new wavelengths, called interfering products. Interfering products that fall on the original signal wavelength become mixed with the signal, mudding the signal, and causing attenuation. Interfering products on either side of the original wavelength can be filtered out. FWM is most prevalent near the zero-dispersion wavelength and at close wavelength spacings.



FP: Abbreviation for Fabry-Perot. Generally refers to any device, such as a type of laser diode, that uses mirrors in an internal cavity to produce multiple reflections.

Free-Space Optics: Also called free-space photonics. The transmission of modulated visible or infrared (IR) beams through the atmosphere via lasers, LEDs, or IR-emitting diodes (IREDs) to obtain broadband communications.

Frequency-division Multiplexing (FDM): A method of deriving two or more simultaneous, continuous channels from a transmission medium by assigning separate portions of the available frequency spectrum to each of the individual channels.

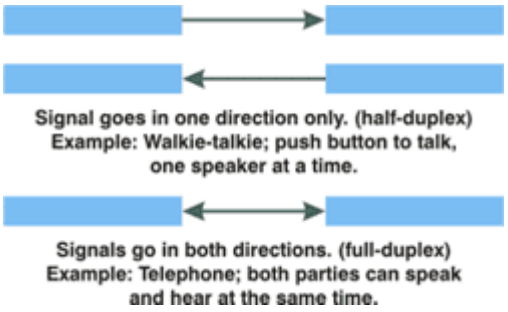
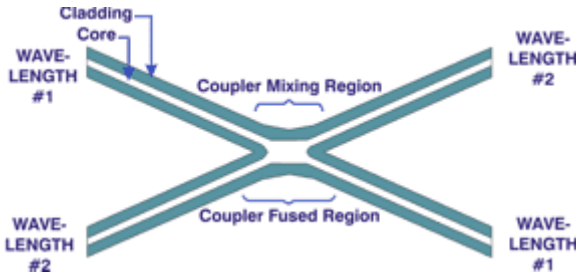
Frequency-shift Keying (FSK): Frequency modulation in which the modulating signal shifts the output frequency between predetermined values. Also called frequency-shift modulation, frequency-shift signaling.

Frequency Stacking: The process that allows two identical frequency bands to be sent over a single cable by up converting one of the frequencies and "stacking" it with the other.

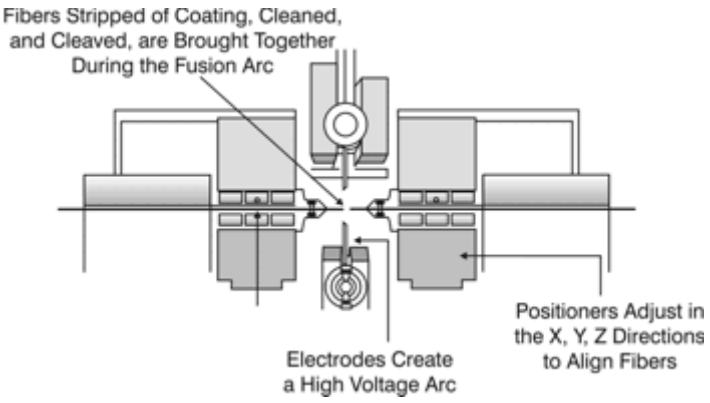
Fresnel Reflection Loss: Reflection losses at the ends of fibers caused by differences in the refractive index between glass and air. The maximum reflection caused by a perpendicular air-glass interface is about 4% or about -14 dB.

FSAN: Abbreviation for full service access network. A forum for the world's largest telecommunications services providers and equipment suppliers

http://www.fsanet.net/

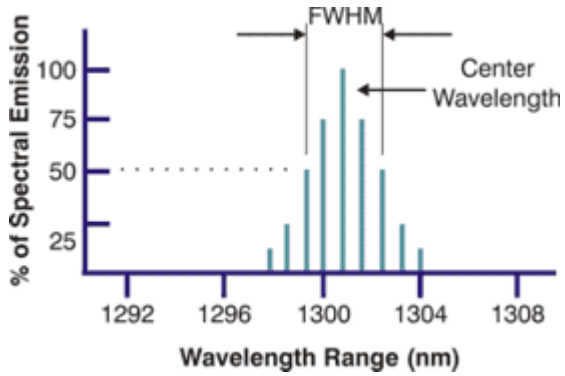
to work define broadband access networks based primarily on the ATM passive optical network structure.	
Full-duplex Transmission: Simultaneous bidirectional transfer of data.	
Fused Coupler: A method of making a multimode or single-mode coupler by wrapping fibers together, heating them, and pulling them to form a central unified mass so that light on any input fiber is coupled to all output fibers.	

Fused Fiber: A bundle of fibers fused together so they maintain a fixed alignment with respect to each other in a rigid rod.

Fusion Splicer: An instrument that permanently bonds two fibers together by heating and fusing them.	

FUT: Abbreviation for fiber under test. Refers to the fiber being measured by some type of test equipment.

FWHM: Abbreviation for full width half maximum. Used to describe the width of a spectral emission at the 50% amplitude points. Also known as FWHP (full width half power).



FWM: See four wave mixing.

G

G: Abbreviation for giga. One billion or 10^9.

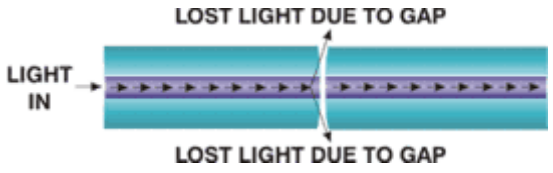
GaAlAs: Abbreviation for gallium aluminum arsenide. Generally used for short wavelength light emitters.

GaAs: Abbreviation for gallium arsenide. Used in light emitters.

Gain: The ratio of output current, voltage, or power to input current, voltage, or power, respectively. Gain is usually expressed in dB. If the ratio is less than unity, the gain, expressed in dB, will be negative, in which case there is a loss between input and output.

GaInAsP: Abbreviation for gallium indium arsenide phosphide. Generally used for long wavelength light emitters.

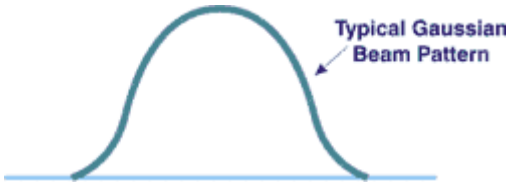
Gap Loss: Loss resulting from the end separation of two axially aligned fibers.



Gate: 1) A device having one output channel and one or more input channels, such that the output channel state is completely determined by the input channel states, except during switching transients. 2) One of the many types of combinational logic elements having at least two inputs.

Gaussian Beam: A beam pattern used to approximate the distribution of energy in a fiber core. It can also be used to describe emission patterns from surface-emitting LEDs. Most people would recognize it as the bell curve (illustrated). The Gaussian beam is defined by the equation:

$$E(x) = E(0)e^{-x2/w_0^2}$$



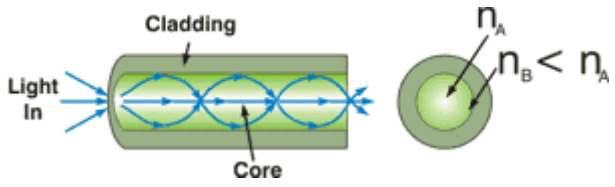
GBaud: One billion bits of data per second or 10^9 bits. Equivalent to 1 for binary signals.

Ge: Abbreviation for germanium. Generally used in detectors. Good for most fiber optic wavelengths (e.g., 800-1600 nm). Performance is inferior to InGaAs

Genlock: A process of sync generator locking. This is usually performed by introducing a composite video signal from a master source to the subject sync generator. The generator to be locked has circuits to isolate vertical drive, horizontal drive and subcarrier. The process then involves locking the subject generator to the master subcarrier, horizontal, and vertical drives so that the result is that both sync generators are running at the same frequency and phase.

GHz: Abbreviation for gigahertz. One billion Hertz (cycles per second) or 10^9 Hertz.

Graded-index Fiber: Optical fiber in which the refractive index of the core is in the form of a parabolic curve, decreasing toward the cladding.



GRIN: Abbreviation for gradient index. Generally refers to the SELFOC lens often used in fiber optics.

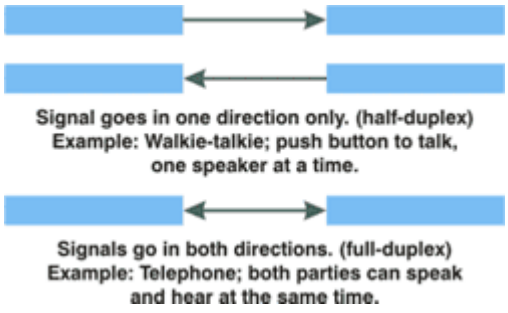
Ground Loop Noise: Noise that results when equipment is grounded at points having different potentials thereby creating an unintended current path. The dielectric properties of optical fiber provide electrical isolation that eliminates ground loops.

Group Index: Also called group refractive index. In fiber optics, for a given mode propagating in a medium of refractive index (n), the group index (N), is the velocity of light in a vacuum (c), divided by the group velocity of the mode.

Group Velocity: 1) The velocity of propagation of an envelope produced when an electromagnetic wave is modulated by, or mixed with, other waves of different frequencies. 2) For a particular mode, the reciprocal of the rate of change of the phase constant with respect to angular frequency. 3) The velocity of the modulated optical power.

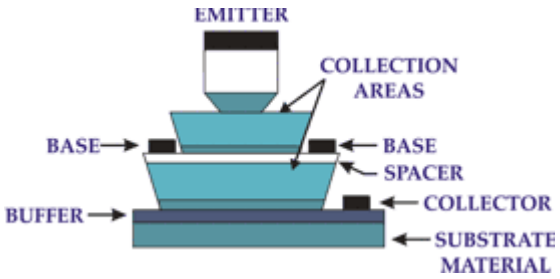
H

Half-duplex Transmission: A bidirectional link that is limited to one-way transfer of data, i.e., data cannot be sent both ways at the same time. Also referred to as simplex transmission.



Hard-clad Silica Fiber: An optical fiber having a silica core and a hard polymeric plastic cladding intimately bounded to the core.

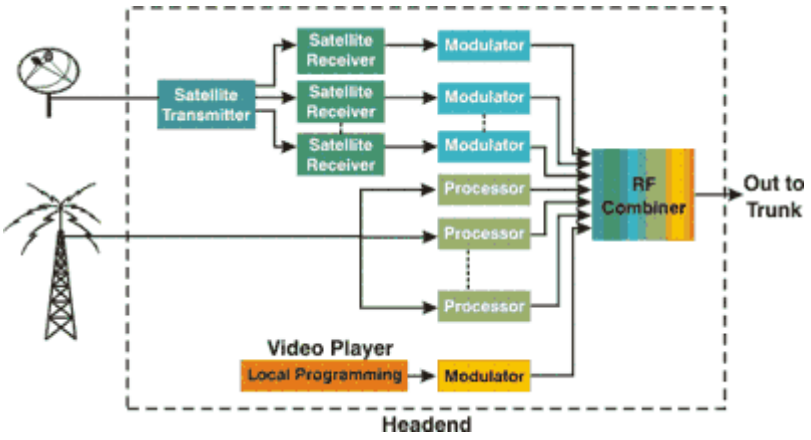
HBT: Abbreviation for heterojunction bipolar transistors. A very high performance transistor structure built using more than one semiconductor material. Used in high performance wireless telecommunications circuits such as those used in digital cell phone handsets and high-bandwidth fiber optic systems.



HDSL: Abbreviation for high data-rate digital subscriber line. A DSL operating at a high data rate compared to the data rates specified for ISDN.

HDTV: Abbreviation for high-definition television. Television that has approximately twice the horizontal and twice the vertical emitted resolution specified by the NTSC standard.

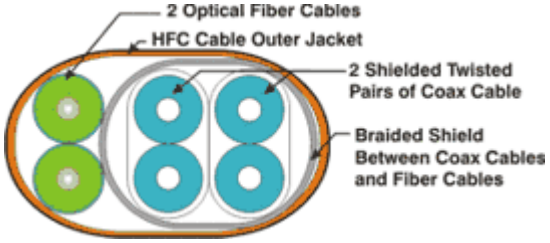
Headend: 1) A central control device required within some LAN and MAN systems to provide such centralized functions as remodulation, retiming, message accountability, contention control, diagnostic control, and access to a gateway. 2) A central control device within CATV systems to provide such centralized functions as remodulation (illustrated). See also local area network (LAN).

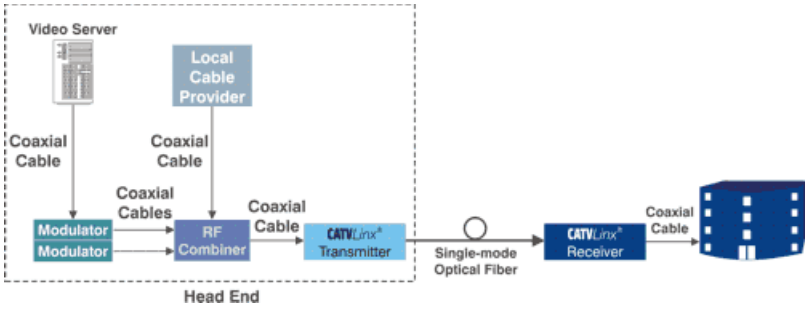


Hero Experiments: Experiments performed in a laboratory environment to test the limits of a given technology.

Hertz (Hz): One cycle per second.

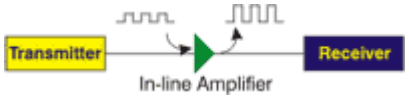
HFC (Hybrid Fiber Coax): A transmission system or cable construction (illustrated) that incorporates both fiber optic transmission components and copper coax transmission components.

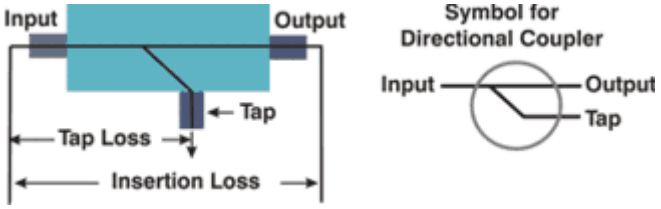


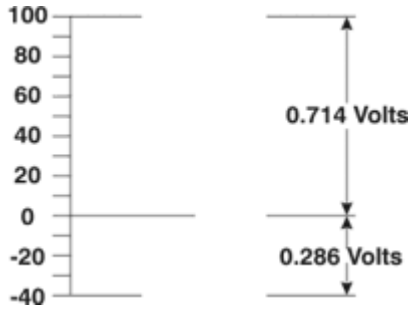
HFC Network: A telecommunication technology in which optical fiber and coaxial cable are used in different sections of the network to carry broadband content. The network allows a CATV company to install fiber from the cable headend to serve nodes located close to business and homes, and then from these fiber nodes, use coaxial cable to individual businesses and homes.	 Click to Enlarge Image
HIPPI: Abbreviation for high performance parallel interface as defined by the ANSI X3T9.3 document, a standard technology for physically connecting devices at short distances and high speeds. Primarily to connect supercomputers and to provide high-speed backbones for local area networks (LANs).	
Hot Swap: In an electronic device subassembly or component, the act or process of removing and replacing the subassembly or component without first powering down the device.	
HP: Abbreviation for homes passed. Homes that could easily and inexpensively be connected to a cable network because the feeder cable is nearby.	
Hydrogen Losses: Increases in fiber connector attenuation that occur when hydrogen diffuses into the glass matrix and absorbs some light.	

I

IC: See integrated circuit.	
ICEA: Abbreviation for Insulated Cable Engineers Association. A technical professional organization that contributes to the standards of insulated cable in these four areas: power cables, communication cables, portable cables, and control and instrumentation. Within this organization there are subcommittees that concentrate on one of the four areas.	http://www.icea.net/
IDP: See integrated detector/preamplifier.	

IEEE: Abbreviation for Institute of Electrical and Electronic Engineers. A technical professional association that contributes to voluntary standards in technical areas ranging from computer engineering, biomedical technology and telecommunications, to electric power, aerospace and consumer electronics, among others.	http://www.ieee.org/
IF: Abbreviation for Intermediate Frequency. A frequency to which a carrier frequency is shifted as an intermediate step in transmission or reception.	
IIN: See interferometric intensity noise.	
Impedance: The total passive opposition offered to the flow of electric current. Determined by the particular combination of resistance, inductive reactance, and capacitive reactance in a given circuit. A function of frequency, except when in a purely resistive network.	
Impedance Matching: The connection of an additional impedance to an existing one in order to achieve a specific effect, such as to balance a circuit or to reduce reflection in a transmission line.	
Index-matching Fluid: A fluid whose index of refraction nearly equals that of the fibers core. Used to reduce Fresnel reflection loss at fiber ends. Also known as index-matching gel.	
Index of Refraction: The ratio of the velocity of light in free space to the velocity of light in a fiber material. Always greater than or equal to one. Also called refractive index.	**n = C/V** Where: c = The speed of light in a vacuum. v = The speed of the same wavelength in the fiber material.
Infrared (IR): The region of the electromagnetic spectrum bounded by the long-wavelength extreme of the visible spectrum (about 0.7 μm) and the shortest microwaves (about 0.1 μm).	
Infrared Emitting Diodes: LEDs that emit infrared energy (830 nm or longer).	
Infrared Fiber: Colloquially, optical fibers with best transmission at wavelengths of 2 mm or longer, made of materials other than silica glass. See also fluoride glasses.	
InGaAs: Abbreviation for indium gallium arsenide. Generally used to make high-performance long-wavelength detectors.	
InGaAsP: Abbreviation for indium gallium arsenide phosphide. Generally used for long-wavelength light emitters.	
Injection Laser Diode (ILD): A laser employing a forward-biased semiconductor junction as the active medium. Stimulated emission of coherent light occurs at a PIN junction where electrons and holes are driven into the junction.	
In-line Amplifier: An EDFA or other type of amplifier placed in a transmission line to strengthen the attenuated signal for	

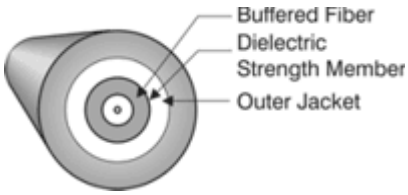
transmission onto the next, distant site. In-line amplifiers are all-optical devices.	
InP: Indium Phosphide. A semiconductor material used to make optical amplifiers and HBTs.	
Insertion Loss: The loss of power that results from inserting a component, such as a connector, coupler (illustrated), or splice, into a previously continuous path.	
Integrated Circuit (IC): An electronic circuit that consists of many individual circuit elements, such as transistors, diodes, resistors, capacitors, inductors, and other passive and active semiconductor devices, formed on a single chip of semiconducting material and mounted on a single piece of substrate material.	
Integrated Detector/Preamplifier (IDP): A detector package containing a PIN photodiode and transimpedance amplifier.	
Integrated Systems Digital Network (ISDN): An integrated digital network in which the same time-division switches and digital transmission paths are used to establish connections for services such as telephone, data, electronic mail and facsimile. How a connection is accomplished is often specified as a switched connection, non-switched connection, exchange connection, ISDN connection, etc.	
Intensity: The square of the electric field strength of an electromagnetic wave. Intensity is proportional to irradiance and may get used in place of the term "irradiance" when only relative values are important.	
Intensity Modulation (IM): In optical communications, a form of modulation in which the optical power output of a source varies in accordance with some characteristic of the modulating signal.	
Interchannel Isolation: The ability to prevent undesired optical energy from appearing in one signal path as a result of coupling from another signal path. Also called crosstalk.	
Interference: Any extraneous energy, from natural or manmade sources, that impedes the reception of desired signals. The interference may be constructive or destructive, resulting in increased or decreased amplitude, respectively.	
Interferometer: An instrument that uses the principle of interference of electromagnetic waves for purposes of measurement. Used to measure a variety of physical variables, such as displacement (distance), temperature, pressure, and strain.	
Interferometric Intensity Noise (IIN): Noise generated in optical fiber caused by the distributed backreflection that all fiber generates mainly due to Rayleigh scattering. OTDRs make use of this scattering power to deduce the fiber loss over distance.	
Interferometric Sensors: Fiber optic sensors that rely on interferometric detection.	
Inter-LATA: 1. Between local access and transport areas (LATAs). 2. Services, revenues, and functions related to telecommunications that begin in one LATA and that terminate in another or that terminate outside of the LATA.	
Intermodulation (Mixing): A fiber nonlinearity mechanism caused by the power dependant refractive index of glass. Causes signals to beat together and generate interfering components at different frequencies. Very similar to four wave mixing.	

International Telecommunications Union (ITU): A civil international organization, headquartered in Geneva, Switzerland, established to promote standardized telecommunications on a worldwide basis. The ITU-R and the ITU-T are committees under the ITU, which is recognized by the United Nations as the specialized agency for telecommunications.	http://www.itu.int/home/index.html
Internet: A worldwide collection of millions of computers that consists mainly of the world wide web and e-mail.	
Intersymbol Interference: 1) In a digital transmission system, distortion of the received signal, manifested in the temporal spreading and consequent overlap of individual pulses to the degree that the receiver cannot reliably distinguish between changes of state, i.e., between individual signal elements. At a certain threshold, intersymbol interference will compromise the integrity of the received data. Intersymbol interference may be measured by eye patterns.	
Intrinsic Losses: Splice losses arising from differences in the fibers being spliced.	
IP: Abbreviation for Internet protocol. A standard protocol, developed by the DOD, for use in interconnected systems of packet-switched computer communications networks.	
IPI: Abbreviation for intelligent peripheral interface as defined by ANSI X3T9.3 document.	
IR: See infrared.	
IRE Unit: An arbitrary unit created by the Institute of Radio Engineers to describe the amplitude characteristic of a video signal, where pure white is defined as 100 IRE with a corresponding voltage of 0.714 Volts and the blanking level is 0 IRE with a corresponding voltage of 0.286 Volts.	
Irradiance: Power per unit area.	
ISA: Abbreviation for Instrumentation, Systems, and Automation Society. An international, non-profit, technical organization. The society fosters advancement of the use of sensors, instruments, computers, and systems for measurement and control in variety of applications	http://www.isa.org/
ISDN: See integrated services digital network.	
ISO: Abbreviation for International	http://www.iso.ch/iso/en/ISOOnline.frontpage

Standards Organization. Established in 1947, ISO is a worldwide federation of national standards committees from 140 countries. The organization promotes the development of standardization throughout the world with a focus on facilitating the international exchange of goods and services, and developing the cooperation of intellectual, scientific, technological, and economical activities.	
ISP: Abbreviation for Internet service provider. A company or organization that provides Internet connections to individuals or companies via dial-up, ISDN, T1, or some other connection.	
Isolation: See near-end crosstalk.	
ITU: See International Telecommunications Union.	

RETURN TO TOP OF PAGE

J

Jacket: The outer, protective covering of the cable. Also called the cable sheath.	
Jitter: Small and rapid variations in the timing of a waveform due to noise, changes in component characteristics, supply voltages, imperfect synchronizing circuits, etc. See also DDJ, DCD, and RJ.	
JPEG: Abbreviation for joint photographers expert group. International standard for compressing still photography.	
Jumper: A short fiber optic cable with connectors on both ends.	

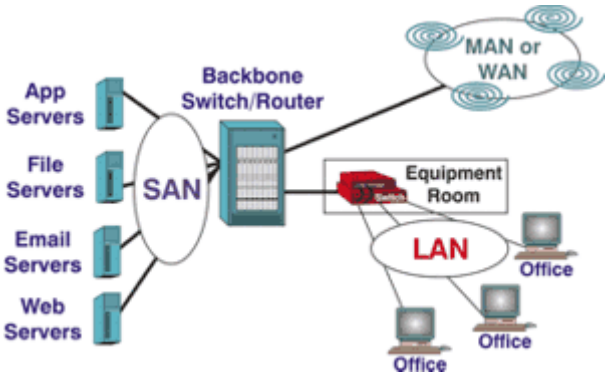
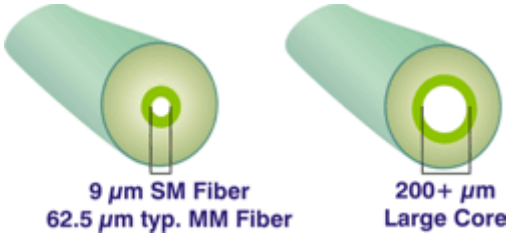
RETURN TO TOP OF PAGE

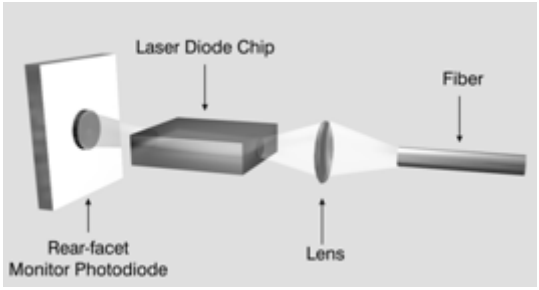
K

k: Abbreviation for kilo. One thousand or 10^3.

K: Abbreviation for Kelvin. Measure of temperature where pure water freezes at 273° and boils at 373°.
kBaud: One thousand symbols of data per second. Equivalent to 1 kb/s for binary signaling.
Kevlar®: A very strong, very light, synthetic compound developed by DuPont which is used to strengthen optical cables.
Keying: Generating signals by the interruption or modulation of a steady signal or carrier.
kg: Abbreviation for kilogram. Approximately 2.2 pounds.
kHz: One thousand cycles per second.
km: Abbreviation for kilometer. 1 km = 3,280 feet or 0.62 miles.

L

Lambertian Emitter: An emitter that radiates according to Lambert's cosine law, which states that the radiance of certain idealized surfaces depends on the viewing angle of the surface. The radiant intensity of such a surface is maximum normal to the surface and decreases in proportion to the cosine of the angle from the normal. Given by:	$N = N_0 \cos A$ Where: N = radiant intensity N_0 = radiance normal to an emitting surface. A = angle between the viewing direction and the normal to the surface.
LAN (Local Area Network): A communication link between two or more points within a small geographic area, such as between buildings. Smaller than a metropolitan area network (MAN) or a wide area network(WAN).	
Large Core Fiber: Usually, a fiber with a core of 200 µm or more.	
Large Effective Area Fiber (LEAF): An optical fiber, developed by Corning, designed to have a large area in the core, which carries the light.	
Laser: Acronym for light amplification by stimulated emission of radiation. A light source that produces, through stimulated emission, coherent, near monochromatic light.	

Laser Diode (LD): A semiconductor that emits coherent light when forward biased.	
Lateral Displacement Loss: The loss of power that results from lateral displacement of optimum alignment between two fibers or between a fiber and an active device.	

Launch Fiber: An optical fiber used to couple and condition light from an optical source into an optical fiber. Often the launch fiber is used to create an equilibrium mode distribution in multimode fiber. Also called launching fiber.

L-Band: The wavelength range between 1570 nm and 1610 nm used in some CWDM and DWDM applications.

LD: See laser diode.

LEAF: See large effective area fiber.

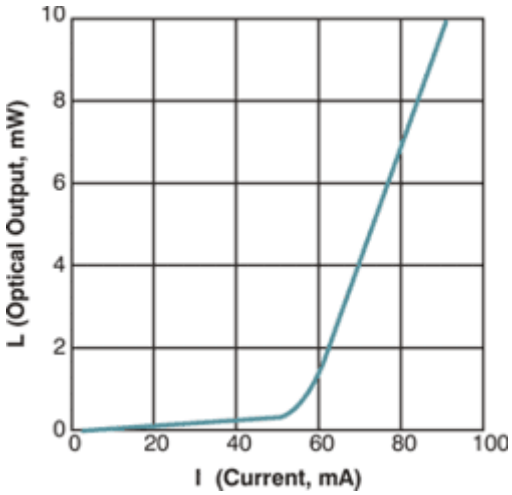
Least Significant Bit: In a binary code, the bit or bit position assigned to the smallest quantity or increment that can be represented by the code.

LED: See light-emitting diode.

LEC (Local Exchange Carrier): A local telephone company, i.e., a communications common carrier that provides ordinary local voice-grade telecommunications service under regulation within a specified service area.

LEX: Abbreviation for local exchange. Synonym for central office.

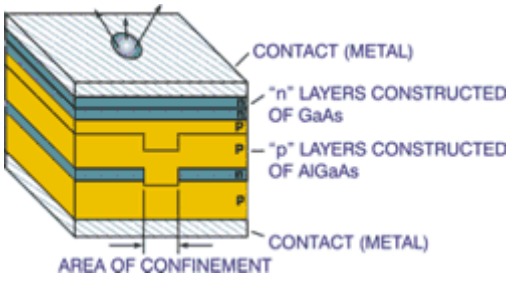
LH: Abbreviation for long-haul. A classification of video performance under RS-250C. Lower performance than medium-haul or short-haul.

L-I Curve: The plot of optical output (L) as a function of current (I) which characterizes an electrical-to-optical converter. A typical L-I curve is shown at right.	

Light: In a strict sense, the region of the electromagnetic spectrum that can be perceived by human vision,

designated the visible spectrum, and nominally covering the wavelength range of 0.4 µm to 0.7 µm. In the laser and optical communication fields, custom and practice have extended usage of the term to include the much broader portion of the electromagnetic spectrum that can be handled by the basic optical techniques used for the visible spectrum. This region has not been clearly defined, but, as employed by most workers in the field, may be considered to extend from the near-ultraviolet region of approximately 0.3 µm, through the visible region, and into the mid-infrared region to 30 µm.

Light-emitting Diode (LED): A semiconductor that emits incoherent light when forward biased. Two types of LED's include edge-emitting LED's and surface-emitting LED's (illustrated).



Light Piping: Use of optical fibers to illuminate.

Lightguide: Synonym for optical fiber.

Lightwave: The path of a point on a wavefront. The direction of the lightwave is generally normal (perpendicular) to the wavefront.

Linear Device: A device for which the output is, within a given dynamic range, linearly proportional to the input.

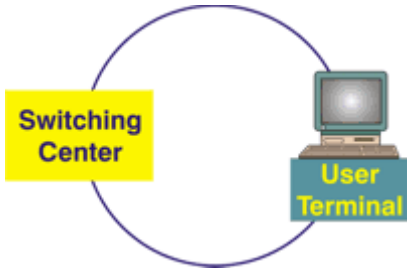
Linearity: The basic measurement of how well analog-to-digital and digital-to-analog conversions are performed. To test for linearity, a mathematically perfect diagonal line is converted and then compared to a copy of itself. The difference between the two lines is calculated to show linearity of the system and is given as a percentage or range of least significant bits.

LNB: Abbreviation for Low Noise Blockdown Converter. A device within a satellite dish which converts X-Band intermediate frequencies (IF) to lower L-Band intermediate frequencies.

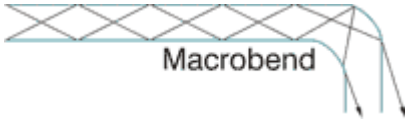
Local Loop: Synonym for loop.

Long-haul Telecommunications: 1. In public switched networks, regarding circuits that span long distances, such as the circuits in inter-LANA, interstate, and international communications. 2. In military use, communications among users on a national or worldwide basis. Long-haul communications are characterized by a higher level of users, more rigorous performance requirements, longer distances between users, including world wide distances, higher traffic volumes and densities, larger switches and trunk cross sections, and fixed and recoverable assets. Usually pertains to the U.S. Defense Communications System.

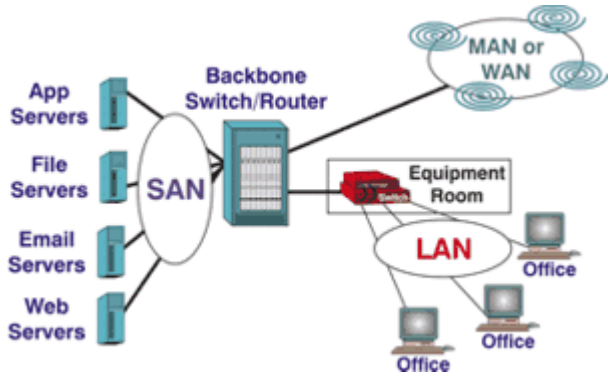
Longitudinal Mode: An optical waveguide mode with boundary condition determined along the length of the optical cavity.

Loop: 1) A communication channel from a switching center or an individual message distribution point to the user terminal (illustrated). 2) In telephone systems, a pair of wires from a central office to a subscriber's telephone. 3) A type of antenna used extensively in direction-finding equipment and in UHF reception.	
Loose-tube: A type of fiber optic cable construction where the fiber is contained within a loose tube in the cable jacket.	
Loss: The amount of a signal's power, expressed in dB, that is lost in connectors, splices, or fiber defects.	
Loss Budget: An accounting of overall attenuation in a system. See optical link loss budget.	
Lossless Compression: 1) Reduction of the storage size of digital data by employing one or more appropriate algorithms in such a way that the data can be recover without loosing integrity. 2) Reduction of the amount of data that needs to be transmitted per unit time though an analogous real-time process that does not compromise the ability to completely restore the data.	
Lossy Compression: Reduction of the bit-rate for an image signal by using algorithms that achieve a higher compression than lossless compression. Lossy compression presents loss of information and artifacts that can be ignore when comparing to original image. Lossy compression takes advantage of the subtended viewing angle for the intended display, the perceptual characteristics of the human eye, the statistics of image populations, and the objective of the display. 2) Removal of redundant bits from an image in video technology producing a minor loss of image quality.	

M

m: Abbreviation for meter. 39.37".	
M: Abbreviation for mega. One million or 10^6.	
mA: Abbreviation for milliamp. One thousandth of an Amp or 10^{-3} Amps.	
MAC: Abbreviation for multiplexed analog components. A video standard developed by the European community. An enhanced version, HD-MAC delivers 1250 lines at 50 frames per second, HDTV quality.	
Macrobending: In a fiber, all macroscopic deviations of the fiber's axis from a straight line, that will cause light to leak out of the fiber, causing signal attenuation.	

MAN (Metropolitan Area Network): A network covering an area larger than a local area network. A series of local area networks, usually two or more, that cover a metropolitan area.

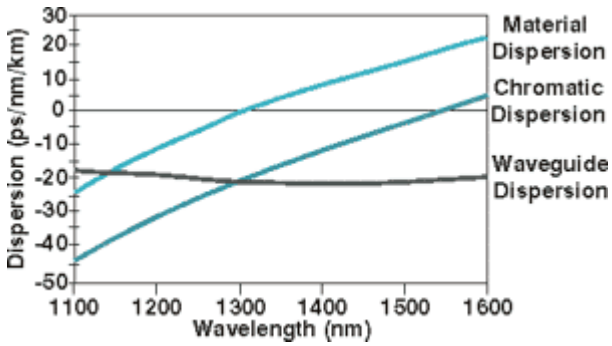


MAP: Abbreviation for manufacturing automation protocol. Computer programs that run manufacturing automation systems.

Margin: Allowance for attenuation in addition to that explicitly accounted for in system design.

Mass Splicing: splicing of many fibers in a cable.

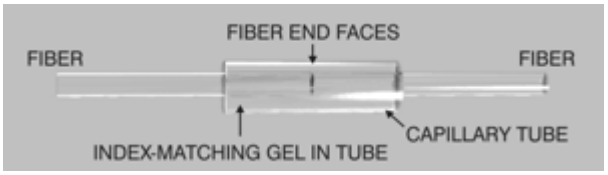
Material Dispersion: Dispersion resulting from the different velocities of each wavelength in a material.



MBaud: One million symbols of information per second. Equivalent to 1 mb/s for binary signals.

Mean Launched Power: The average power for a continuous valid symbol sequence coupled into a fiber.

Mechanical Splice: An optical fiber splice accomplished by fixtures or materials, rather than by thermal fusion. The capillary splice, illustrated, is one example of a mechanical splice.



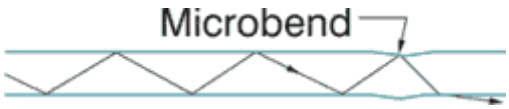
Medium Access Control (MAC): 1) A service feature or technique used to permit or deny use of the components of a communication system. 2) A technique used to define or restrict the rights of individuals or application programs to obtain data from, or place data onto, a storage device, or the definition derived from that technique.

Mezzanine Compression: Contribution level quality encoded high-definition television signals. Typically split into two levels: high level at 140 Mb/s and low level at 39 Mb/s. For high definition within the studio, 270 Mb/s is being considered.

MFD: See mode field diameter.

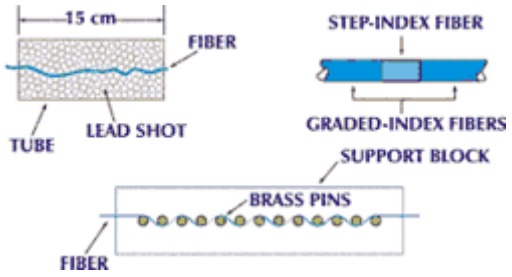
MH: Abbreviation for medium-haul. A classification of video performance under RS-250C. Higher performance than long-haul and lower performance than short-haul.

MHz: Abbreviation for megahertz. One million Hertz (cycles per second).

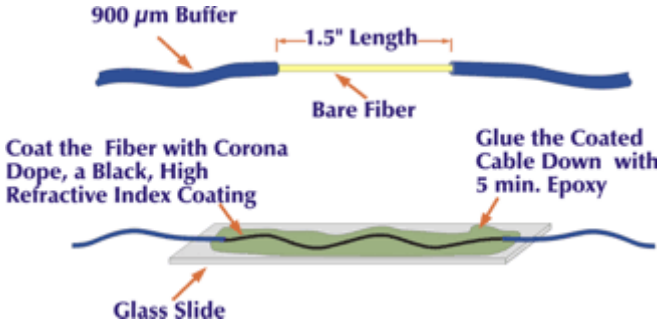
Microbending: Mechanical stress on a fiber that introduces local discontinuities, which results in light leaking from the core to the cladding by a process called mode coupling.	
Microwave Dish: A parabolic shaped antenna used for high-frequency RF signals.	
Micrometer: One millionth of a meter or 10^{-6} meters. Abbreviated µm.	
Microsecond: One millionth of a second or 10^{-6} seconds. Abbreviated µs.	
Microwatt: One millionth of a Watt or 10^{-6} Watts. Abbreviated µW.	
Microwave Transmission: Communication systems using very high-frequency RF to carry the signal information.	
MIL-SPEC: Abbreviation for military specification. Performance specifications issued by the Department of Defense that must be met in order to pass a MIL-STD.	
MIL-STD: Abbreviation for military standard. Standards issued by the Department of Defense.	
Minimum Bend Radius: The smallest radius an optical fiber or fiber cable can bend before increased attenuation or breakage occurs.	
Misalignment Loss: The loss of power resulting from angular misalignment, lateral displacement, and fiber end separation.	
MLM: See multilongitudinal mode laser.	
mm: Abbreviation for millimeter. One thousandth of a meter or 10^{-3} meters.	
MM: See multimode.	
Modal Dispersion: See multimode dispersion.	
Modal Noise: Noise that occurs whenever the optical power propagates through mode-selective devices. It is usually only a factor with laser light sources.	
Mode: A single electromagnetic wave traveling in a fiber.	
Mode Coupling: The transfer of energy between modes. In a fiber, mode coupling occurs until equilibrium mode distribution (EMD) is reached.	
Mode Evolution: The dynamic process a multilongitudinal mode laser undergoes whereby the changing distribution of power among the modes creates a continuously changing envelope of the laser's spectrum.	
Mode Field Diameter (MFD): A measure of distribution of optical power intensity across the end face of a single-mode fiber.	
Mode Filter: A device that removes higher-order modes to simulate equilibrium mode distribution. A mode filter is most easily constructed	
Modem: Acronym for modulator/demodulator. 1) In general, a device that both modulates and	

demodulates signals. 2) In computer communications, a device used for converting digital signals into, and recovering them from, quasi-analog signals suitable for transmission over analog communications channels such as telephone lines.

Mode Scrambler: A device that mixes modes to uniform power distribution.



Mode Stripper: A device that removes cladding modes.



Modulation: The process by which the characteristic of one wave (the carrier) modifies another wave (the signal). Examples include amplitude modulation (AM), frequency modulation (FM), and pulse-coded modulation (PCM).

Modulation Index: In an intensity-based system, the modulation index is a measure of how much the modulation signal affects the light output. It is defined as follows:

m = (highlevel - lowlevel) / (highlevel + lowlevel)

Modulator: A device that imposes a signal on a carrier.

Monitor:1) a CRT that receives its signal directly from a VCR, camera, or separate TV tuner for high-quality picture reproduction. 2) A device used for the real-time temporary display of computer output data. 3) Software or hardware that is used to scrutinize and to display, record, supervise, control, or verify the operations of a system.

Monochrome: Black and white TV signal.

Moore's Law: A prediction for the rate of development of modern electronics. It states that the density of information storable in silicon roughly doubles every year. Or, the performance of silicon will double every eighteen months, with proportional decreases in cost. For more than two decades this prediction has held true. Named after Gordon E. Moore, physicist, cofounder and chairman emeritus of Intel Corporation.

Most Significant Bit: In a binary code, the bit or bit position that is assigned to, or represents, the largest

quantity or increment that the code can represent.

MPEG: Abbreviation for motion picture experts group. An international standard for compressing video that provides for high compression ratios. The standard has two recommendations: MPEG-1 compresses lower-resolution images for videoconferencing and lower-quality desktop video applications and transmits at around 1.5 Mb/s. MPEG-2 was devised primarily for delivering compressed television for home entertainment and is used at CCIR resolution when bit rates exceed 5.0 Mb/s as in hard disk-based applications.

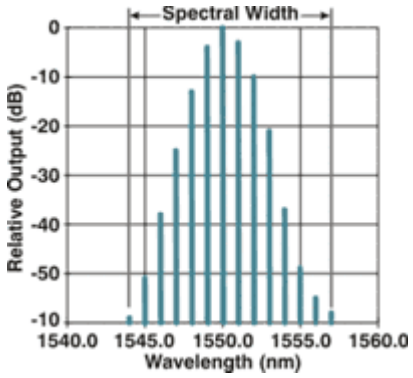
MQW: See multi-quantum well laser.

ms: Abbreviation for milliseconds. One thousandth of a second or 10^{-3} seconds.

MSO: Abbreviation for multiple service operator. A telecommunications company that offers more than one service, e.g. telephone service, Internet access, satellite service, etc.

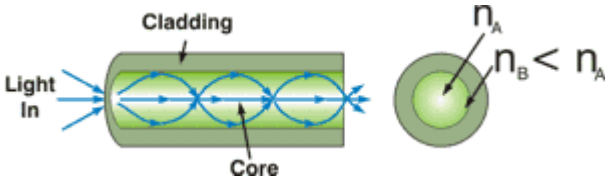
MTBF: Abbreviation for mean time between failure. Time after which 50% of the units of interest will have failed. Also called MTTF (mean time to failure).

Multilongitudinal Mode (MLM) Laser : An injection laser diode which has a number of longitudinal modes.



Multimode Dispersion: Dispersion resulting from the different transit lengths of different propagating modes in a multimode optical fiber. Also called modal dispersion.

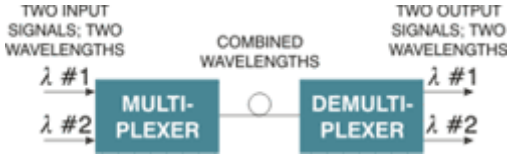
Multimode (MM) Fiber: An optical fiber that has a core large enough to propagate more than one mode of light The typical diameter is 62.5 micrometers.



Multimode Laser Diode (MMLD): Synonym for multilongitudinal mode laser.

Multiple Reflection Noise (MRN): The fiber optic receiver noise resulting from the interference of delayed signals from two or more reflection points in a fiber optic span. Also known as multipath interference.

Multiplexer: A device that combines two or more signals into one output.

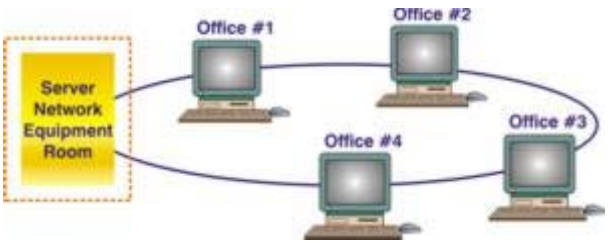
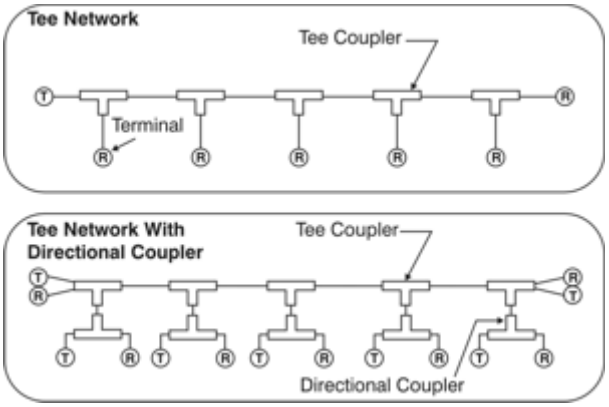


Multiplexing: The process by which two or more signals are transmitted over a single communications channel. Examples include time-division multiplexing (TDM) and wavelength-division multiplexing (WDM).

Multi-quantum Well (MQW) Laser: A laser structure with a very thin (about 10 nm thick) layer of bulk semiconductor material sandwiched between the two barrier regions of a higher bandgap material. This restricts the motion of the electrons and holes and forces energies for motion to be quantized and only occur at discrete energies.
MUSE: Abbreviation for multiple sub-nyquist encoder. A high-definition standard developed in Europe that delivers 1125 lines at 60 frames per second.
mV: Abbreviation for millivolt. One thousandth of a Volt or 10^{-3} Volts.
mW: Abbreviation for milliwatt. One thousandth of a Watt or 10^{-3} Watts.
MZ: Abbreviation for Mach-Zehnder, a structure used in fiber Bragg gratings and interferometers. Named for the two men who developed the underlying principles of the structure.

N

n: Abbreviation for nano. One billionth or 10^{-9}.	
N: Abbreviation for Newtons. Measure of force generally used to specify fiber optic cable tensile strength.	
nA: Abbreviation for nanoamp. One billionth of an Amp or 10^{-9} Amps.	
NA: See numerical aperture.	
NAB: Abbreviation for National Association of Broadcasters. A trade association that promotes and protects the interests of radio and television broadcasters before Congress, federal agencies and the Courts.	http://www.nab.org/
NA Mismatch Loss: The loss of power at a joint that occurs when the transmitting half has a numerical aperture greater than the NA of the receiving half. The loss occurs when coupling light from a source to fiber, from fiber to fiber, or from fiber to detector.	
National Electric Code® (NEC): A standard governing the use of electrical wire, cable and fixtures installed in buildings; developed by the American National Standards Institute (ANSI), sponsored by the National Fire Protection Association (NFPA), identified by the description ANSI/NFPA 70-1990.	http://www.ansi.org/
NCTA: Abbreviation for National Cable Television Association. The major trade association for the cable television industry.	http://www.ncta.com/

NDSF: See non dispersion-shifted fiber.	
Near-end Crosstalk (NEXT, RN): The optical power reflected from one or more input ports, back to another input port. Also known as isolation directivity.	
Near Infrared: The part of the infrared near the visible spectrum, typically 700 nm to 1500 nm or 2000 nm; it is not rigidly defined.	
NEMA: Abbreviation for National Electrical Manufacturers Association. Organization responsible for the standardization of electrical equipment, enabling consumers to select from a range of safe, effective, and compatible electrical products.	http://www.nema.org/
NEP: See noise equivalent power.	
Network: 1) An interconnection of three or more communicating entities and (usually) one or more nodes (illustrated). 2) A combination of passive or active electronic components that serves a given purpose.	
Network Topology: The specific physical, i.e., real, logical, or virtual, arrangement of the elements of a network. Common network topologies include a bus (or linear) topology, a ring topology, and a hybrid topology, which can be a combination of any two or more network topologies. Illustrated to the right is a bus topology utilizing tee couplers to connect a series of stations that listen to a single backbone of cable.	
NF: See noise figure.	
NFPA: Abbreviation for National Fire Protection Association. Publisher of the National Electrical Code®, and 300 other codes and standards through a full, open-consensus process.	http://www.nfpa.org/Home/index.asp
nm: Abbreviation for nanometer. One billionth of a meter or 10^{-9} meters.	
Node: 1) A terminal of any branch in network topology or an interconnection common to two or more branches in a network. 2) One of the switches forming the network backbone in a switch network. 3) A point in a standing or stationary wave at which the amplitude is a minimum.	

Noise: 1) An undesired disturbance within the frequency band of interest; the summation of unwanted or disturbing energy introduced into a communications system from man-made and natural sources. 2) A disturbance that affects a signal and that may distort the information carried by the signal. 3) Random variations of one or more characteristics of any entity such as voltage, current, or data.

Noise Equivalent Power (NEP): The noise of optical receivers, or of an entire transmission system, is often expressed in terms of noise equivalent optical power.

Noise Figure (NF): The ratio of the output signal-to-noise ratio to the input signal-to-noise ratio for a given element in a transmission system. Used for optical and electrical components.

Non Dispersion-shifted Fiber (NDSF): The most popular type of single-mode fiber deployed. It is designed to have a zero-dispersion wavelength near 1310 nm.

Nonlinearity: The deviation from linearity in an electronic circuit, an electro-optic device or a fiber that generates undesired components in a signal. Examples of fiber nonlinearities include SBS, SRS, FWM, SPM, XPM, and Intermodulation.

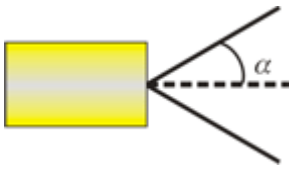
Non Zero-dispersion-shifted Fiber (NZ-DSF): A dispersion-shifted single-mode fiber that has the zero-dispersion wavelength near the 1550 nm window, but outside the window actually used to transmit signals. This strategy maximizes bandwidth while minimizing fiber nonlinearities.

NRZ: Abbreviation for nonreturn to zero. A common means of encoding data that has two states termed "zero" and "one" and no neutral or rest position.

ns: Abbreviation for nanosecond. One billionth of a second or 10^{-9} seconds.

NTSC: 1) Abbreviation for National Television Systems Committee. The organization which formulated the NTSC system. 2) Standard used in the U.S. that delivers 525 lines at 60 frames per second.

Numerical Aperture (NA): The light-gathering ability of a fiber; the maximum angle to the fiber axis at which light will be accepted and propagated through the fiber. NA = sin α, where α is the acceptance angle. NA also describes the angular spread of light from a central axis, as in exiting a fiber, emitting from a source, or entering a detector.



$$NA = \sin\alpha = \sqrt{n_1^2 - n_2^2}$$

nW: Abbreviation for nanowatt. One billionth of a Watt or 10^{-9} Watts.

Nyquist Frequency: The lowest sampling frequency that can be used for analog-to-digital conversion of a signal without resulting in significant aliasing. Normally, this frequency is twice the rate of the highest frequency contained in the signal being sampled. Also called Nyquist rate.

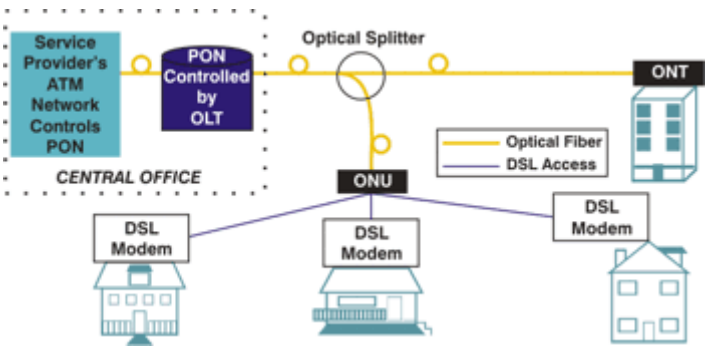
NZ-DSF: See non zero-dispersion-shifted fiber.

O

OADM: See optical add/drop multiplexer.

OAM: Abbreviation for operation, administration, and maintenance. Refers to telecommunications networks.

OAN: Abbreviation for optical access network. A network technology, based on passive optical networks (PONs), that includes an optical switch at the central office, an intelligent optical terminal at the customer's premises, and a passive optical network between the two, allowing services providers to deliver fiber-to-the-home while eliminating the expensive electronics located outside the central office.



OCH: See optical channel.

OC-x: Abbreviation for optical carrier. A carrier rate specified in the SONET standard.

ODN: Abbreviation for optical distribution network. Term for optical networks being developed for interactive video, audio, and data distribution.

O/E: Abbreviation for optical-to-electrical converter. A device used to convert optical signals to electrical signals. Also known as OEC.

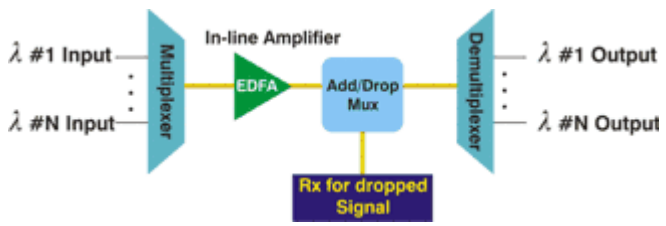
OEIC: Abbreviation for opto-electronic integrated circuit. An integrated circuit that includes both optical and electrical elements.

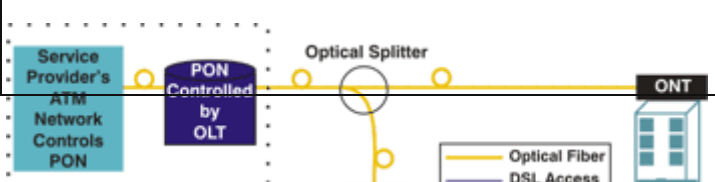
OEM: Abbreviation for original equipment manufacturer. The manufacturer of any device that is designed and built to be distributed under the label of another company.

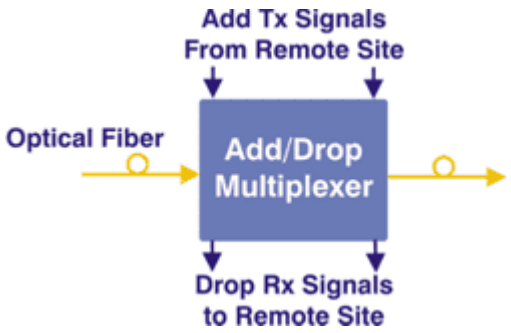
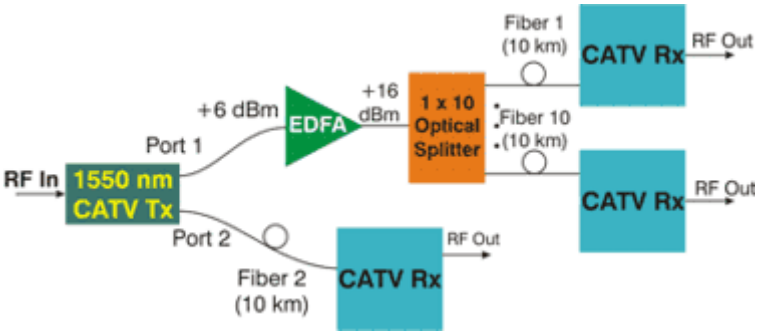
OLT: Abbreviation for optical line termination. Optical network elements that terminate a line signal.

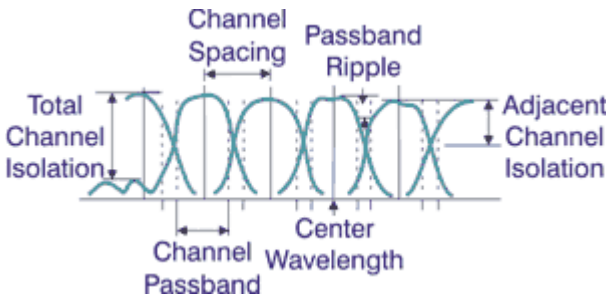
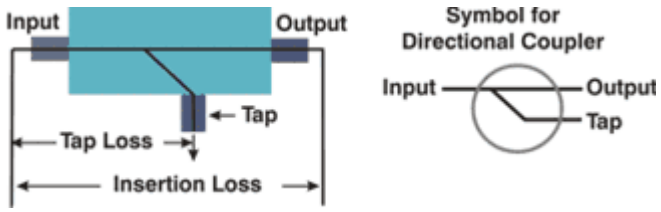
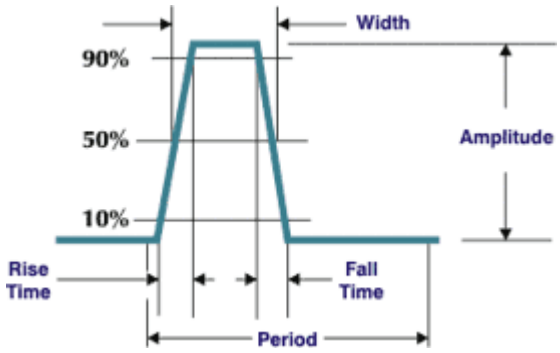
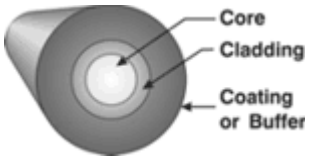
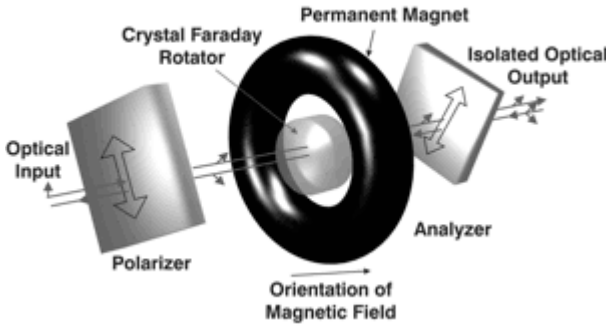
OLTS: Abbreviation for optical loss test set. A source and optical power meter combined used to measure optical loss.

OMS: Abbreviation for optical multiplex section. A section of a DWDM system that incorporates an optical add/drop multiplexer.

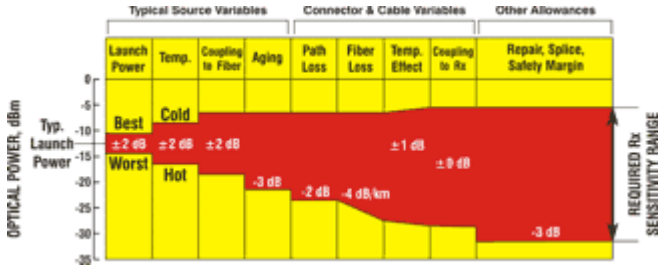




in an optical distribution network to connect two parts of that network.	
ONT: Abbreviation for optical network termination. Optical network element that terminates a line signal in installations where the fiber extends into the customer premises.	
ONU: Abbreviation for optical network unit. A network element that is part of a fiber-in-the-loop system.	
OOI: Abbreviation for open optical interface. A point at which an optical signal is passed from one equipment medium to another without conversion to an electrical signal.	
Open Systems Interconnection (OSI): Pertaining to the logical structure for communications networks standardized by the International Organization for Standardization (ISO).	
Optical Add/Drop Multiplexer (OADM): A device which adds or drops individual wavelengths from a DWDM system.	
Optical Amplifier: A device that amplifies an input optical signal without converting it into electrical form. The best developed are optical fibers doped with the rare earth element, erbium. See also EDFA.	
Optical Bandpass: The range of optical wavelengths which can be transmitted through a component.	
Optical Channel: An optical wavelength band for WDM optical communications.	

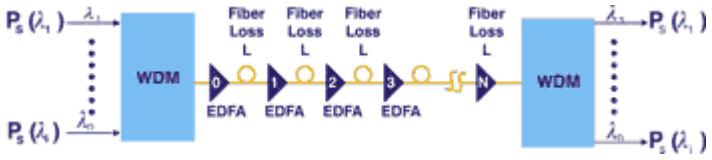
Optical Channel Spacing: The wavelength separation between adjacent WDM channels.	
Optical Channel Width: The optical wavelength range of a channel.	
Optical Continuous Wave Reflectometer (OCWR): An instrument used to characterize a fiber optic link wherein an unmodulated signal is transmitted through the link, and the resulting light scattered and reflected back to the input is measured. Useful in estimating component reflectance and link optical return loss.	
Optical Directional Coupler (ODC): A component used to combine and separate optical power.	
Optical Fall Time: The time interval for the falling edge of an optical pulse to transition from 90% to 10% of the pulse amplitude. Alternatively, values of 80% and 20% may be used.	
Optical Fiber: A glass or plastic fiber that has the ability to guide light along its axis. The three parts of an optical fiber are the core, the cladding, and the coating or buffer.	
Optical Isolator: A component used to block out reflected and unwanted light. Also called an isolator.	

Optical Link Loss Budget: The range of optical loss over which a fiber optic link will operate and meet all specifications. The loss is relative to the transmitter output power and affects the required receiver input power.



Click image to enlarge.

Optical Path Power Penalty: The additional loss budget required to account for degradations due to reflections, and the combined effects of dispersion resulting from intersymbol interference, mode-partition noise, and laser chirp.

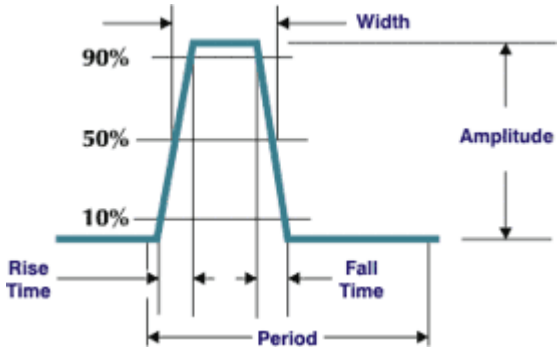


Optical Power Meter: An instrument that measures the amount of optical power present at the end of a fiber or cable.

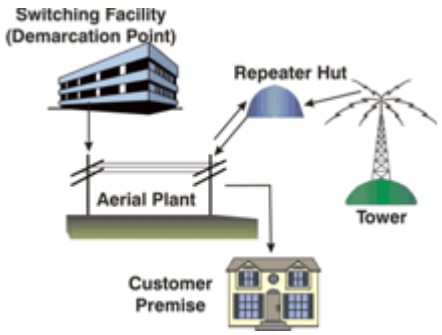
Optical Pump Laser: A shorter wavelength laser used to pump a length of fiber with energy to provide amplification at one or more longer wavelengths. See also EDFA.

Optical Return Loss (ORL): The ratio (expressed in dB) of optical power reflected by a component or an assembly to the optical power incident on a component port when that component or assembly is introduced into a link or system.

Optical Rise Time: The time interval for the rising edge of an optical pulse to transition from 10% to 90% of the pulse amplitude. Alternatively, values of 20% and 80% may be used.

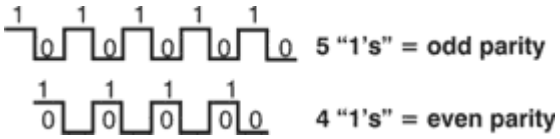


Optical Signal-to-Noise-Ratio (OSNR): The optical equivalent of SNR.

Optical Spectrum Analyzer (OSA): A device that allows the details of a region of an optical spectrum to be resolved. Commonly used to diagnose DWDM systems.	
OTDR (Optical Time Domain Reflectometer): An instrument that locates faults in optical fibers or infers attenuation by backscattered light measurements.	
Optical Waveguide: Another name for optical fiber.	
OSA: See optical spectrum analyzer.	
OSNR: See optical signal-to-noise ratio.	
Outside Plant (OSP): In telephony, all cables, conduits, ducts, poles, towers, repeaters, repeater huts, and other equipment located between a demarcation point in a switching facility and a demarcation point in another switching facility or customer premises.	
OXC: Abbreviation for optical cross-connect. See cross-connect.	
p: Abbreviation for pico. One trillionth or 10^{-12}.	
pA: Abbreviation for picoamp. One trillionth of an Amp or 10^{-12} Amps.	
PABX: Abbreviation for private automatic branch exchange. See PBX.	
Packet: In data communications, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. The packet contains data, control signals, and possibly error control information, arranged in a specific format.	
Packet Switching: The process of routing and transferring data by means of addressed packets so that a channel is occupied during the transmission of the packet only, and upon completion of the transmission the channel is made available for the transfer of other traffic.	
PAL: Abbreviation for phase alternation by line. A composite color standard used in many parts of the world for TV broadcast. The phase alternation makes the signal relatively immune to certain distortions	

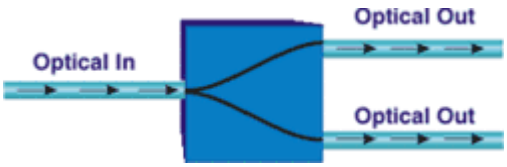
(compared to NTSC). Delivers 625 lines at 50 frames per second. PAL-plus is an enhanced-definition version.

Parity: A term used in binary communication systems to indicate whether a number of 1's in a transmission is even or odd. If the number of 1's is even, the parity is said to be even; if the number of 1's is odd, the parity is said to be odd.



Passband: The region of usable frequency in electronics or wavelength in optics.

Passive Branching Device: A device which divides an optical input into two or more optical outputs.



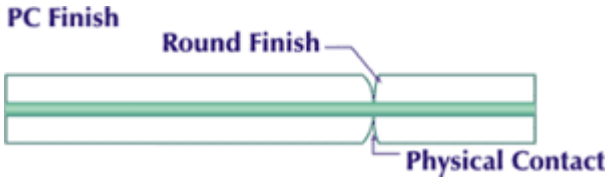
Passive Device: Any device that does not require a source of energy for its operation. Examples include electrical resistors or capacitors, diodes, optical fiber (photo), cable, wires, glass, lenses, and filters.

Pathological Test Code: A special test pattern used with DTV and HDTV signals to create the longest strings of zeros and ones over the serial link. This requires the serial transport link to handle much lower frequency components than is typical in a normal data link.

Pay-Per-View (PPV): An event that has an associated viewing cost, and which may be purchased separately from any package or subscription. The ordered events could include movies, special events, such as sporting, or adult programming. The event could be purchased by either impulse PPV by using a television remote (this application requires a continuous land line phone based connection), or over the phone PPV (this application may have additional costs for processing).

PBX: Abbreviation for private branch exchange. A subscriber-owned telecommunications exchange that usually includes access to public switched networks.

PC: Abbreviation for physical contact. Refers to an optical connector that allows the fiber ends to physically touch. Used to minimize backreflection and insertion loss.



PCB: Abbreviation for printed circuit board. Also referred to as PWB (printed writing board).

PCM: See pulse-code modulation.

PCS Fiber: See plastic clad silica.

PD: See photodiode.

Peak Power Output: The output power averaged over that cycle of an electromagnetic wave having the

maximum peak value that can occur under any combination of signals transmitted.

Peak Wavelength: In optical emitters, the spectral line having the greatest output power. Also called peak emission wavelength.

PFM: Abbreviation for pulse-frequency modulation. Also referred to as square wave FM.

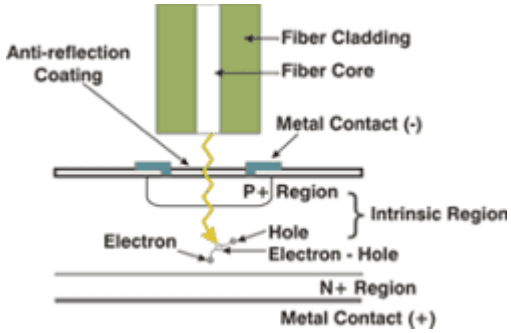
Phase Constant: The imaginary part of the axial propagation constant for a particular mode, usually expressed in radians per unit length. See also attenuation.

Phase Noise: Rapid, short-term, random fluctuations in the phase of a wave caused by time-domain instabilities in an oscillator.

Phase-shift Keying (PSK): 1) In digital transmission, angle modulation in which the phase of the carrier discretely varies in relation, either to a reference phase or to the phase of the immediately preceding signal element, in accordance with data being transmitted. 2) In a communications system, the representation of characters, such as bits or quaternary digits, by a shift in the phase of an electromagnetic carrier wave with respect to a reference, by an amount corresponding to the symbol being encoded. Also called biphase modulation, phase-shift signaling.

Photoconductive: Losing an electrical charge on exposure to light.

Photodetector: An optoelectronic transducer such as a PIN photodiode (illustrated) or avalanche photodiode. In the case of the PIN diode, it is so named because it is constructed from materials layered by their positive, intrinsic, and negative electron regions.



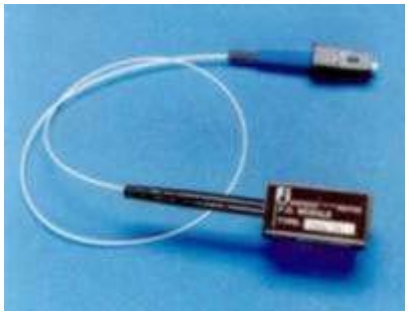
Photodiode (PD): A semiconductor device that converts light to electrical current.

Photon: A quantum of electromagnetic energy. A particle of light.

Photonic: A term coined for devices that work using photons, analogous to the electronic for devices working with electrons.

Photovoltaic: Providing an electric current under the influence of light or similar radiation.

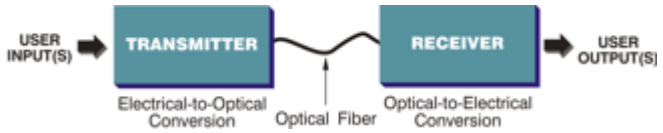
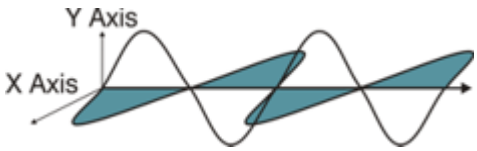
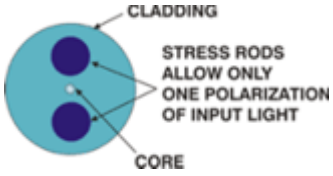
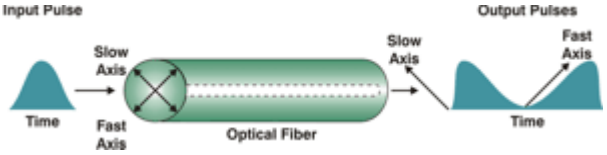
Pigtail: A short optical fiber permanently attached to a source, detector, or other fiber optic device at one end and an optical connector at the other.



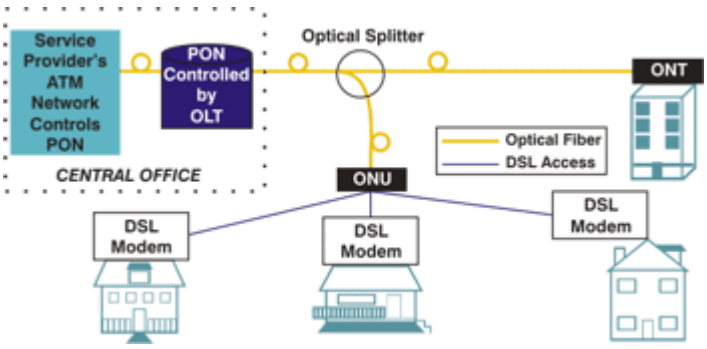
PIN Photodiode: See photodiode.

Planar Waveguide: A waveguide fabricated in a flat material such as thin film.

Plastic Clad Silica (PCS): Also called hard clad silica (HCS). A step-index fiber with a glass core and

plastic or polymer cladding instead of glass.	
Plastic Fiber: An optical fiber having a plastic core and plastic cladding.	
PLC: Abbreviation for planar lightwave circuit. A device which incorporates a planar waveguide.	
Plenum: The air handling space between walls, under structural floors, and above drop ceilings, which can be used to route intrabuilding cabling.	
Plenum Cable: A cable whose flammability and smoke characteristics allow it to be routed in a plenum area without being enclosed in a conduit.	
PMD: See polarization mode dispersion.	
Point-to-Multipoint Transmission:	
Point-to-Point Transmission: Transmission between two designated stations.	
Polarization: The direction of the electric field in the lightwave. If the electric field of the lightwave is in the Y Axis, the light is said to be vertically polarized. If the electric field of the lightwave is in the X axis, the light is said to be horizontally polarized.	
Polarization Maintaining Fiber: Fiber designed to propagate only one polarization of light that enters it.	
Polarization Mode Dispersion (PMD): Polarization mode dispersion is an inherent property of all optical media. It is caused by the difference in the propagation velocities of light in the orthogonal principal polarization states of the transmission medium. The net effect is that if an optical pulse contains both polarization components, then the different polarization components will travel at different speeds and arrive at different times, smearing the received optical signal.	 Click on the image to enlarge.

PON: Abbreviation for passive optical network. A broadband fiber optic access network that uses a means of sharing fiber to the home without running individual fiber optic lines from an exchange point, telco CO, or a CATV headend and the subscriber's home.



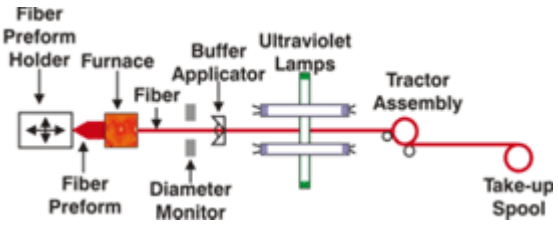
Port: Hardware entity at each end of the link.

POTS: Abbreviation for plain old telephone system. A call that requires nothing more than basic call handling without additional features.

p-p: Abbreviation for peak-to-peak. The algebraic difference between extreme values of a varying quantity.

PPM: Abbreviation for pulse-position modulation. A method of encoding data.

Preform: The glass rod from which optical fiber is drawn.



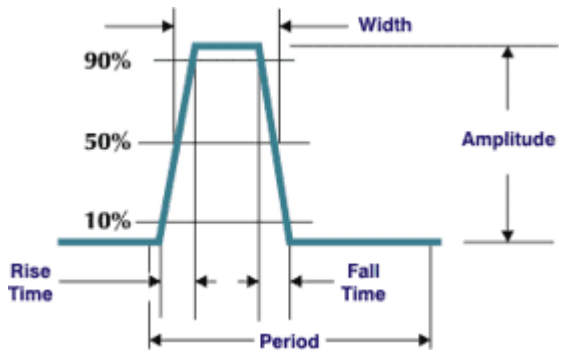
Profile Dispersion: Dispersion attributed to the variation of refractive index contrast with wavelength.

ps: Abbreviation for picosecond. One trillionth of a second or 10^{-12} seconds.

PSTN: Abbreviation for public switched telephone network. A domestic telecommunications network usually accessed by telephones, key telephone systems, private branch exchange trunks, and data arrangements.

Public Switched Networks (PSN): 1. Any common carrier network that provides circuit switching among public users. 2. A switched network accessible to the public for originating and terminating telecommunications messages. 3. Any common carrier switched network, whether by wire or radio, including local exchange carriers, interexchange carriers, and mobile service providers, that use the North American Numbering Plan in common with provision of switched services.

Pulse: A current or voltage which changes abruptly from one value to another and back to the original value in a finite length of time. Used to describe one particular variation in a series of wave motions. The parts of the pulse include the rise time, fall time, and pulse width, pulse amplitude. The period of a pulse refers to the amount of time between pulses.



Pulse-code Modulation (PCM): A technique in which an analog signal, such as a voice, is converted into a digital signal by sampling the signal's amplitude and expressing the different amplitudes as a binary number. The sampling rate must be at least twice the highest frequency in the signal.
Pulse Dispersion: The dispersion of an optical signal as it propagates through an optical fiber. Also called pulse spreading.
Pump Laser: A power source for signal amplification, typically a 980 nm or 1480 nm laser, used in EDFA applications.
Push: 1) In electronic marketing, to send data to another computer without a direct request from that computer. 2) In networking, to send data from a server to a client in compliance with a previous request from the client, as soon as the data becomes available.
pW: Abbreviation for picowatt. One trillionth of a Watt or 10^{-12} Watts.

Q

QAM: See quadrature amplitude modulation.
QDST: Abbreviation for quaternary dispersion supported transmission. See DST.
QoS: See quality of service.
QPSK: See quadrature phase-shift keying.
Quadrature Amplitude Modulation (QAM): A coding technique that uses many discrete digital levels to transmit data with minimum bandwidth. QAM256 uses 256 discrete levels to transmit digitized video.
Quadrature Phase-shift Keying (QPSK): Phase-shift keying uses four different phase angles out of phase by 90°. Also called quadriphase or quaternary phase-shift keying.
Quality of Service (QoS): 1. The performance specification of a communications channel or system which may be quantitatively indicated by channel or system performance parameters such as signal-to-noise ratio, bit error rate, message throughput rate, and call blocking probability. 2. A subjective rating of telephone communications quality in which listeners judge transmissions by qualifiers such as excellent, good, fair, poor, or unsatisfactory.
Quantization: The process of converting the voltage level of a signal into digital data before or after the signal has been sampled.
Quantizing Error: Inaccuracies in the digital representation of an analog signal. These errors occur because of limitations in the resolution of the digitizing process.
Quantizing Noise: Noise which results from the quantization process. In serial digital video, a granular type of noise that occurs only in the presence of a signal.
Quantum Efficiency: In a photodiode, the ratio of primary carriers (electron-hole pairs) created to incident photons. A quantum efficiency of 70% means seven out of ten incident photons create a carrier.

Quaternary Signal: A digital signal having four significant conditions.

R

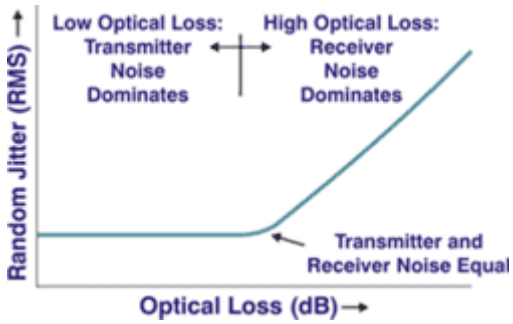
Radiation-hardened Fiber: An optical fiber made with core and cladding materials that are designed to recover their intrinsic value of attenuation coefficient, within an acceptable time period, after exposure to a radiation pulse.

Radiometer: An instrument, distinct from a photometer, to measure power (Watts) of electromagnetic radiation.

Radiometry: The science of radiation measurement.

Raman Amplifier: An optical amplifier based on Raman scattering which generates many different wavelengths of light from a nominally single-wavelength source by means of lasing action or by the beating together of two frequencies. The optical signal can be amplified by collecting the Raman scattered light.

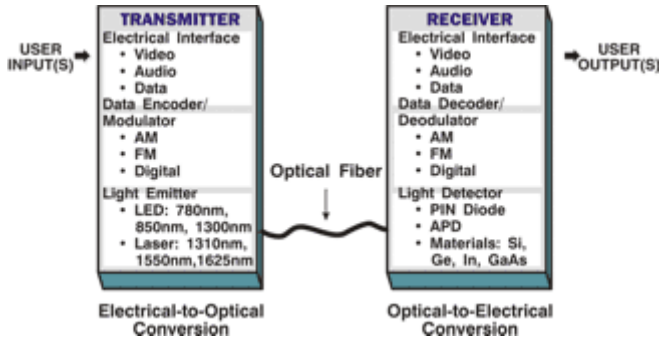
Random Jitter (RJ): Random jitter is due to thermal noise and may be modeled as a Gaussian process. The peak-to-peak value of RJ is of a probabilistic nature, and thus any specific value requires an associated probability.



Rayleigh Scattering: The scattering of light that results from small inhomogeneities of material density or composition.

Rays: Lines that represent the path taken by light.

Receiver: A terminal device that includes a detector and signal processing electronics. It functions as an optical-to-electrical converter.

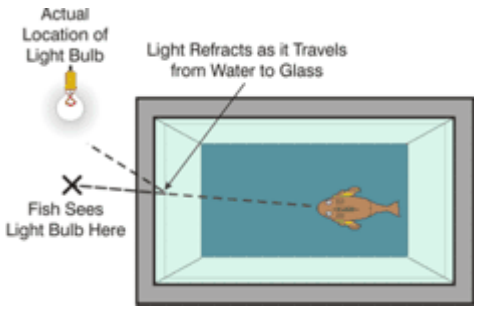


Receiver Overload: The maximum acceptable value of average received power for an acceptable BER or performance.

Receiver Sensitivity: The minimum acceptable value of received power needed to achieve an acceptable BER or performance. It takes into account power penalties caused by use of a transmitter with worst-case values of extinction ratio, jitter, pulse rise times and fall times, optical return loss, receiver connector degradations, and measurement tolerances. The receiver sensitivity does not include power penalties associated with dispersion, or backreflections from the optical path; these effects are specified separately in the allocation of maximum optical path penalty. Sensitivity usually takes into account worst-case operating and end-of-life (EOL) conditions.

Recombination: Combination of an electron and a hole in a semiconductor that releases energy, leading to light emission.

Refraction: The changing of direction of a lightwave in passing through a boundary between two dissimilar media, or in a graded-index medium where refractive index is a continuous function of position.



Refractive Index: A property of optical materials that relates to the speed of light in the material versus the speed of light in a vacuum.

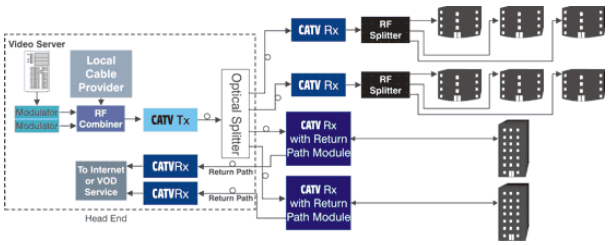
Refractive Index Gradient: The description of the value of the refractive index as a function of distance from the optical axis along an optical fiber diameter. Also called refractive index profile.

Regenerative Repeater: A repeater, designed for digital transmission, in which digital signals are amplified, reshaped, retimed, and retransmitted.

Regenerator: Synonym for regenerative repeater.

Repeater: A receiver and transmitter set designed to regenerate attenuated signals. Used to extend operating range.

Return Path: A communications connection that carries signals from the subscriber back to the operator. The return path allows for interactive television and on-demand services, such as pay-per-view, video on demand, and interactive games.



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Residual Loss: The loss of the attenuator at the minimum setting of the attenuator.

Responsivity: The ratio of a photodetector's electrical output to its optical input in Amperes/Watt (A/W).

Return Loss: See optical return loss.

RF: Abbreviation for radio frequency. Any frequency within the electromagnetic spectrum normally associated with radio wave propagation.

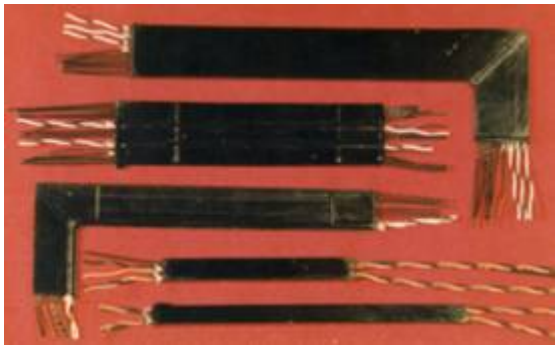
RF Carrier: An AM technique wherein a carrier, with a frequency much higher than the encoded information, varies according to the amplitude of the information being encoded.

RFI: Abbreviation for radio frequency interference. Synonym for electromagnetic interference.

RGB: Abbreviation for red, green, and blue. The basic parallel component set in which a signal is used for each primary color, or the related equipment or interconnect formats or standards.

Ribbon Cables: Cables in which many fibers and/or copper wires are embedded in a plastic material in parallel, forming a flat ribbon-like structure.

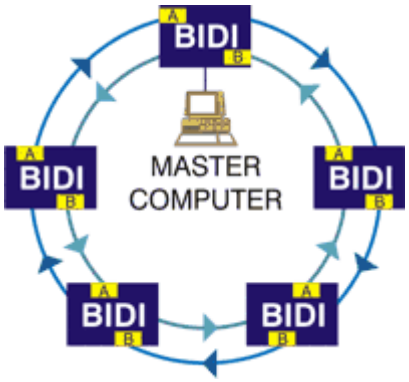
(Photo courtesy of Force, Inc.)



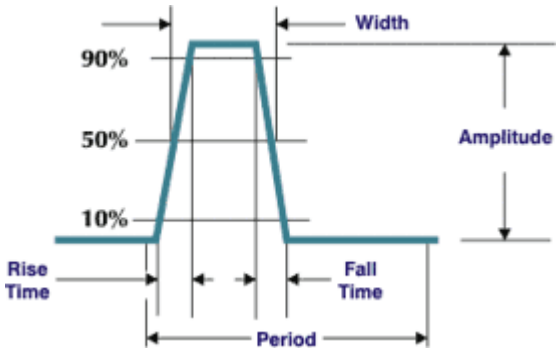
RIN: Abbreviation for relative intensity noise. Often used to quantify the noise characteristics of a laser.

Ring: A set of stations wherein information is passed sequentially between stations, each station in turn examining or copying the information, and finally returning it to the originating station.

Ring Network: A network topology in which terminals are connected in a point-to-point serial fashion in an unbroken circular configuration.



Rise Time: The time taken to make a transition from one state to another, usually measured between the 10% and 90% completion points of the transition. Alternatively the rise time may be specified at the 20% and 80% amplitudes. Shorter or faster rise times require more bandwidth in a transmission channel.



RJ: See Random Jitter.

RMS: Abbreviation for root mean square. Technique used to measure AC voltages.

RS-250C: An ANSI recommended standard for video transmission used to evaluate the quality of a

received picture quality. Different requirements exist for short-haul, medium-haul, and long-haul RS-250C. Each of these three levels is defined by the number of intermediate processing devices and the type of path (optical or electrical).

RTS: Abbreviation for request to send. In a communications network, a signal from a remote receiver to a transmitter for data to be sent to that receiver.

RZ: Abbreviation for return to zero. A common means of encoding data that has two information states called “zero” and “one” in which the signal returns to a rest state during a portion of the bit period.

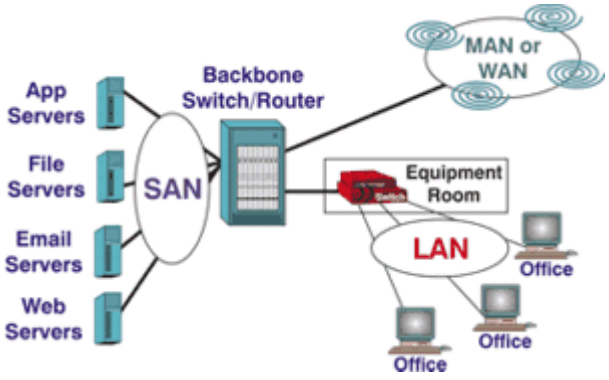
S

s: Abbreviation for second.

Sampling Rate: The number of discrete sample measurements made in a given period of time. Often expressed in megahertz (MHz) for video.

SAP (Secondary Audio Programming): Secondary audio signal that is broadcast along with a television signal and its primary audio. SAP may be enabled through either the television, stereo VCR equipped to receive SAP signals, or an SAP receiver. SAPs may be used for a variety of enhanced programming, including providing a "video description" of a program's key visual elements, inserted in natural pauses, that describes actions not otherwise reflected in the dialog, used by visually impaired viewers. This service also allows television stations to broadcast programs in a language other than English, and may be used to receiver weather information, or other forms of "real-time" information.

SAN (Storage Area Network): Connects a group of computers to high-capacity storage devices. May be incorporated into local area networks (LAN), metropolitan area networks (MAN), and wide area networks (WAN).

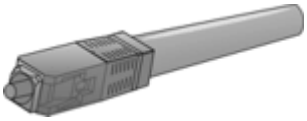


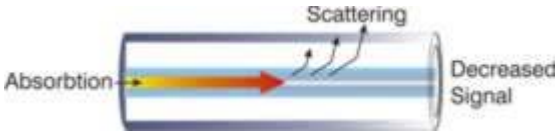
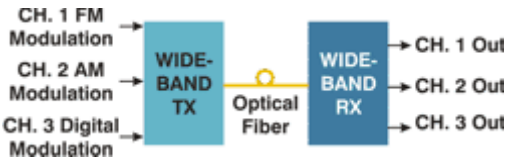
Saturation: 1) In a communications system, the condition in which a component of the system has reached its maximum traffic handling capacity. 2) The point at which the output of a linear device, such as a linear amplifier, deviates significantly from being a linear function of the input when the input signal is increased. 3) The degree of the chroma or purity of a color.

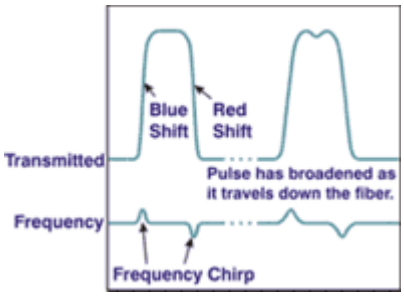
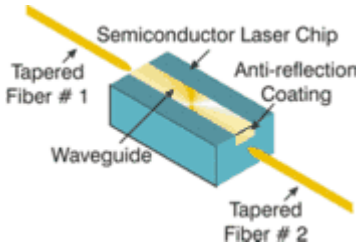
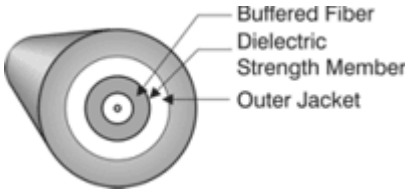
S-Band: The wavelength region between 1485 nm and 1520 nm used in some CWDM and DWDM applications.

SBS: See stimulated Brillouin scattering.

SC: Abbreviation for subscription channel connector. A push-pull type of optical connector that features high packing density, low loss, low backreflection, and



low cost.	
Scattering: The change of direction of light rays or photons after striking small particles. It may also be regarded as the diffusion of a light beam caused by the inhomogeneity of the transmitting material.	
Scalable Coding: The ability to encode a visual sequence so as to enable the decoding of the digital data stream at various spatial and/or temporal resolutions.	
Scalable Video: Refers to video compression that can handle a range of bandwidths, scaling smoothly over them.	
Scanning: 1) In telecommunications systems, periodic examination of traffic activity to determine whether further processing is required. 2) In television, facsimile, and picture transmission, the process of successively analyzing the colors and densities of the object according to a predetermined pattern.	
S-CDMA: Abbreviation for synchronous code division multiple access. A synchronized version of CDMA.	
SCM: Abbreviation for subcarrier multiplexing. The process by which multiple subcarrier signals are combined onto one signal.	
Scrambler: 1) A device that transposes or inverts signals or otherwise encodes a message at the transmitter to make the message unintelligible at a receiver not equipped with an appropriately set descrambling device. Scramblers usually use a fixed algorithm or mechanism. 2) A device intended to normalize the duty cycle of a data stream to be close to 50%.	
Scrambling: To transpose or invert digital data according to a prearranged scheme in order to break up the low-frequency patterns associated with serial digital signals.	
SCSI: Acronym for small computer system interface. An intelligent interface device that expands a microprocessor (CPU) bus to facilitate connections to multiple peripherals (e.g., CD-ROM drives, hard drives, or scanners) and exchange data with those peripherals via a separate communications bus.	
SDTV: Abbreviation for standard-definition television. Synonym NTSC television transmission.	
SECAM: Abbreviation for Système Électronique Couleur avec Mèmoire. A TV standard used in various parts of the world. Delivers 625 lines at 50 frames per second.	
Selfoc Lens: A trade name used by the Nippon Sheet Glass Company for a graded-index fiber lens; a segment of graded-index fiber made to serve as a lens.	

Self-phase modulation (SPM): A fiber nonlinearity caused by the nonlinear index of refraction of glass. The index of refraction varies with optical power level causing a frequency chirp which interacts with the fiber's dispersion to broaden the pulse.	
Semiconductor Optical Amplifier (SOA): A laser diode without end mirrors coupled to the fibers on both ends. Light coming in either fiber is amplified by a single pass through the laser diode. An alternative to EDFAs.	
Sensitivity: See receiver sensitivity.	
Serial: One bit at a time, along a single transmission path.	
Serial Digital: Digital information that is transmitted in serial form. Often used informally to refer to serial digital television signals.	
Serial Digital Interface (SDI): A 10-bit, scrambled, polarity independent interface, based on a 270 Mb/s data rate, with common scrambling for both component ITU-R 601, composite digital video, and four channels of (embedded) digital audio. Most new broadcast digital equipment includes SDI.	
Serial Digital Transport Interface (SDTI): Another name for SMPTE 305M. Allows faster-than-real-time transfers between various servers and between acquisition tapes, disk-based editing systems and servers. Supports both 270 Mb/s and 360 Mb/s data rates.	
Servo-loop: Automatic device for regulating	
Set-top Box: See STB.	
SH: Abbreviation for short-haul. A classification of video performance under RS-250B/C. Higher performance than long-haul or medium-haul.	
Sheath: An outer protective layer of a fiber optic cable. Also called the cable jacket.	
Shot Noise: Noise caused by current fluctuations arising from the discrete nature of electrons.	
Si: Abbreviation for silicon. Generally used in detectors. Good for short wavelengths only (e.g., < 1000 nm).	
Sideband: Frequencies distributed above and below the carrier that contain energy resulting from amplitude modulation. The frequencies above the carrier are called upper sidebands, and the frequencies below the carrier are called lower sidebands.	
Silica Glass: Glass made mostly of silicon dioxide, SiO_2, used in conventional optical fibers.	

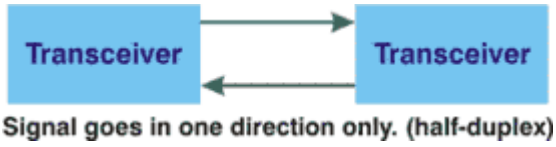
Signal-to-Noise Ratio (SNR): The ratio of the total signal to the total noise which shows how much higher the signal level is than the level of the noise. A measure of signal quality.

Simple Network Management Protocol (SNMP): The Internet standard protocol for network management software. It monitors devices on the network, and gathers device performance data for management information data bases (MIB).

Simplex: Single element (e.g., a simplex connector is a single-fiber connector).

Simplex Cable: A term sometimes used for a single-fiber cable.

Simplex Transmission: Transmission in one direction only. Also referred to as half-duplex transmission.

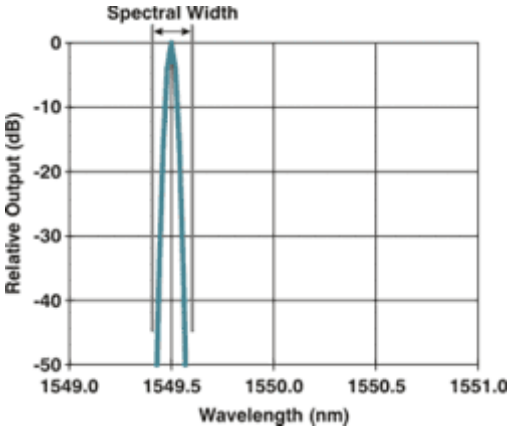


Signal goes in one direction only. (half-duplex)

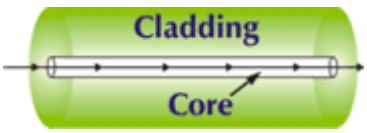
Single Attachment Concentrator: A concentrator that offers one attachment to the FDDI network.

Single-line Laser: See single-longitudinal mode laser.

Single-longitudinal Mode Laser (SLM): An injection laser diode which has a single dominant longitudinal mode. A single-mode laser with a side mode suppression ratio (SMSR)< 25 dB.



Single-mode (SM) Fiber: A small-core optical fiber through which only one mode will propagate. The typical diameter is 8-9 microns.



Single-mode Laser Diode (SMLD): See single-longitudinal mode laser.

Single-mode Optical Loss Test Set (SMOLTS): An optical loss test set for use with single-mode fiber.

SI Units: Abbreviation for Système Internationale (in English, International System of Units), commonly known as the metric system.

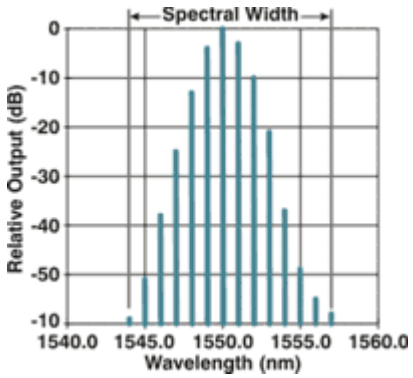
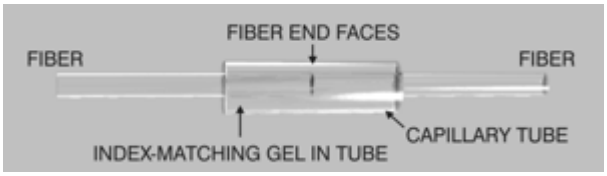
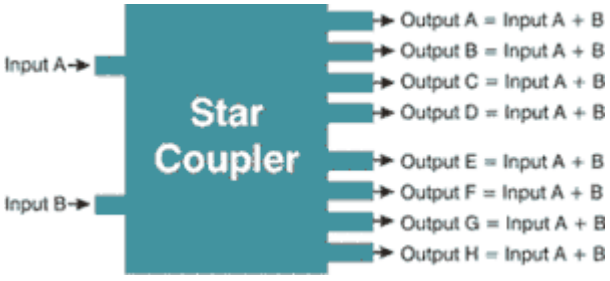
SLED: See surface-emitting diode.

SLM: See single-longitudinal mode laser.

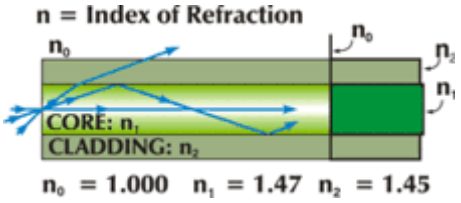
Slope Efficiency (SE): This is the mean value of the incremental change in optical power for an incremental change in forward current when the device is operating in the lasing region of the optical power output versus forward current curve. Also referred to as differential efficiency.

SMF: Abbreviation for single-mode fiber.

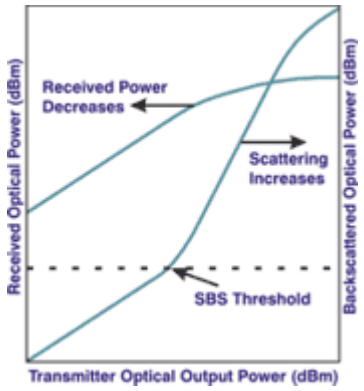
SMA: A threaded type of optical connector. One of the earliest optical connectors to be widely used. Offers poor repeatability and performance.	
Smart Structures: Also smart skins. Materials containing sensors (fiber optic or other types) to measure their properties during fabrication and use.	
SMD: Abbreviation for surface-mount device. See SMT.	
SMPTE: Abbreviation for Society of Motion Picture and Television Engineers. Organization that publishes ANSI-approved standards, recommended practices, and engineering guidelines for the motion picture and television industry.	http://www.smpte.org
SMPTE 259M: Television standard, written by the Society of Motion Picture and Television Engineers (SMPTE), that describes a serial digital interface (SDI) for 10-bit 4:2:2 component and $4f_{sc}$ composite digital transport.	
SMPTE 310M: Television standard, written by the Society of Motion Picture and Television Engineers (SMPTE), that describes a synchronous serial interface for MPEG-2 digital transport streams.	
SMT: Abbreviation for surface-mount technology. An electronics manufacturing technique.	
S/N: See signal-to-noise ratio.	
SNR: See signal-to-noise ratio.	
SOA: See semiconductor optical amplifier.	
Soliton Pulse: An optical pulse having a shape, spectral content, and power level designed to take advantage of nonlinear effects in an optical fiber waveguide, for the purpose of essentially negating dispersion over long distances.	
SONET: Abbreviation for synchronous optical network transport system. An interface standard widely used by the telecom industry where OC-3 is the lowest current rate (155.5 Mb/s), and OC-768 is the highest rate being contemplated (39.808 Gb/s). Valid rates increase by a factor of four from the OC-3 rate up to OC-768.	
Source: In fiber optics, a transmitting LED or laser diode, or an instrument that injects test signals into fibers.	
Span Engineering: The process of designing a DWDM transmission span to achieve the required performance based on fiber type, the transmission distance, amplifier spacing, noise, power, and channel count.	
Spectral Efficiency: The number of data bits per second that can be transmitted in a one Hertz bandwidth range.	

Spectral Width: A measure of the extent of a spectrum. For a source, the width of wavelengths contained in the output at one half of the wavelength of peak power. Typical spectral widths are 50 to 160 nm for an LED and less than 5 nm for a laser diode.	
Spectral Width, Full Width, Half Maximum (FWHM): The absolute difference between the wavelengths at which the spectral radiant intensity is 50 percent of the maximum power.	
Splice: A permanent connection of two optical fibers through fusion or mechanical means.	
Splitter: see Coupler.	
Splitting Ratio: The ratio of power emerging from two output ports of a coupler.	
SPM: See self-phase modulation.	
SRS: See stimulated Raman scattering.	
ST: Abbreviation for straight tip connector. Popular fiber optic connector originally developed by AT&T.	
Stabilized Light Source: An LED or laser diode that emits light with a controlled and constant spectral width, center wavelength, and peak power with respect to time and temperature.	
Star Coupler: A coupler in which power at any input port is distributed to all output ports.	
Star Network: A network in which all terminals are connected through a single point, such as a star coupler or concentrator.	
STB: Abbreviation for set-top box. An auxiliary device that usually sits on top of or adjacent to a television receiver used in direct analog or digital satellite transmission and digital television to view the signals on an analog TV. Converter boxes are becoming obsolete as old model televisions requiring a converter are replaced by modern televisions, which incorporate a converter into the television. Also called a set-top converter.	

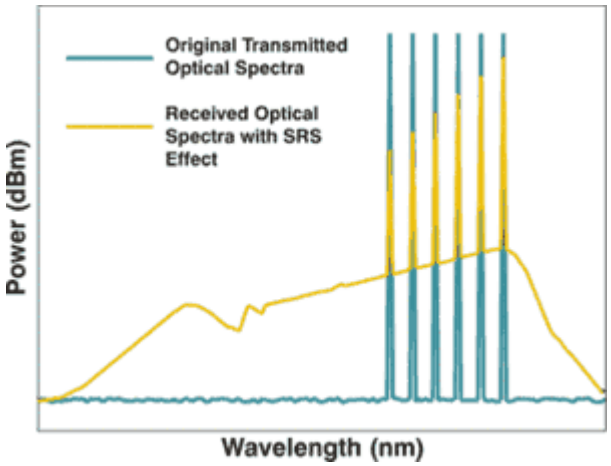
Step-index Fiber: Fiber that has a uniform index of refraction throughout the core that is a step below the index of refraction in the cladding.



Stimulated Brillouin Scattering (SBS): The easiest fiber nonlinearity to trigger. When a powerful light wave travels through a fiber it interacts with acoustical vibration modes in the glass. This causes a scattering mechanism to be formed that reflects much of the light back to the source.

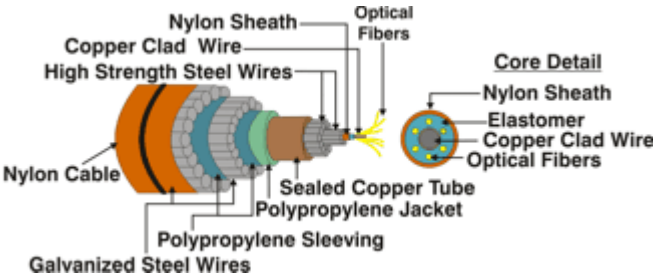


Stimulated Raman Scattering (SRS): A fiber nonlinearity similar to SBS but having a much higher threshold. This mechanism can also cause power to be robbed from shorter wavelength signals and provide gain to longer wavelength signals.



Strength Member: The part of a fiber optic cable composed of aramid yarn, steel strands, or fiberglass filaments that increase the tensile strength of the cable.

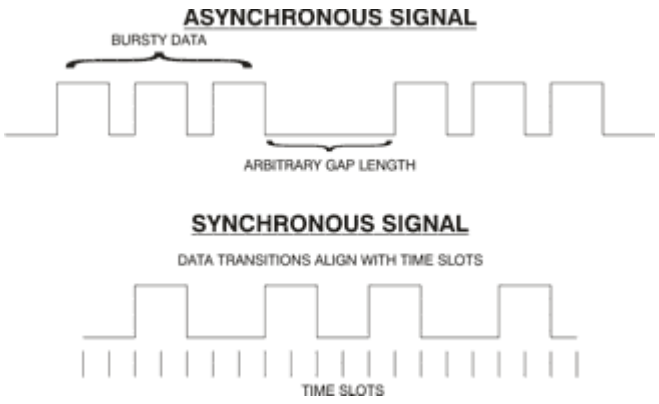
Submarine Cable: A cable designed to be laid underwater.



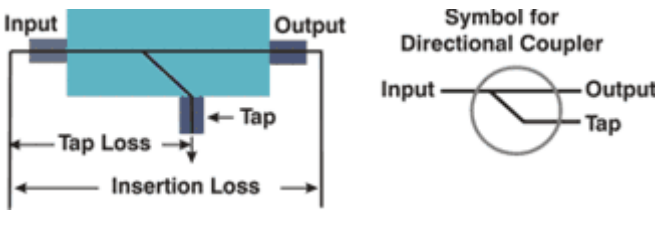
Subscriber Loop: Also called local loop. The link from the telephone company central office (CO) to the home or business (customer premises).

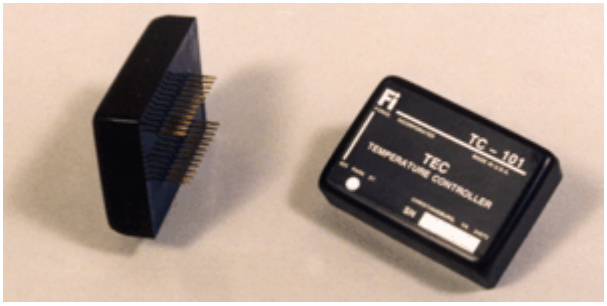
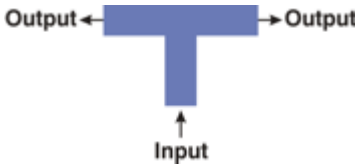
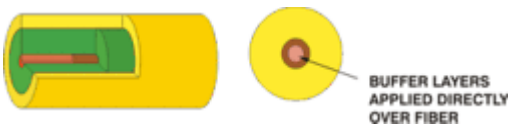
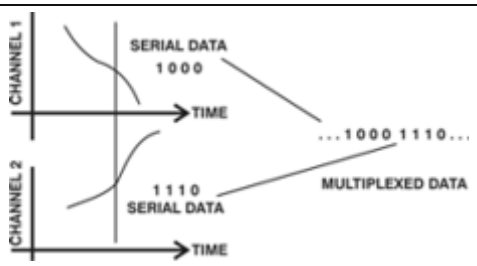
Sun Fade: In satellite systems, the loss of a satellite signal that occurs when energy from the sun overpowers the satellite's signal. Also called sun transit or sun outage.

Supertrunk: A cable that carries several video channels between facilities of a cable television company.

Surface-emitting Diode: A simple and inexpensive LED that emits light from its flat surface rather than its side with emission spread over a wide angle.	
Surround Sound: More commonly referred to as Dolby Digital, a standard for high-quality digital audio that is used for the sound portion of video stored in digital format, especially videos stored on DVD-ROMs. Dolby Digital delivers 6 channels in the so called "5:1" configuration: left, right, and center screen channels, separate left and right sounds, and a subwoofer channel.	
Switch: 1) In communications systems, a mechanical, electro-mechanical, or electronic device for making, breaking, or changing the connections in or among circuits. 2) Synonym for central office, switching center. 3) In communications systems, to transfer a connection from one circuit to another.	
Synchronization Pulse: 1) A signal derived from the composite or combination of the horizontal and vertical drives. 2) A pulse used to achieve or maintain synchronism, usually applied to analog signals. (The term "synchronization bit" is usually applied to digital data streams.) Commonly called the sync pulse. See also composite sync.	
Synchronous: A data signal that is sent along with a clock signal. A system in which events, such as signals, occur at evenly spaced time durations. Opposite of asynchronous.	

T

T: Abbreviation for tera. One trillion or 10^{12}.	
T1: In telecommunications, the cable used to transport DS1 service.	
Tap Loss: In a fiber optic coupler, the ratio of power at the tap port to the power at the input port.	
Tap Port: In a coupler where the splitting ratio between output ports is not equal, the output port containing the lesser power.	
T-Carrier: Generic designator for any of several digitally multiplexed telecommunications carrier systems.	
TCP/IP: Abbreviation for transmission control protocol/Internet protocol. Two interrelated protocols that	

are part of the Internet protocol suite. TCP operates on the OSI transport layer and breaks data into packets. IP operates on the OSI network layer and routes packets. Originally developed by the U.S. Department of Defense.	
TDM: See time-division multiplexing.	
TDMA: See time-division multiple access.	
TEC: Abbreviation for thermoelectric cooler. A device used to dissipate heat in electronic assemblies. (Photo of Model TC-101 TEC courtesy of Force, Inc.)	
Tee Coupler: A three-port optical coupler.	
Telecommunications Management Network (TMN): A network that interfaces with a telecommunications network at several points in order to receive information from, and to control the operation of, the telecommunications network.	
Ternary: A semiconductor compound made of three elements (e.g., GaAlAs).	
Thermal Noise: Noise resulting from thermally induced random fluctuation in current in the receiver's load resistance.	
Throughput Loss: In a fiber optic coupler, the ratio of power at the throughput port to the power at the input port.	
Throughput Port: In a coupler where the splitting ratio between output ports is not equal, the output port containing the greater power.	
TICL: Abbreviation for temperature induced cable loss. Optical loss as a result of extreme temperatures outside a fiber optic cable's environmental specifications.	
Tight-Buffer: A material tightly surrounding a fiber in a cable, holding it rigidly in place.	
Time-division Multiplexing (TDM): A transmission technique whereby several low-speed channels are multiplexed into a high-speed channel for transmission. Each low-speed channel is allocated a specific position based on time.	
Time-division Multiple Access (TDMA): A communications technique that uses a common channel	

(multipoint or broadcast) for communications among multiple users by allocating unique time slots to each user. Used extensively in satellite systems, local area networks, physical security systems, and combat-net radiosystems.

TMN: See telecommunications management network.

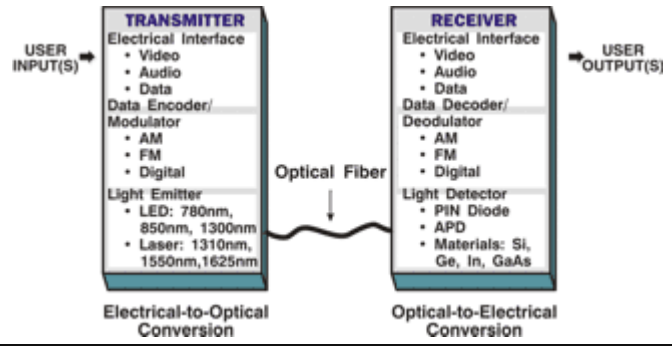
Token Ring: A ring-based network scheme in which a token is used to control access to a network. Used by IEEE 802.5 and FDDI.

Total Internal Reflection: The reflection that occurs when light strikes an interface at an angle of incidence (with respect to the normal) greater than the critical angle.

Transceiver: A device that performs, within one chassis, both telecommunication transmitting and receiving functions.

Transducer: A device that converts energy from one form to another, such as optical energy to electrical energy.

Transmitter: A device that includes a source and driving electronics. It functions as an electrical-to-optical converter.



Transponder: The part of a satellite that receives and transmits a signal.

Tree: In communications networks, a physical topology consisting of a hierarchy of master-slave connections between a concentrator and other FDDI nodes (including subordinate concentrators).

Trunk: 1) In a communications network, a single transmission channel between two switching centers or nodes, or both. 2) A circuit between switchboards or other switching equipment, as distinguished from circuits which extend between central office switching equipment and information origination/termination equipment. Trunks may be used to interconnect switches, such as major, minor, public and private switches, to form networks.

TTL: Abbreviation for transistor-transistor logic. An old logic family.

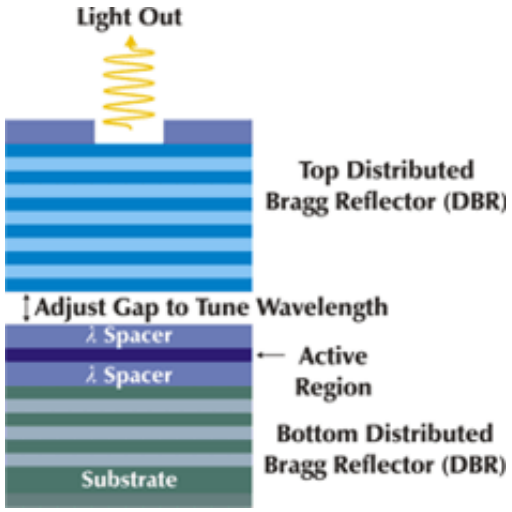
Twisted Pair (TP) Cable: A cable made up of one or more separately insulated twisted wire pairs, none of which is arranged with another to form quads.

U

UHF: Abbreviation for ultra high frequency. The frequencies, ranging from 300 MHz to 3000 MHz, in the electromagnetic spectrum. Contains off-air television channels 21-68.

UL: Abbreviation for Underwriter's Laboratory. An organization that tests product safety for a wide variety of products. UL approved products carry the symbol shown at right.	
Unidirectional: Operating in one direction only.	
Unity Gain: A concept in which all the amplifiers in a cascade are in balance with their power inputs and outputs. Unity gain can be achieved by adjusting the receiver output, either by padding or attenuation in the node, to the proper level determined by the RF input.	
UTP cabling (Unshielded Twisted Pair):	
UV: Abbreviation for ultraviolet. That portion of the electromagnetic spectrum in which the longest wavelength is just below the visible spectrum, extending from approximately 4 nm to 400 nm.	

V

V: Abbreviation for Volt. A unit of electrical force or potential, equal to the force that will cause a current of one Amp to flow through a conductor with a resistance of one Ohm.	
V_{AC}: Abbreviation for Volts, AC. Voltage using alternating current.	
VCSEL: See vertical cavity surface-emitting laser.	
V_{DC}: Abbreviation for Volts, DC. Voltage using direct current.	
VDSL: Abbreviation for very high data rate digital subscriber line. A DSL operating at a data rate higher than that of HDSL. See also DSL.	
Vector Quantization (VQ): A digital video compression technique based on Shannon's distortion-rate theory which states that the performance of data compression systems improves if blocks of data are coded, with larger coded data blocks giving better performance.	
Vertical Cavity Surface-emitting Laser: Lasers that emit light perpendicular to the plane of the wafer they are grown on. They have very small dimensions compared to conventional lasers and are very efficient.	
Vestigial-sideband (VSB) Transmission: A modified double-sideband transmission in which one sideband, the carrier, and only a portion of the other sideband are transmitted. See also sideband.	

VGA: Abbreviation for video graphics array. A high-resolution color standard for computer monitors.
VHF: Abbreviation for very high frequency. The frequencies, ranging from 30 MHz to 300 MHz, in the electromagnetic spectrum. Contains off-air television channels 2-12.
Video on Demand (VOD): A term used for interactive or customized video delivery service.

Videoconferencing: Conducting conferences via a video telecommunications system.	

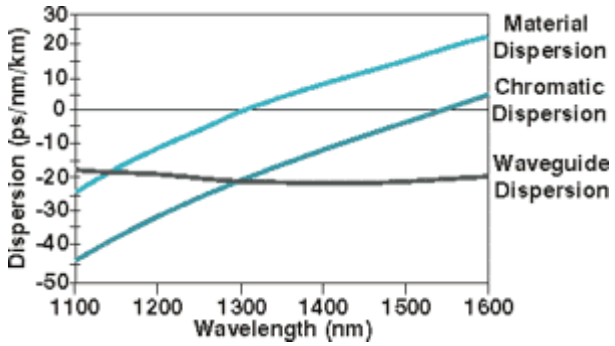
Videophone: A telephone-like service with a picture as well as sound.
Virtual Circuit (VC): A communications arrangement in which data from a source user may be passed to a destination user over various real circuit configurations during a single period of communication, usually on a per call basis, although permanent connections can be established.
Visible Light: Electromagnetic radiation visible to the human eye; wavelengths of 400-700 nm.
VOD: See video on demand.
Voice Circuit: A circuit capable of carrying one telephone conversation or its equivalent; the standard sub-unit in which telecommunication capacity is counted. The U.S. analog equivalent is 4 kHz. The digital equivalent is 64 kbit/s in North America and in Europe.
VPN: Abbreviation for virtual private network. A protected information-system link utilizing tunneling, security controls, and end-point address translation giving the end user the impression that a dedicated line exists between nodes.
VSB: See vestigial-sideband transmission.

W

W: Abbreviation for Watt. A linear measurement of optical power, usually expressed in milliwatts, microwatts, and nanowatts.
WAN: See Wide Area Network.
Waveguide: A material medium that confines and guides a propagating electromagnetic wave. In the microwave regime, a waveguide normally consists of a hollow metallic conductor, generally rectangular, elliptical, or circular in cross-section. This type of waveguide may, under certain conditions, contain a solid or gaseous dielectric material. In the optical regime, a waveguide used as a long transmission line consists of a solid dielectric filament (fiber), usually circular in cross-section. In integrated optical circuits an optical waveguide may consist of a thin dielectric film. In the RF regime, ionized layers of the stratosphere and the refractive surfaces of the troposphere may also serve as a waveguide.

Waveguide Coupler: A coupler in which light gets transferred between planar waveguides.

Waveguide Dispersion: The part of chromatic dispersion arising from the different speeds light travels in the core and cladding of a single-mode fiber (i.e., from the fiber's waveguide structure).



Wavelength: The distance between points of corresponding phase of two consecutive cycles of a wave. The wavelength relates to the propagation velocity, and the frequency, by:

Wavelength = Propagation Velocity / Frequency

Wavelength Adapter: A device which receives one wavelength and outputs a second wavelength, usually to take a standard signal and convert it to an ITU wavelength.

Wavelength-division Multiplexing (WDM): Sending several signals through one fiber with different wavelengths of light.

Wavelength Isolation: A WDM's isolation of a light signal in the desired optical channel from the unwanted optical channels. Also called far-end crosstalk.

Wavelength Routing Switch (WRS): A switch, used in optical networks, that routes wavelengths as required to specific terminals in the network.

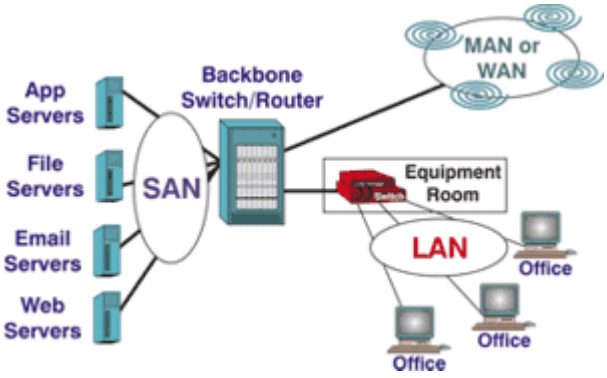
Wavelength Selective Coupler: A device which couples the pump laser wavelength to the optical fiber while filtering out all other unwanted wavelengths. Used in erbium-doped fiber amplifiers.

Wavelength Stability: The maximum deviation of the peak wavelength of an optical source from its average wavelength.

WDM: See wavelength-division multiplexing.

Weather Fade: In satellite systems, the loss of a satellite signal due to extremely heavy (and generally very localized) rain, snow, or other extreme weather.

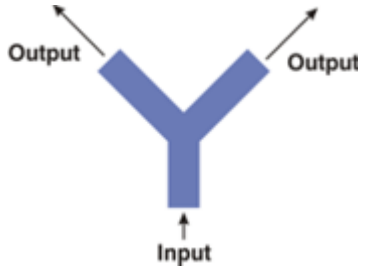
Wide Area Network (WAN): A physical or logical network that provides capabilities for a number of independent devices to communicate with each other over a common transmission-interconnected topology in geographic areas larger than those served by local area networks or metropolitan area networks.



Wideband: Possessing large bandwidth.
Wireless: A network or terminal that uses electromagnetic waves, such as RF, infrared, laser, visible light, and acoustic energy, not wires, for telecommunications.
WWW (World Wide Web) : The collection of millions of graphical pages that heavily utilize HTML to provide access to information. One of the key components of the Internet.

X, Y

X-Band: The frequency range between 8.0 and 8.4 GHz.
XC: See cross-connect.
XGM: See cross-gain modulation.
XPM: See cross-phase modulation.
X-Series Recommendations: Sets of data telecommunications protocols and interfaces defined by the ITU.
XT: See crosstalk.

Y Coupler: A variation on the tee coupler in which input light is split between two channels (typically planar waveguide) that branch out like a Y from the input.	

Z

Zero-dispersion Slope: In single-mode fiber, the rate of change of dispersion with respect to wavelength, at the fiber's zero-dispersion wavelength.
Zero-dispersion Wavelength (λ_0): In a single-mode optical fiber, the wavelength at which material dispersion and waveguide dispersion cancel one another. The wavelength of maximum bandwidth in the fiber. Also called zero-dispersion point.

Zipcord: A two-fiber cable consisting of two single fiber cables having conjoined jackets. A zipcord cable can be easily divided by slitting and pulling the conjoined jackets apart.