Fiber Optic Glossary

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Glossary of Terms

µm
A micron; a millionth of a meter. Common unit of measurement of optical fibers.

Abrasion resistance
A cable's ability to resist surface wear.

Absorption
Caused by impurities introduced during the manufacturing process, absorption creates loss in a fiber by turning light energy into heat. The amount of absorption is determined by the wavelength and depends upon the composition of the glass or plastic. Absorption and scattering are the two causes of intrinsic attenuation in an optical fiber.

Acceptance angle
See *Critical angle*.

Acceptance test
A test to confirm that an optical cable or link meets established performance specifications.

Active device
An active device is a device that requires electrical power. One type is those that convert signals between electrical and optical formats such as lasers, LEDs, and photodiodes. Active devices also can manipulate light, such as optical amplifiers and modulators.

Active optical cable (AOC)
A fiber optic cable that has been pre-terminated with an external electrical endface , thereby removing the termination process. The electrical endfaces can be manufactured with most module formats. The most common module formats are the SFP and HDMI interfaces, but DVI, VGA, SFP+, and QSFP+ interfaces also can be provided.

Adapter
A mechanical device that is used to mate two connectors. Adapters also provide the transition point for the transmitter or receiver of an optical loss test set (OLTS) to connect to the fiber optic cable assembly.

Add/drop multiplexer (ADM)
A mid-span electronic element that provides opto-electric/electro-optic conversion to add, drop, or multiplex photonic signals. See also *OADM*.

Aeolian vibration
Wind-induced vibration, usually high frequency, which causes oscillation of cable.

Aerial
A type of installation in which the cable is connected to poles or towers by means of clamps or other attachment hardware.

Aerial cables
Cables that are designed to handle environmental concerns such as wind and ice loading, pollution, UV radiation, thermal cycling, stress, and aging in aerial placements. There are several variations of aerial cables including OPGW and ADSS.

Air blown fiber (ABF)
An installation technique developed by British Telecom where micro ducts or "pipe cables" are installed, and then optical fibers or fiber bundles are blown into the cable with spans reaching 10,000 feet.

Air handling plenum
A space within a building designed for the movement of environmental air, e.g., an open HVAC air supply or return space above a suspended ceiling or below an access floor.

Air polish
The first polish of a ferrule or termini after the fiber has been cleaved. The lapping film is passed over the fiber stub in the air to reduce it to just above the ferrule endface.

Alignment sleeve
An appliance for mating and holding two connector ferrules in alignment.

All-dielectric
No metal elements.

All-dielectric self-supporting (ADSS)
A self-supporting loose tube cable structure without any metallic elements. Specified by the IEEE P-1222 standard, ADSS cable is designed for a variety of short and long span lengths between poles and to withstand typical weather loads on those spans.

All-optical network (AON)
A network that uses only optical components to produce, direct, condition, control, and connect optical signals.

American National Standards Institute (ANSI)
The official American standards body through which standards are published and various other standards committees are accredited.

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Anaerobic
In adhesives, a bonding method that uses its own chemical reaction to complete the adhesion.

Analog
A data format using continuous physical variables such as voltage amplitude (AM) or frequency (FM) variations that are analogous to the original signal.

Angled physical contact connector (APC)
References the ferrule endface of a connector angled at 8° to minimize Fresnel reflections at connection points. APC polishes normally have a component reflectance value of 60-70dB. They are most often used in high-speed networks and for analog video transmission.

Angular misalignment
The fiber optic cores of a mated pair of connectors are held at an angle, either by mispolish, worn alignment sleeve, or contamination.

Apex (or dome) offset
The difference in microns between the center of the fiber compared to the center of the radius of curvature on a polished end face. One of the three critical components of end face geometry.

Application-specific optical fiber (ASOF)
Fibers built for specific applications such as those doped with erbium for use in fiber amplifiers or the high numerical aperture fibers used for manufacturing filters and gratings.

Aramid yarn
A woven strength member incorporated into fiber optic cable assemblies for protection and mechanical bonding.

Arc
The discharge from the electrodes of a fusion splicer.

Architecture
In networks, it is how the components are connected to and operate with one another. The term "network architecture" focuses on how fiber optic system elements communicate including functional organization (services) and configuration (topology and communications). Network architectures are usually designed as to their protocols. B-PON, G-PON, EPON, GEPON, SONET, ATM, Ethernet, etc., are examples of network architectures.

Armored cable
Cable with metallic sheathing or rods placed under or between cable jackets to prevent rodents from damaging the internal cable elements.

Array connector
Typically, connectors with multiple fibers in a small form factor housing, i.e., MPO, MTP®, MT-RJ.

Arrayed waveguide grating (AWG)
A device that allows multiple wavelengths to be combined and separated in a DWDM system.

As builts
Drawings that provide accurate depictions of cable running lines, pedestal locations, electronic sites, manholes, marker posts, etc., to aid with the management of cable assets and allow the facilities to be located, protected, maintained, and modified.

Attenuation
The loss of optical power, whether caused intrinsically (e.g., absorption, scattering, microbends), or extrinsically by components (e.g., connectors, splices, splitters). Expressed as dB or dB/km (with fiber).

Attenuator
A component that incorporates a specific amount of loss into an operational optical network. Attenuators also provide a safety margin in planned networks to allow for electronics degradation over time, or physical changes to the optical component portion of the network. Attenuators come in two styles, fixed and variable. Variable optical attenuators are used for testing systems for dynamic range and quality of signal testing.

Automatic test equipment (ATE)
Test equipment that is computer programmed to perform measurements on a device without changing the test setup.

Avalanche photodiode (APD)
A photodiode that takes advantage of avalanche multiplication of photocurrent to convert one photon to multiple electrons.

Axial ray
A ray passing through the axis of the optical waveguide without any internal reflection.

Backbone
The cabling used to connect entrance facilities, cross-connects, telecommunications closets, and equipment rooms. The backbone may consist of either interbuilding and/or intrabuilding cabling.

Backreflection
This term is often interchanged with optical return loss (ORL) for spans, reflectance for components, and Fresnel reflectance. It is the amount of light that is reflected back toward the transmitter, most often from the mated connector points. APC connectors help to minimize the reflectance.

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Backscatter coefficient
The ratio of the optical pulse power (not energy) at the OTDR output to the backscatter power at the near end of the fiber (z=0). This ratio is inversely proportional to the pulse width, because the optical pulse power is independent. It is expressed in dB.

Backscattering
See *Rayleigh scattering*.

Band
A range of optical spectrum allocated based on optical amplifiers. Six bands are specified: O (original), E (enhanced), S (short), C (conventional), L (long), and U (ultra). These cover the optical spectrum from 1260nm to 1675nm. Further, the ITU-T G.983 through G.987 have identified operational wavelength bands with the names of: 1300nm, intermediate, basic, and enhancement bands.

Bandwidth
A measure of the maximum frequency by which light intensity can be modulated before the signal experiences 3dB of excess attenuation. The difference between the highest and the lowest frequencies of a transmission channel or path; identifies the amount of data that can be sent through a given channel. The greater the bandwidth, the greater the information carrying capacity. Multimode fiber bandwidth is expressed in Megahertz per kilometer (MHz-km).

Baseband
A transmission media where the entire capacity of the cable is used for one signal.

Bayonet
A locking prong and slot interconnect device. The mechanical latching mechanism for the STtype connector.

Bayonet fiber-optic connector (BFOC)
The formal name for the ST connector, a specific slotted twistlock connector with 2.5mm ferrule.

Bend-insensitive (single-mode) fiber (BIF)
Single-mode fibers that have been modified to demonstrate reduced bend radius characteristics without attenuation changes. Specified in the ITU-T G.657 standard.

Bend loss
Increased attenuation due to macrobends (curvature of fiber) or microbends (small distortions in the fiber) coupling light energy from the fiber core to the cladding.

Bend radius
The minimum radius that fiber or cable can bend and still maintain its optical and physical qualities.

Biconic
A phenolic-bodied, threaded, spring-loaded, nonkeyed connector with a cone-shaped alignment area.

Bidirectional (BiDi)
Operating in both directions.

Bidirectional transceiver
A device that sends information in one direction and receives information from the opposite direction.

Binder
A tape or thread used for holding assembled cable components in place within loose tube cables.

Bit
An electrical or optical pulse whose presence or absence indicates data. The capacity of the optical waveguide to transmit information without error is expressed in bits per second per unit length.

Bit error rate (BER)
A measurement of transmission accuracy. It is a ratio of bits received in error versus bits sent. Fiber optic communication systems normally have a BER value of 10^{-9} or 10^{-12}.

Bit error rate tester (BERT)
Test equipment that measures the bit error rate of digital transmission systems.

Bit rate
A unit of measure for digital transmission speeds expressed in bit per second (b/s).

Blocking
Creating a physical barrier to keep moisture-repellent gel in loose tube cables from migrating or flowing out of the buffer tubes into splice trays.

Bonding
A method where all conductive cables and messengers are continuously connected to the grounding network. May also be referred to as continuity bonding.

Boot
Strain relief device consisting of a flexible material on the rear end of a fiber optic connector that protects the cable-to-connector interface from bending damage.

Braid
Textile or metallic filaments that are interwoven to form a flexible tube structure that may be applied over one or more wires, or flattened to form a strap. Kevlar™ is also braided into cables for additional strength.

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Breakout cable
A tight buffered cable with 900µm tight buffered fibers and aramid yarn surrounding each fiber. Jumper cordage is a breakout structure. Available in simplex and duplex variations for jumpers and in large fiber counts. Normally used for indoor installations and for tactical cables.

Breakout kit
A kit that provides a breakout cable structure for non-breakout structures (with one fiber per tube).

Bridge
A data communications device that connects two or more network segments and forwards packets between them.

Brillouin scattering
In stimulated Brillouin backscattering (SBS), the laser signal creates periodic regions of altered refractive index; that is, a periodic grating that travels as an acoustic wave away from the signal. This effect can result in a noisy and unstable forward-propagating signal, since much of the optical energy is backscattered.

Broadband PON (B-PON)
The first FTTx standard issued as ITU-T G.983, the B-PON standard was designed for the bidirectional transmission of ATM cells over G.652 single-mode fiber at a distance of 20 kilometers using wavelength independent splitters with split rates of up to 1:32. Originally defined by the FSAN S652 document.

Bubble splice
An air bubble in a splice that can cause high loss.

Buffer
A secondary 900µm plastic coating with no optical function that is adhered around the coating of an optical fiber to cover, identify, and protect the fiber.

Buffer tube
Buffer tubes accommodate 250µm coated fibers in a loose tube cable configuration. They can be filled with gels, powders, threads, or tapes to resist moisture intrusion.

Bulge splice
Slight overfeed results in bulging at the splice point. Also known as a fat splice.

Buried
Cable placed by trenching, direct burial, plowing, boring, or installation into underground ducts.

Butt closure
Closure with cable ports located at one end of the closure.

Bypass switch
A high-speed switch that transfers an optical signal to an alternate fiber.

Byte
One segment of digital information; usually 8, 16, or 32 bits equal to a single character. Defined with a capital “B” as opposed to “bits”, which uses a lowercase “b”.

Cabinet
A container that may enclose connection devices, terminations, and equipment.

Cable assembly
A fixed length of cable with connectors installed on both ends. Sometimes called a patchcord, patch cable, or jumper.

Cable jacket
The protective outer covering of wire or optical cable. Common materials include polyethylene (PE), polyurethane (PU), polyvinyl chloride (PVC) and Teflon (plenum).

Cable rack
Vertical or horizontal open support attached to a ceiling or wall.

Cable tray
A ladder, trough, solid bottom, or raceway intended for, but not limited to, the support of telecommunications cable.

C-band
The C-band is the “Conventional” DWDM transmission band, occupying the 1530nm to 1565nm wavelength range, as specified in ITU-T G.692. Most erbium-doped fiber amplifiers (EDFAs) operate in the C-band. See *conventional band*.

Center wavelength (CW)
The nominal value operating wavelength in a laser; thereby, the wavelength defined by a peak mode measurement where the effective optical power resides. Also, the average of the two wavelengths measured at half amplitude points of the power spectrum in lasers and LEDs.

Central office (CO)
The building in which telephone companies, etc., locate their switching equipment and terminate their circuits. Sometimes called an “exchange.”

Central strength member (CSM)
A semi-rigid, fibered glass or metallic rod located in the center of a multifiber cable assembly. Usually dielectric or fiberglass, it provides a directional form

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for wrapping and stability. This inhibits the buffers from being damaged (stressing the fibers) during the bending of the cable.

Central tube cable
See *Unitube cable*.

Centralized cabling
Provides connections from the work areas to the centralized cross-connect by allowing the use of pull-through cables, an interconnect, or splice in the telecommunications closet.

Chromatic dispersion (CD)
The variation in the velocity of light (group velocity) as a function of wavelength. It causes pulses of a modulated laser source to broaden when traveling within the fiber, up to a point where pulses overlap and bit error rate increases. CD is a limiting factor in high-speed transmission and must be properly compensated, which implies proper testing. A combination of material and waveguide dispersion.

Cladding
The low refractive index material, usually glass, that surrounds and protects the core and provides the optical refractive barrier.

Cleave
A technique where an optical fiber is scored and broken to produce flat end surfaces that are perpendicular to the longitudinal axis of the fiber. See *scribe*.

Cleave and crimp
A connector installation technique, also known as a no-polish connector. The plug is installed onto the cable with the optic protruding from the end. The cable is crimped to the connector and the optic is cleaved as close to the connector endface as possible.

Cleave tool
A device with a scribing blade, usually made from either diamond or tungsten carbide, used to score a fiber in order to break it without causing a fracture, hackles or angular irregularities. Also known as a cleaver or scribe tool.

Closed circuit television (CCTV)
Video transmissions not provided for public access.

Closure
See *splice closure*.

Coarse wavelength division multiplexing (CWDM)
Applies to greater separation of wavelengths than DWDM. In single-mode applications, CWDM defines a 20nm separation from 1471nm to 1611nm. With multimode fibers, the wavelengths are 778nm, 800nm, 825nm, and 850nm.

Coating
A 200µm or 250µm two-part primary acrylate layer with no optical function that is adhered around the cladding of an optical fiber during manufacture to cover, identify, and protect the fiber.

Coaxial cable
A type of cable with a central conductor, an insulator, and a solid or braided shield inside a tough jacket. The inner insulation maintains a constant distance between the central conductor and the shielding, providing a superior quality signal over longer distances.

Coefficient of expansion
The rate that a material or composite object expands or contracts due to temperature changes.

Coherence
Lasers and LEDs emit coherent light waves that are in phase with one another. Coherence describes properties of the correlation between a single wave, or between several waves or wave packets. When interfering, two waves can add together to create a wave of greater amplitude than either one (constructive interference) or subtract from one another to create a wave of lesser amplitude than either one (destructive interference).

Collimation
A process in which a divergent or convergent beam of radiation is converted into a beam with the minimum divergence as possible, preferably parallel.

Color code
A color system for circuit identification by use of solid colors, contrasting stripes, tracers, braids, surface markings, etc., as determined by the TIA 598 standard.

Community antenna (or access) television (CATV)
Often called cable television, CATV uses fiber and coaxial media to provide voice, video, or data services.

Competitive local exchange carrier (CLEC)
A company that provides its own network and switching in competition with the already-established ILEC. A newly-formed exchange company in direct competition with the ILEC for the telecom transport market in a specific area. Also known as competitive access provider (CAP).

Composite cable
An NEC term to describe a cable containing mixed media such as fiber with either coax, twisted pair, or power conductors under a common sheath. In wire-

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less applications and regions outside of the US, this configuration may also be referred to as a hybrid cable.

Compression
A technique to minimize bandwidth requirements by reducing the data stream needed to convey the information.

Conduit
A pipe made of metal, plastic, or clay used for the installation of communications or power cables between two or more locations.

Cone of acceptance
See *critical angle*.

Connector
A device installed on the end of an optical fiber to allow it to be connected to another fiber or to a transceiver, test equipment or other device. Connectors are 'mated' via an adapter to properly align and allow the light to pass from one connector to the other. They are available in many different form factors. In the communications space, SC and LC single fiber connectors and MPO multi-fiber connectors are the most common. Specific details are listed in each connector definition in this document. Other connector styles include ST, FC, MU and several vendor specific styles.

Consolidation
A step during the optical fiber manufacturing process during which the bait rod is removed and the remaining silica is heated at high temperatures (sintering) to drive out impurities and water and leave only a pure glass rod.

Continuity testing
A test that shows that the optical path is continuous with no breaks.

Continuous wave (CW)
Energy is emitted from a module continuously, rather than in short pulses. CW applications require the laser to be on at all times. Constant output from an optical source that is active but not modulated by a signal.

Controlled environment vault (CEV)
A reinforced vault designed as an environmentally-stable underground area to house fiber optic transmission equipment and electronics for switching, monitoring, back-up power, remote terminals, etc.

Cordage
Tight buffered breakout cables used to build patch cords (jumpers). Internally, the fibers are normally one or two 900 micron coated fibers. The term "zipcord" describes a two-fiber cordage to allow two separate plugs to have their own strain relief.

Core
The light guiding part of the fiber with a refractive index higher than that of the cladding.

Core concentricity
A measure of the relationship between the geometric center of the core of an optical fiber and the geometric center of the cladding, or how centered the core is.

Core ovality
A ratio of the minimum to maximum diameters of the core within an optical fiber, or how round the core is.

Coupler
See *splitter*.

Coupling loss
The optical attenuation of a connection or passive device, expressed as a value in dB.

Coupling ratio
A measure of how a device distributes light from its inputs to its outputs. Expressed as either a percentage or in dB.

Crimp sleeve
A sleeve of lightweight metal is deformed by compression to encapsulate material and provide strain relief at the rear of a fiber optic plug.

Critical angle
The minimum angle at which light can be propagated within a fiber. Sine critical angle equals the ratio of the numerical aperture to the index of refraction of the fiber core.

Cross-connect
See *patch panel*.

Cross-phase modulation (XPM)
A nonlinear optical effect where one wavelength of light affects the phase of a similar wavelength of light.

Crush resistance
A test that determines the ability of a fiber optic cable to mechanically and optically withstand the effects of a compressive force. Testing specifies the changes in optical transmittance or attenuation during compressive loading. Specified in the TIA-455-41 "Compressive Loading Resistance of Fiber Optic Cables" fiber optic test procedure.

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Curing oven
An oven specifically manufactured to use thermal curing to harden the epoxy injected into a fiber-optic ferrules.

Customer premises equipment (CPE)
The telecommunications terminal equipment located on the customer's premises, including telephones, private branch exchanges, and data terminals.

Cutback method
A technique for measuring fiber attenuation by performing two transmission measurements. One is done at the output end of the full length of the fiber. The other is usually done within 13 meters of the input end and accessed by "cutting back" the test fiber and measuring the change in the pre- and post-cutback measurements.

Cutoff wavelength
The wavelength at which a particular waveguide mode ceases to be a bound mode. When transmitting lower than a single-mode fiber's cutoff wavelength, the fiber transmits multimode. For G.652 single-mode fibers the cutoff wavelength is 1260nm. For G.655 fibers, it can range from 1260nm to 1450nm.

Dark fiber
An unused fiber installed for future use.

Data communications
The transmission of data from one point to another.

Data link
A fiber optic signal transmission system that carries information in digital or analog form. Usually applies to short-distance communications (less than a kilometer).

dB
A decibel, a logarithmic unit describing the ratio of two powers. Used to measure attenuation, reflectance, and amplification of optical signals. The ratio of two power levels, P1 and P2, expressed by -10 log10(P1/P2).

dB/km
A logarithmic unit that describes the ratio of loss of power per kilometer distance, always referenced to a specific wavelength, e.g., 0.35dB/km at 1310nm. Used by fiber and cable manufacturers to define the fiber's attenuation.

dBm
Decibels relative to one milliwatt. A positive number indicates the power is above one milliwatt; a negative number indicates the power is below. This unit has become common in fiber optic communication systems because the power of light sources used with optical fibers is on the order of one milliwatt.

Deadzone
An area where an OTDR cannot make measurements. It is limited by the laser's pulse width, the reflection of the front panel connector, and detector circuitry. The shorter the pulse width, the shorter the deadzone.

Deadzone box
A package with internal fiber that is used to test fiber spans with an OTDR, allowing attenuation and connector reflectance to be measured within the OTDR's deadzone. The internal fiber must be at least 20 times the OTDR's minimum pulse width.

Demarcation point
The point of interconnection between service provider's terminal equipment and a building's wiring.

Demultiplexer (Demux)
A device that separates the two or more signals that have been combined into a multiplexed signal. An optical demultiplexer separates signals at different wavelengths. An electronic demultiplexer separates signals that have been electronically multiplexed by time (TDM) or frequency (FDM).

Dense wavelength division multiplexing (DWDM)
Specified by ITU-T G.694, DWDM is the transmission of multiple optical wavelengths over a single-mode fiber with spacings of 200GHz (1.6nm), 100GHz (0.8nm), or 50GHz (0.4nm). First implemented in the 1990s, it is mostly used for oceanic, long haul, and metropolitan area networks.

Depressed-clad optical fiber
The inner cladding, next to the core, has a lower index of refraction than the outer cladding region. Depressed refers to the IOR mismatch between the two claddings, resulting in a small MFD that reportedly fusion splices more readily but tends to be less sensitive to the bending losses encountered in most enclosures.

Detector
A device such a photodiode or photodetector that converts optical energy into electrical energy. They can be made from various semiconductor materials, depending on the wavelengths to detect. The positive-intrinsic-negative (PIN) and the avalanche photodiode (APD) types are used in fiber optics. PIN types can be used for analog or digital systems, while APDs with their internal amplification can only be used in digital systems.

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Detector-amplifier
A device in which an optical detector is packaged with electronic amplification circuitry.

Dielectric
An insulating (nonconducting) medium.

Differential group delay (DGD)
A delay caused by different arrival times of optical signals, which results in modal dispersion. In multimode fibers, DGD is the delay difference of the various modes. In single-mode fibers, DGD can be caused by chromatic, waveguide, and polarization mode dispersion.

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 data format that uses discrete varying signals to contain information. Used in fiber optics as this format is easier to process and multiplex, and it is less sensitive to noise than analog transmission.

Digital signal (DS)
A hierarchy of digital signal speeds used to classify capacities of digital lines and trunks. The fundamental speed level is DS-0 (64kb/s).

Digital subscriber line (DSL)
A generic name for a family of digital lines provided by local telephone companies to their subscribers.

Diode adapter receptacle
Designed to house LED or PIN/APD diodes in a receptacle that allows the mating plug to position the fiber for an optimum coupling efficiency.

Diplexer
A component used to provide two functions, such as multiplexing or filtering optical signals. For example, a diplexer used at an FTTx optical network terminal filters the downstream 1490nm wavelength and multiplexes the upstream 1310nm wavelength to or from a single fiber.

Direct buried
See *buried*.

Directional coupler
A fiber optic coupler that preferentially transmits light in one direction.

Directionality
A quantification of how much light is passing in any direction, measured in dB. If a 0dBm signal passes through a coupler with 50dB directionality, only -50dB (0.01µm) will pass in the wrong direction.

Directly-modulated laser (DML)
A laser directly modulated by electrical voltage and current.

Dispersion
The spreading of a pulse of light as it travels over the length of a fiber and is the cause of bandwidth limitations in fiber. For single-mode systems, chromatic dispersion is a combination of material (and waveguide dispersion. Another type of dispersion is polarization mode dispersion (PMD). In multimode systems, modal dispersion is caused by differential optical path lengths known as differential mode delay.

Dispersion-compensating fiber (DCF)
A type of specialized fiber designed to offset or compensate for chromatic dispersion in single-mode fibers.

Dispersion compensation module (DCM)
Dispersion compensation modules use a chirped fiber Bragg grating (FBG) and a optical circulator, which act as an individual wavelength or channel filter. Faster wavelengths are reflected further in the filter than slower wavelengths, enabling the slower wavelengths to catch up. The amount of delay is determined by the physical characteristics of the FBG. DCMs typically have insertion losses around 5 dB, consisting only of circulator and reflection losses. Tunable versions are also available.

Dispersion-shifted fiber (DSF)
Specified by ITU-T G.653, this fiber provides low attenuation and dispersion at 1550nm. It could not be used with DWDM as it caused four wave mixing and has been obsoleted and replaced by G.655 nonzero dispersion-shifted (NZDS) fiber.

Distributed feedback (DFB) laser
A laser that uses an internal grating to reduce the line width of the laser, and may be used for analog applications, e.g., AM/FM/DWDM.

Distribution cable
A tight buffered non breakout style cable mostly used for indoor installations. Jackets can be plenum, riser, or low smoke zero halogen to meet building codes. Internally, the fibers have a 900 micron coating. In the outside plant, the term "distribution cable" is used by service providers to describe the cable between the feeder (backbone) and drop cables.

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Distribution panel
A combination of a patch panel and splice panel.

DOCSIS
The Data-Over-Cable-Service Interface Specification that permits a cable modem termination system to be designed as either a layer 3 router or layer 2 switch. Used by the CATV industry.

Dopant
A material, usually germanium or boron oxide, added to silica to change its index of refraction.

Doping
Controlled addition of small quantities of an impurity to a pure substance in order to change its characteristics, e.g., increase the refractive index of the fiber core.

Draw
A step during the optical fiber manufacturing process in which a consolidated preform is loaded into a high temperature furnace and "drawn down" to the diameter of an optical fiber's cladding, then cooled.

Dry fit
It is when fiber is inserted into a plug's ferrule or termini to verify the strip length and fit prior to insertion of the bonding adhesive. This helps the technician to recognize the "feel" of the fiber insertion process.

Dual inline package (DIP)
Only refers to pigtailed dual inline packaged devices.

Duct
A small pathway, generally 4" or smaller in diameter. Smaller inner ducts or fabric mesh inner duct are installed to allow cables to be pulled through. It may be buried, installed aerially, or within a building. Common types include smooth wall, ribbed, and corrugated.

Duplex
Two; twin. Refers to the type of fiber optic cable, e.g., duplex zipcord, or connector, e.g., duplex SC, LC,.

Duplex transmission
Transmission in both directions, either one at a time (half duplex) or both directions simultaneous (full duplex)

Dust cap
A protective cover that fits tightly over the connector ferrule, plug, or sleeve. Usually made of plastic, it is used to protect the connector endface.

Dynamic range
For an optical instrument, defined as the difference between the smallest signal that can be detected at a specified wavelength and the strongest signal that can be detected accurately. Expressed in dB.

E-band
Defined by ITU-T G.692 as "extended" for wavelengths between 1360 and 1460nm, this band includes the high OH peak in single-mode fibers. G.652D fiber is designed for transmission within this band. In FTTx systems, the term can be confused with the enhancement band, which the ITU-T G.983 and G.984 PON FTTx standards define as the wavelengths between 1550 and 1560nm for RF overlay transmission of video signals. See *extended band*.

Edge-emitting diode (ELED)
A diode that emits lights from the edge of a semiconductor chip, producing higher power and narrower spectral width.

Electrode
The device in a fusion splicer that discharges the electric energy, fusing two or more fibers together.

Electromagnetic interference (EMI)
The frequency spectrum of electromagnetic radiation that extends from subsonic frequency to X rays. Not to be used in place of RFI.

Electromagnetic pulse (EMP)
An extremely strong but short-lived magnetic field that results from a solar flare or nuclear explosion. A high-altitude explosion could cause a damaging magnetic field up to 3000 miles away.

Emergency restoration kit (ERK)
A kit consisting of a length of optical cable, two closures, splice products, tools, and fixtures to assist in temporary or permanent restoration of cable repairs.

Encircled flux (EF)
Defined by IEC 14763, TIA 455-203, and IEEE 802.3ae, EF is the most accurate test for determining optical attenuation for multimode fibers.

End face
The surface area of the fiber optic ferrule where the optical fiber is centered and polished.

End finish
Surface condition at the optical plug/ferrule end.

End separation loss
The optical power loss caused by distance between the end of a fiber and a source, detector, or another fiber.

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Entrance facility
The entrance to a building for communications and power. It provides the transition between the outside plant and the premises. The entrance facility can connect to telecom, utility, or communication rooms or closets.

Epoxy
A polymer resin and activator that are mixed together to create a chemical reaction. The resulting adhesive is then used to join two materials together, then cured or dried to create a permanent bond.

Epoxyless connector
A connector that requires no epoxy to hold the optical fiber to the connector.

Equilibrium modal distribution (EMD)
Steady-state modal distribution in multimode fiber, achieved some distance from the source, where the relative power in the modes becomes stable with increasing distance. Mandrels are used to simulate EMD during multimode testing.

Erbium-doped fiber amplifier (EDFA)
An optical amplifier that uses active erbium-doped fiber and a pump source (laser) to boost or amplify the optical signal. Used in DWDM, CATV HFC, RF overlay and RFoG systems. Amplifies mostly in the C-band (1530 to 1565nm).

Ethernet
A data communications protocol for premises and local access networks (IEEE 802.3). Ethernet features variable length packets that allow data to be sent with less overhead.

Ethernet PON (EPON)
Based on IEEE 802.3ah protocol for Ethernet, EPON is a network data transport using a variable length packet structure up to 1,518 bytes at data rates up to 1,000Mb/s over single-mode fiber. The EPON format uses up to 1:32 optical splitters and can use either one fiber bidirectionally (BX) or two fibers (LX) in low medium or high-power configurations.

Excess loss
The amount of light lost in a coupler, beyond that inherent in the splitting to multiple output fibers.

Extrinsic loss
Loss caused by imperfect alignment of fibers in a connector or splice such as lateral offset, angular misalignment, end separation, and end finish.

Fabry-Perot (FP) laser
A multi-longitudinal mode laser diode with a semiconductor on each end to form a resonant chamber to create the lasing effect. Used in digital applications. Limited to 10Gb/s speeds and used only for digital transmission.

Fanout kit
A kit designed for loose tube cable structures with multiple fibers per buffer tube. The fanout kit provides a 900µm tubing over each 250µm coated fiber strand, which allows for additional protection.

Fast Ethernet
IEEE 802.3 standard operating at 100Mb/s.

Fault
Break or stress in the continuity of the optical fiber's normal performance.

Fault finder
See *fiber break locator.*

Ferrule
Most often made of ceramic but can also be steel or plastic. The fiber is bonded internally to the ferrule, which provides the alignment with the mating sleeve and opposite ferrule. Ferrule endfaces can be flat, radiused, or angled depending on the type of fiber and endface polish.

Fiber
A single optical transmission element characterized by a core, a cladding, and a coating. Two common structures, single-mode (with a step-index profile) or multimode (with a graded-index profile) are used for fiber optic communication systems. Different variations are made depending on the attenuation, bandwidth, dispersion, wavelengths, and mechanical requirements.

Fiber amplifier
Most common are the erbium doped fiber amplifiers (EDFAs), semiconductor optical amplifiers (SOAs), and Raman amplifiers, which are used to increase signal gain without electrical conversion.

Fiber Bragg grating (FBG)
A piece of photo-refractive fiber that is exposed to high-intensity UV interference patterns, causing it to reflect a specific wavelength while being transparent to all other wavelengths. Used as a filter in WDM systems.

Fiber break locator
A low-cost, simplified OTDR used to locate breaks in optical fiber cables. Not to be confused with a visual fault finder, typically called a visual fault locator (VFL).

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Fiber coating
A UV cured material immediately surrounding the glass cladding that serves to protect the integrity of the fiber from surface damage and stresses. Normally 200µm or 250µm for outside plant cables and upjacketed to 900µm for indoor cables.

Fiber connector (FC)
A keyed connector with threaded coupling mechanism that has 2.5mm ferrule. Mostly used in single-mode systems and test equipment.

Fiber demarcation box (FDB)
A fiber demarcation box provides a service provider with a customer disconnection point, either via a splice or connector interface. Slack cable storage and battery backup are stored here as well.

Fiber distributed data interface (FDDI)
A duplex, counter-rotating, and self-healing ring communication standard (ANSI X3T9) that provides a 100 Mb/s data format. Often used to interconnect low-speed protocols such as Token Ring and Ethernet.

Fiber distribution unit (FDU)
Enclosures that house and organize groups of fibers.

Fiber optic cable
A communications cable that consists of one or more optical fibers, each capable of transmitting data via modulated light waves. Loose buffered types for outside plant applications can be armored or dielectric stranded or central tube designs. Applications include aerial figure 8, ducted, direct buried, all dielectric self-supporting (ADSS), and optical ground wire (OPGW). Indoor designs are tight buffered breakout or distribution types with cable jackets designed to meet building codes for use in plenum, riser, and low smoke zero halogen environments.

Fiber optic test procedure (FOTP)
Standardized methods for testing various fiber optic components, as specified in the TIA-455 standard.

Fiber optics
A method of using light over glass strands to transmit and receive signals for voice, video, data, medical, sensing, illumination, and other communications applications.

Fiber proof testing
A mechanical tensile test used to measure the axial strength of an optical fiber, normally 100 kpsi.

Fiber sensor
A sensing device in which the active sensing element is an optical element attached directly to an optical fiber. The measured quantity changes the optical properties of the fiber so that it can be detected and measured. In some cases the optical fiber itself acts as the sensor.

Fiber endface surface finish
The overall visual surface quality of a finished end face of a fiber optic connector under magnification. Criteria usually include, scratches, pits, cracks, and contamination. When describing the end face quality of a cleaved fiber, terms such as hackle, mist, chips, cracks, and roll-off may be used to describe undesired characteristics.

Fiber to the antenna (FTTA)
Fiber to the cell tower; provides greater bandwidth and a transition to IP requirements using Ethernet.

Fiber to the building/business (FTTB)
A topological reference to a network that supports multiple subscribers in a single structure, i.e., a business or a building. Multiple dwelling unit (MDU) defines residential use and multiple tenant unit (MTU) defines business units. In order to classify as FTTB, the fiber must at least: (a) enter the building; (b) terminate on an external wall of the building; (c) terminate no more than 2m from an external wall of the building; (d) enter at least one building within a cluster of buildings on the same property; (e) terminate on an external wall of one building within a cluster of buildings on the same property; or (f) terminate no more than 2m from an external wall of one building within a cluster of buildings on the same property.

Fiber to the cell (FTTCell)
The use of fiber optics for cellular communication using macrocells, micro and small cells, and DAS. Modern cellular systems utilize C-RAN technology that extends a fiber front-haul from the head end directly to the antenna or radio.

Fiber to the curb/customer (FTTC)
Distribution of communication services by providing fiber optic links to a central point in each neighborhood and continuing to homes by either twisted pair or coax.

Fiber to the desk (FTTD)
Transmission system using fiber optics from transmitter to desktop.

Fiber to the home (FTTH)
An access network architecture in which the final connection to the subscriber's premises is optical fiber. The fiber optic communications path is terminated on or inside the premises for the purpose of carrying communication services (voice, video, data) to a single subscriber. In order to be classified as FTTH,

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the access fiber must cross the subscriber's premises boundary and terminate: (a) inside the premises; (b) on an external wall of the subscriber's premises; or (c) no more than 2m from an external wall of the subscriber's premises. FTTH excludes architectures where the optical fiber terminates before reaching the premises and where the access path continues to the subscriber over a physical medium other than optical fiber, i.e., coax.

Fiber to the node (FTTN)
An access network in which fiber is used for part, but not all, of the link from the OLT to the end user. An optical-to-electrical conversion takes place at a node, which typically serves a neighborhood. The terminal network segment is usually twisted copper pair (FTTC) or coaxial cable (HFC). Most current CATV and telephony networks have FTTN architectures.

Fiber to the premises (FTTP)
Coined around the preliminary debates associated with the RBOCs and the CLECs before the FCC triennial review of the Telecommunications Act of 1996. A less generic term for fiber to the user (FTTx).

Fiber to the user (FTTx)
A more generic term than FTTP covering all types rather than one specifically.

Fibre Channel
A high-speed interconnection ANSI standard for connecting supercomputers with peripheral devices up to 10 km away at transmission rates over 1 Gb/s. Used for the broadcast industry, storage area networks, and data centers.

Figure8 cable
A type of cable with a builtin messenger designed for aerial installations.

Figure8 polishing
When a connector is hand polished on a lapping film/plate combination in a Figure8 pattern to minimize scratches by using a different area of the lapping film.

Fillers
Nonconducting components cabled with optical fibers to impart roundness, flexibility, tensile strength, or a combination of all three to the cable.

Firestop
A material, device, or assembly of parts installed within a cable system in a fire-rated wall or floor to prevent the passage of flame, smoke, or gases through the rated barrier.

Five nines
Any system operating 99.999% of the time.

Forward error correction (FEC)
A method to improve the performance of large-capacity optical transmission systems. System designs employing FEC can accept relatively large BER (better than 10^{-12}) in the optical transmission line before encoding.

Four wave mixing (FWM)
A collective name for a group of nonlinear processes where up to three different incident waves interact in the medium, resulting in a fourth wave.

Frequency
The number of cycles per unit of time, denoted by Hertz (Hz); 1 Hertz = 1 cycle per second.

Frequency division multiplexing (FDM)
Two or more signals combined at different frequencies so they can be transmitted as one signal.

Frequency modulation (FM)
A modulation scheme in which the message signal modulates a carrier signal so that the frequency (as opposed to the amplitude or phase) of the carrier is varied.

Fresnel reflection
Reflection of a portion of the incident light at a planar interface between connectors, mechanical splices, or two homogeneous media having different refractive indices.

Full width half maximum (FWHM)
Used to measure the spectral width of light sources. Measure the spectral width at 3 dB (half power from peak) and at the full width of the source's power peak.

Fusion splicer
A portable machine that optically joins or welds optical fibers together using precision alignment and a discharge of voltage across two electrodes.

Gain
Increased backscatter inherent within OTDR. Fiber measurements due to different core sizes or core mismatch. A gainer refers to an OTDR signature that shows splice loss in one direction and "gain" of the reflected signal in the opposite direction.

Gateway
A computer that connects and translates protocols between disparate types of networks.

Ghost
An OTDR signature caused by an optical echo that occurs when light reflects off two reflective surfaces, creating a false image at double the distance from the initial event showing no loss.

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Giga (G)
A prefix meaning one billion.

Gigabit Ethernet
The IEEE 802.3z standard for high-speed Ethernet, capable of transmitting one billion bits per second over fiber. 802.3ab is Gigabit Ethernet over twisted pair copper. It provides increased network bandwidth and interoperability and can be used in backbone environments to interconnect multiple lower-speed Ethernet systems.

Gigabit PON (G-PON)
Standardized in ITU-T G.984, G-PON handles data rates up to 2.5Gb/s and split ratios up to 1:64. The standard features the G-PON encapsulation method (GEM), which allows for the transmission of Ethernet packets and ATM cells.

Gigahertz (GHz)
A unit of frequency equal to one billion Hertz.

Glass blank
The pure, solid glass mass formed after sintering an oxide preform. This glass blank undergoes a drawing process to become optical fiber.

G-PON encapsulation method (GEM)
A method of data encapsulation over the G-PON network, similar to ATM, that uses variable length frames to transport up to an encapsulated payload of 1500 bytes. Capable of sending ATM cells or Ethernet packets over the network.

Graded-index multimode fiber (GI-MMF)
A type of multimode fiber where the refractive index of the fiber core decreases radically towards the outside of the fiber. Four types of GI-MMF have been specified in IEC 60793-2: legacy OM1 (62.5/125) and OM2 (50/125) fibers and the newer, high bandwidth, laser-optimized OM3 and OM4 fiber (both 50/125), designed for VCSEL lasers and Gigabit data rates.

Greenfield
Network deployment in an area under development. Since everything is being built for the first time, network construction can be done with few obstructions and installation can be accomplished parallel to other utilities.

Ground
An electrical connection to the earth, generally through a ground rod.

Group delay (GD)
The difference in arrival time between wavelengths.

Handhole
An access opening provided in equipment or in a below-the-surface enclosure into which personnel reach, but do not enter, to work with or place cable. Also known as maintenance access handhole.

Head end
Central distribution point for a CATV system where a link is created between the HFC system and any external data networks. Video signals are received, and frequency is converted to the appropriate channels, combined with locally originated signals, and then rebroadcast.

High-definition television (HDTV)
Digital television with significantly more resolution than that of a good NTSC or PAL television signal. The specific resolution can vary, however it is typically about twice the resolution of standard television signals and has a 16:9 aspect ratio.

High-density connector
Typically, connectors with multiple fibers in a small form factor housing, i.e., MPO, MTP®.

High-density polyethylene (HDPE)
A jacketing material used in harsh environments to protect cables from accidental chemical exposure.

Home run
A PON architecture where the optical splitter is housed at the service provider's facility. Home runs are the easiest for handling changes but require a fiber rich cabling system as one fiber is dedicated for each subscriber.

Horizontal cabling
Cabling that extends between and includes the horizontal cross-connect and the telecommunications outlet.

Horizontal cross-connect (HC)
Known internationally as a floor distributor (FD), a cross-connect of horizontal cabling to other cabling, e.g., horizontal, backbone or equipment. Could be a patch panel or LAN (small) panel.

Hot melt
A type of connector pre-loaded with thermoplastic adhesive. The ferrule is heated to liquefy adhesive for fiber optic insertion and then cooled to re-harden the adhesive.

Hub
In LANs, a hub is the core of a star, a central point on a network where circuits are connected. In ITS systems, it is a small building or hut located along a roadway or under bridges, which is used to consoli-

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date video and data signals between the traffic management center and distributed to roadside cameras, DMS, VMS, or traffic control systems.

Hybrid cable
An NEC term for a cable with multiple types of optical fibers (e.g., multimode and single-mode) under a common sheath and is differentiated from the other NEC term, composite cable, which typically includes mixed media. In wireless applications and regions outside the US, both of these cable types are referred to as hybrid cables.

Hybrid cable assembly
A jumper assembly with different connections on each end. May also mean an assembly containing two different fiber types, or one containing copper and fiber outside of an NEC application.

Hybrid fiber coax (HFC)
A hybrid system, used by the CATV industry, that employs a fiber optic backbone and coax cables for final distribution from the node to the customer.

IckyPic
A nickname for the gel added inside a cable to prevent water penetration. Used in outdoor cables.

Impact resistance
A test that determines the ability of fiber optic cables and cable assemblies to withstand repeated impact loads. It measures the number of broken fibers, damage to the outer sheath, and any change in the optical transmittance or attenuation. Specified in the TIA 455-25 "Repeated Impact testing of Fiber Optic Cables and Cable Assemblies" fiber optic test procedure.

Incumbent local exchange carrier (ILEC)
The dominant phone carrier within a geographic area that provides local exchange service to that area.

Index matching gel
A gel material whose index of refraction is almost equal to that of the fiber core. It is used to reduce Fresnel reflections in mechanical splices or cleave and crimp connectors.

Index of refraction (IOR)
The ratio of the speed of light in a vacuum to the speed of light in a material. When light strikes the surface of a transparent material, some light is reflected while some is bent (refracted) as it enters. The IOR is used to calibrate OTDRs for measuring fiber length.

Indium gallium arsenide (InGaAs)
The components of crystalline semiconductors used in fiber optic photodetectors.

Infrared
Light wavelengths extending from 770nm on.

Inline splice closure
Closure that has cable ports at opposite ends.

Innerduct
Usually a nonmetallic pathway that may be placed within a duct to facilitate initial and subsequent placement of multiple cables in a single duct In indoor applications.

Insertion loss
Total optical power loss caused by the insertion of an optical component such as a connector, splice or splitter.

Inspection scope
A microscope or digital scope that inspects fiber connector ferrule and termini endfaces for polish quality, damage, or contamination. Many scopes include auto pass/fail detection against IEC 61300-3-35 endface quality standards.

Institute of Electrical & Electronics Engineers (IEEE)
A standards organization representing the United States on the ISO in the areas of electrical or electronic standards. Writes standards on communications including Ethernet and OPGW and ADSS cables.

Insulated Cable Engineers Association (ICEA)
Professional organization dedicated to developing cable standards for the electric power, control, and telecommunications industries.

Interbuilding backbone
A network that provides communications between buildings, (e.g., college campus, office park, or military installation).

Interconnection
A scheme that provides for the direct connection of a cable to the other cable without a patchcord or jumper.

Interexchange carrier (IXC)
Any common carrier that provides long-distance services, i.e., Sprint or AT&T.

Interference bands
Measured on an interferometer, the dark lines or "bands" optically projected across the face of an object to determine its shape by means of measured elevation.

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Interferometer
A measurement instrument that projects interference bands across the face of fiber optic connector. The bands are used to determine the centering, angle of apex offset and radius of curvature of the fiber optic connector.

Intermediate cross-connect (IC)
A cross-connect between first and second level backbone cabling. It can be between main (MC) and horizontal (HC). Normally would consist of a patch panel.

Intermediate distribution frame (IDF)
Currently known as intermediate cross-connect (IC), or internationally as the building distributor (BD). A connection between first and secondary cabling topologies within a building. Usually two separate patch panels connected with a patch cord connecting the two backbones. Typically located within a dedicated telecommunications space such as a telecom room (TR).

International Electrotechnical Commission (IEC)
An international standards body responsible for a wide range of recommendations and standards for telecommunications.

International Standards Organization (ISO)
An international body funded by the United Nations, that provides consistent worldwide standards. U.S. membership is provided by ANSI.

International Telecommunications Union (ITU)
The international body for communications standards. The telecommunications group within ITU is designated as ITU-T.

Internet protocol (IP)
A set of rules for how data is transmitted from place to place on the Internet. IP is a connectionless protocol in which data is broken down into small bundles known as packets. Each packet is transmitted separately, possibly along a different route than other packets from the same message.

Internet protocol television (IPTV)
A compressed digitized video provided through packet or cell transmission (FTTH) to subscribers.

Internet service provider (ISP)
An organization whose business is connecting users to the Internet. By serving as the interface between end users and the Internet, the ISP's equipment is analogous to a CATV head end or telephony CO.

Intrabuilding backbone
A network that provides communications within a building; often referred to as the riser backbone in vertical buildings.

Intrinsic losses
Losses arising from differences in fiber tolerances.

Isolator
A passive fiber optic component that either allows only unidirectional passing of light or that passes only some wavelengths of light. Used in conjunction with lasers or optical amplifiers to reduce or remove backreflections.

Jacketing
The outer jacket of a cable, which can be made from a variety of materials including but not limited to HDPE, MDPE, PVC, *et. al*.

Jitter
The variation in time of a received signal compared to the instance of its transmission or compared to a fixed time frame at the receiver. Examples of jitter sources include signal-pattern-dependent laser turn-on delay jitter, noise-induced jitter on a gating turn-on point, gating hysteresis jitter, and gating jitter that accumulates in a link between two nodes.

Jumper
See *patchcord*.

Kellems grips
Wire, aramid or synthetic mesh that is placed around the cable to be installed, intended to provide positive pulling power. Also known as pulling or mesh grips.

Kevlar™
Strands of protective aramid fiber used to provide strain relief in cable assemblies. Also used in cables as their dominant means of strain relief. Kevlar™ is a trademarked name by DuPont.

Keyed
Connectors in which the plug and adaptor are fixed in alignment to prevent rotation and physical fiber endface damage.

Kilo (k)
Numerical prefix denoting one thousand.

Kilometer (km)
Standard length of measurement for fiber optics; 1,000 meters, 3,281 feet, or 0.621 miles.

Kpsi
Tensile strength measured in thousands of pounds per square inch.

Lapping film
Sheets of a thin plastic film with grit of varying coarseness (in microns) that are used to polish fiber endfaces.

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Large core fiber
An optical fiber with a comparatively large core, usually a step-index type. Generally considered as fibers with diameters of 400 microns or more.

Laser
Light amplification by stimulated emission of radiation; a coherent source of light with a narrow spectral width.

Laser chirp
Noise created by reflected or crosstalk optical energy entering the lasing chamber.

Laser diode
A semiconductor diode that emits light in a narrow spectrum; used because of its speed and efficiency.

Laser-optimized multimode fiber
The ISO/IEC 11801 standard defines two types: the OM3 50/125 fiber, with an effective modal bandwidth of 2,000MHz-km at 850nm, and the OM4 50/125 fiber, with 4,700MHz-km bandwidth.

Lashing
Attaching a cable to a supporting strand or cable using a steel or dielectric filament around both cable and messenger.

Last mile
The last mile is the local access network that extends from the CO to the end-user subscriber. Also called the local loop network, it was traditionally copper-based but has increasingly become mostly fiber-based.

Latency
Delay of a signal in time, which can be caused by transmission, processing, rotation, and propagation delays.

Laydown
A step during the optical fiber manufacturing process in which gases are deposited as a wet "soot" upon a quartz rod by flame hydrolysis, ultimately creating a preform for the glass core and cladding of an optical fiber.

L-band
The "long" DWDM transmission band, occupying the 1565nm to 1625nm wavelength range.

LC connector
This small form, latched connector provides high density and is common in FTTH networks, data centers and other fiber intensive applications. The LC is available in many form factors including several simplex, duplex, and hardened versions.

Least square approximation (LSA)
A technique used by OTDRs to automatically measure splice attenuation.

Light
The region of the electromagnetic spectrum perceived by human vision is designated by the visible spectrum and nominally covering the wavelength range of 400 770nm. In optical telecommunications, the wavelength range is typically 850-1650nm.

Light-emitting diode (LED)
A semiconductor device that emits incoherent light formed by the P-N junction. Burrus (well) and edge-emitting diodes are used with systems operating up to 622Mb/s over multimode fibers.

Light source
The fiber optic transmitter in an optical loss test set (OLTS) that uses one or more LEDs or lasers at specified wavelength. Lasers used in communication systems must be stabilized and operating in continuous wave or modulated at 2kHz.

Lightguide
See *waveguide*.

Link
An optical cable with connectors attached to a transmitter and receiver.

Local access and transport area (LATA)
The geographic area that is the domain of the local exchange carrier. Bell operating companies are generally precluded from carrying traffic across LATA boundaries; this traffic must be handed off to an interexchange carrier.

Local area network (LAN)
An interconnected system of separate layer 2 and 3 network devices and IP enabled peripherals, connected by wireless, fiber, or twisted pair cabling, usually following Ethernet protocols, in a contained relatively small geographical location such a as an office building or campus.

Local exchange carrier (LEC)
The phone carrier providing local transmission services. Defined as either independent or regional Bell operating company (RBOC).

Local injection and detection (LID)
A type of core alignment fusion splicer that injects light through a macrobend prior to the splice point and detects the light through a macrobend past the splice point. This allows the splicer to achieve maximum core-to-core alignment.

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Local loop
The connection between a customer's telephone or data equipment and a local exchange company or other telephone service provider.

Long wavelength
Light in the 1300nm, 1550nm, and 1625nm wavelengths.

Loose tube cable
A type of cable where the internal 250 micron fibers are loose within buffer tubes. Types include stranded, central tube, OPGW, ADSS, and microduct cable. Also known as loose buffer cable.

Loose tube gel filled (LTGF)
A loose tube cable structure with buffer tubes filled with gel to restrict moisture intrusion. Mostly replaced with "dry" techniques, it is still used in areas of extreme low temperatures.

Loosely-coupled mode
One example would be a high order mode from a LED coupled into a multimode fiber. Higher order modes limit the bandwidth of optical fibers.

Loss
See *attenuation*.

Loss budget
The tolerable difference between the light impulse where it originates and the light impulse where it arrives at the receiving end. If too much light power has been lost along the way through deficiencies in the cable or connectors, the signal cannot be read and interpreted.

Loss windows
Fiber optic transmission typically occurs at 850, 1300, 1310, 1550, and/or 1625nm. These "windows" were selected because absorption and scattering losses were lower within them. These wavelengths require light sources and photodetectors that operate efficiently over multimode and single-mode fibers.

Low-smoke zero halogen (LSZH) cable
The standard cable used in Europe in place of plenum or riser cable types. Internationally, LSZH cables are used in place of plenum and riser cable jackets. In North America, LSZH cables are used on ships and in tunnels. Also known as zero halogen cable.

Machine polishers
Automated polishers that are capable of polishing from two to 32 connectors at one time. These polishers can provide uniform low reflection polishes (e.g., PC, SPC, UPC, APC).

Macrobending
In an optical fiber, all macroscopic deviations of the axis from a straight line; distinguished from microbending.

Main cross-connect (MC)
A cross-connect for first and second level cabling, e.g., from equipment facility connecting to all other locations (ICs and HCs). Usually would consist of a distribution or patch panel.

Main distribution frame (MDF)
Currently known as main cross-connect (MC), or internationally as the campus distributor (CD). A connection between service cables entering the building, equipment cables, and the first level backbone cabling topologies within a building or campus. Usually two separate patch panels connected with a patch cord connecting the incoming cabling to the equipment cabling or connecting the equipment cabling to the building or campus backbone. Typically located within a dedicated telecommunications space such as an entrance facility (EF) or telecommunications room (TR).

Mainframe OTDR
An OTDR with a larger chassis than a mini OTDR. Mainframe OTDRs have CRT displays, internal printers and are larger and heavier than most OTDRs. They were the most common type up till the early 1990s. Mainframes could also be provided with different laser and fiber modules as needed.

Mandrel
A mechanical device of a specific diameter that strips out higher order modes from multimode fibers to simulate equilibrium modal distribution (EMD).

Margin
The amount of additional loss that can be tolerated in a link.

Matched-clad optical fiber
Optical fiber with a cladding of consistent refractive index up to the core boundary, resulting in the desired single-mode step-index profile. Used where fibers of different periods are spliced together as they produce lower attenuation readings and are less susceptible to bending losses.

Material dispersion
Dispersion caused by differential delay of various wavelengths of light in a waveguide material.

MaxCell
A type of flexible fabric inner duct used to increase capacity of ducts.

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Media outlet
A small patch field located at work areas allowing quick termination of voice, video, and data connectors.

Medium-density polyethylene (MDPE)
A flexible, environmentally-stable thermoplastic used in outside cable jacketing.

Mega (M)
A prefix meaning one million.

Megabit (Mb)
One million bits.

Messenger wire
Galvanized wire ranging from 1/4" to 9/16" which is placed between poles and which standard cable types are lashed.

Metropolitan area network (MAN)
An interconnected data transmission system connecting users and LANs in a localized geographical area such as a city.

Microbending
An effect where small stresses or flaws create attenuation. Mostly an extrinsic effect caused by tie wraps and point deformations onto the fiber that allow light to escape. Intrinsic sources are flaws or defects in the core/cladding boundary created during the manufacturing process.

Microduct
Small HDPE ducts up to 16mm in diameter that can be installed in empty or partially filled ducts to provide space for microduct fiber optic cables.

Microduct cable
Microduct cables are designed for high-density fiber counts in a small optical cable, normally between 5-16mm. Designed for blowing into microducts.

Micron (µm)
A millionth (10^{-6}) of a meter. A common unit of measurement for fiber optic diameters.

Mid-entry
Opening a cable in the middle of a span to access the fibers. Also known as an express entry.

Military tactical cable
Heavy-duty cable designed for rugged installations and operations.

minEMBc
An abbreviation for minimum calculated effective modal bandwidth, minEMBc is used to calculate the bandwidth of multimode fiber at Gigabit data rates.

Mini OTDR
Mini OTDRs emerged in the 1990s as a low-cost, lightweight version of the mainframe OTDR. Features include AC/DC power, LCD display, and various modules for specific fiber types and corresponding wavelengths. Usually without a printer, they can store traces on disk, memory card, their internal hard disk, or via Bluetooth and WiFi.

Mini Zipcord
A separable two-fiber breakout style cable.

Modal dispersion
In multimode fibers, there are axial, lower, and higher order modes that cause modal dispersion, thereby limiting effective transmission distance. Because axial modes arrive sooner than higher order modes, this causes the pulse to spread. See *differential mode delay*.

Mode
A light path.

Mode conditioning patchcord (MCPC, ModCon)
Designed to simulate encircled flux (EF) on non-EF sources in GbE and Fibre Channel links using legacy multimode fibers and VCSEL light sources operating at 850nm. Normally it is a pair of duplex jumpers that are installed between the transmission equipment at each end of the fiber link. The transmit side has a short single-mode section that is offset fusion spliced to MMF so the light is coupled outside of the center core defect. The receiver portion is entirely multimode.

Mode field diameter (MFD)
The portion of a single-mode fiber that actually transmits the light energy. Generally 20% larger than the physical core. The size of the mode field varies with wavelength.

Mode filter
A device to remove high order modes to simulate equilibrium mode distribution in a short length of optical fiber. Also called a mandrel or mode stripper.

Mode power distribution (MPD)
The relative mode power in each mode groups of a multimode fiber.

Mode scrambler
A device for inducing mode coupling in an optical fiber.

Modulated laser
A laser module that allows users to control output power by varying a control voltage, which turns the laser on and off.

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Modulation
The coding of information onto a carrier frequency. May use amplitude, frequency, phase, or time, plus many forms of on/off digital coding.

Modulator
A waveguide device used externally to the laser to electro-optically change the refractive index of the waveguide in response to an applied electric field. The phase changes induced can result in amplitude modulation of light at the output port.

Moving Pictures Experts Group (MPEG)
Various standards, established by the, that define the amount of compression, and thereby the quality, of the resultant video information file.

Multifiber push-on connector (MPO)
A high-density array connector that can terminate multiple fibers in a single ferrule. The ferrules, made from a composite material, align fibers in rows of 12 or 16 fibers. These connectors are keyed and aligned via pins mounted at the edges of the ferrule. A mated pair consists of one pinned and one unpinned connector.

Multilongitudinal mode (MLM) laser
A laser, usually Fabry-Perot, that has a measured spectral width specified by the maximum root mean square of the spectral distribution (side modes), limited to no more than 20dB down from the peak mode.

Multimode fiber (MMF)
An optical waveguide that allows more than one mode to be guided. 50/125, 62.5/125 and 100/140 are the most common. Graded-index types are used in fiber optic communication systems. Multimode fibers are also specified by the IEC 11801 standard and classified by modal bandwidth as OM1, OM2, OM3, OM4 or OM5

Multiple system operator (MSO)
A cable television provider.

Multiplex
A concept in which independent sources of information are combined and transmitted over a single communication channel. Electronic multiplexing includes TDM and FDM, while optical multiplexing includes wide, coarse, and dense wavelength division multiplexing.

Multiplexer (Mux)
A device which combines two or more separate signals for transmission through a single fiber. Optical multiplexer combines signals at different wavelengths. Electronic multiplexer combines TDM or FDM signals electronically before they are converted into optical form.

Multitenant data center (MTDC)
A facility that provides Internet infrastructure services, such as electrical power, fire suppression, security, cooling, and network access, usually over optical fiber. Some firms lease datacenter space to other providers or individual enterprises. Colocation data centers sell space on the basis of racks, cabinets, or cages.

Multi-user telecommunications outlet assembly (MUTOA)
Used in work areas of premises networks to allow multiple terminations.

Nanometer (nm)
One billionth of a meter, or 10^{-9} meters. Most common unit of measurement for light.

Nanosecond (ns)
One billionth of a second, expressed as 10^{-9} seconds.

National Electrical Code (NEC)
A North American code that addresses proper electrical/fiber optic systems and equipment installation to protect people and property from hazards stemming from the use of those systems in buildings and structures. Updated every three years. In Canada, refer to the Canadian Electrical Code (CEC).

National Electrical Safety Code (NESC)
This outside plant code contains basic safety provisions that cover supply, communication lines, equipment, and work practices of personnel employed by utilities.

National Institute of Standards and Technology (NIST)
A U.S. government organization that develops standards in support of industry, commerce, scientific institutions, and all branches of government. The calibration of test equipment is traceable to NIST equipment.

National Television Standards Committee (NTSC)
Committee that defines specifications and methods for displaying video information on a standard television.

Neck splice
Necking or narrowing produces a high loss splice. Also caused by bad cleaves which leave a void between the fiber ends resulting in a narrow section during fusion.

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Network access point (NAP)
A major Internet connection point that allows organizations to exchange information and traffic to flow from freely from ISP to ISP.

Network adapter
A device such as an Ethernet card that enables a computer to be attached to a network. Also called a network interface card or NIC.

Network equipment building system (NEBS)
A multi-level requirement for central office equipment in the North American Public Switched Telephone Network. Originally developed by Bell Labs (now Telcordia) in the 1970s and released as a public document in 1985.

Network operations center (NOC)
The group responsible for the day-to-day care and feeding of a network. Also called a network control center (NCC).

Node
Transmission equipment placed in the outside plant to connect multiple users to a common link that extends back to a head end, CO, or similar location.

Noise
In a cable or circuit, any extraneous signal that tends to interfere with the signal normally present in or passing through the system.

Nonzero dispersion-shifted fiber (NZDS)
Single-mode fiber designed for DWDM and optical amplifier applications. Specified in ITU T G.655.

Numerical aperture (NA)
A measure of the angular acceptance for a fiber, approximately the sine of the half-angle of the acceptance cone. The NA of an optical fiber defines a characteristic of the fiber in terms of its acceptance of incoming light. "Light gathering ability" and "acceptance cone" are terms describing this characteristic.

Nylon
An abrasion-resistant thermoplastic with good chemical resistance.

O-band
The "original" transmission band, occupying the 1260 to 1360nm wavelength range, with a center wavelength of 1310nm. Used in FTTH standards for upstream transmission. See *original band*.

Occupational Safety & Health Administration (OSHA)
The main government agency for enforcement of safety and health law in the United States.

OM1
Legacy 62.5/125 multimode fiber designed for use with LEDs. Designated by IEC 11801.

OM2
Legacy 50/125 multimode fiber designed for use with LEDs. Designated by IEC 11801.

OM3
Laser-optimized 50/125 multimode fiber with an effective modal bandwidth of 2000MHz-km at 850nm. Designated by IEC 11801.

OM4
Laser-optimized 50/125 multimode fiber with bandwidth of 4,700MHz-km at 850nm. Standardized by IEC 11801.

OM5
Laser-optimized 50/125 multimode fiber with bandwidth of 4,700MHz-km at 850nm and 2,470MHz-km at 953nm. Standardized by IEC 11801.

Open system interconnection (OSI) model
A seven-layered open system interconnection (OSI) framework of standards for network communication. OSI creates an open systems networking environment where different systems can share data regardless of vendor or platform.

Operational support system (OSS)
Software that furnishes tools to provide network control, monitoring and business functions.

Operations, administration, and maintenance (OAM)
A group of network management functions that provide fault indications, performance information, and network diagnosis.

Optical access networking (OAN)
An access network made up of optical transmission links as opposed to copper links composed of twisted-pair or coaxial cabling.

Optical add/drop multiplexer (OADM)
A multiplexer typically used in DWDM systems to allow a wavelength to be added or dropped optically. Can be fixed (FOADM), reconfigurable (ROADM), or dynamic (DOADM).

Optical amplifier
A device that amplifies light without converting it to electrical signal. Types include the EDFA, Raman, and SOA.

Optical attenuator
A passive component that produces controlled signal loss in an optical transmission line to decrease the optical power. Available as fixed or as variable types.

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Optical carrier (OC)
Usually followed by a numerical designator such as 1, 12, 192, etc. Used in SONET and ATM transmission systems to describe the optical conversion of a synchronous transport signal at a specific rate, i.e., OC-3.

Optical circulator
A multiport device that steers optical energy between specific ports. Used in conjunction with a Bragg filter to provide OADM.

Optical density (OD)
Used with laser protective eye wear. Optical density is the BASE10 logarithm by a factor of 1000.

Optical distribution network (ODN)
The fibers, splitters, couplers, etc., in a passive optical network that provide the optical transmission means from the OLT to the users, and vice versa.

Optical-electrical-optical (OEO)
Specifies a network switch that receives an optical signal, and demultiplexes, switches, multiplexes and re-transmits the signal optically. Can perform 3R functions.

Optical fiber
An optical waveguide comprised of a light-carrying core and cladding, which traps light in the core. Fiber optic communication systems use either single-mode or multimode types.

Optical filter
A passive component used to modify the optical radiation that passes through it, usually by altering the spectral distribution. Employed to reject or absorb optical radiation in particular ranges of wavelength while transmitting it in other ranges. Tunable optical filters can track the signal wavelength variation over its operating wavelength range while nontunable models have fixed values.

Optical isolator (OI)
A nonreciprocal device intended to suppress backward reflections along an optical fiber transmission line while having minimum insertion loss in the forward direction.

Optical line terminal (OLT)
The OLT is a multi-point line card and contains a bidirectional transceiver using wavelength division multiplexing technology. It is located at the service provider facility transmitting downstream to the subscriber's optical network terminal over a PON network. The OLT also receives upstream transmission from the subscriber's ONT.

Optical loss
The amount of optical power lost as light is transmitted through fiber, splices, couplers, etc. See *attenuation*.

Optical loss test set (OLTS)
A single-mode or multimode test set consisting of a light source and power meter. OLTS is used for measuring a completed fiber optic cable assembly's loss (in dB) at the connector interfaces, within the specified wavelength of the fiber optic.

Optical network terminal (ONT)
A media converter or gateway at a home or business that converts signals from light to electrical signals and contains ports to distribute signals within the subscriber premises.

Optical power
The amount of radiant energy per unit time, expressed linearly (watts) or logarithmically (dB).

Optical protection switch (OPS)
See *bypass switch*.

Optical receiver
An electronic device that converts optical signals to electrical signals.

Optical return loss (ORL)
The sum of the amount of light reflected from all optical fibers and components. The fiber, connectors, or splices in an optical system can cause the reflection. Measured in dB.

Optical signal-to-noise ratio (OSNR)
The difference between the signal being transmitted and the noise being created by an optical laser's pulse. The higher the OSNR, the better the quality of service.

Optical supervisory channel (OSC)
A channel used for maintenance purposes including but not limited to remote site alarm reporting, communications necessary for fault location, and orderwire. Does not carry payload traffic.

Optical switch
A passive component possessing two or more ports that selectively transmits, redirects, or blocks optical power in an optical fiber transmission line, or that re-routes signals from one optical fiber into others. Types include MEMs, matrix, bypass, and optical cross-connect.

Optical time-division multiplexing (OTDM)
Use of optical processors to multiplex, process, and demultiplex signals to achieve higher speeds. There are two fundamentally different types of OTDM,

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interleaved and slotted. OTDM may well be a practical necessity for generating data rates well above 40Gb/s.

Optical time-domain reflectometer (OTDR)
A type of test equipment used to characterize a fiber via the transmission of an optical pulse. The resulting backscatter and reflections are measured as a function of time attenuation. The OTDR provides identification of defects over a length of fiber. Types include mainframe, full feature, mini, fault locators, and specialty OTDRs.

Optical-to-electrical (OE)
Shorthand notation for a point or device that converts an optical signal to an electrical signal.

Optical waveguide fiber
A high refractive index core with low refractive index cladding.

Optoelectronic
Pertaining to a device that responds to optical power, emits or modifies optical radiation, or utilizes optical radiation for its internal operation.

Optomechanical switch
Bipolar switch, based on moving fibers or mirrors, that moves optical signals between fibers.

OS1
Obsolete/grandfathered specification.

OS1a
Indoor single-mode fiber cable performance specification as designated by IEC 11801-1(2017) Table 92.

OS2
Outdoor single-mode fiber cable performance specification, as designated by IEC 11801-1(2017) Table 92.

Outlet
See *telecommunications outlet*.

Output power
Radiant power, expressed in watts.

Outside diameter (OD)
A measurement of the diameter of ferrules, cables, ducts, and innerducts, e.g., 2.5mm.

Outside plant (OSP)
The portion of a communication network that exists mostly outdoors, but also between transmission sites. It includes patch panels, closures, pedestals, the media (e.g., fiber, twisted pair, coax) and the structure (aerial, underground, etc.) where the cable is installed and routed. The patch panels at each end are points of access for testing, as well as a point of separation of responsibilities for the transmission network.

Overbuild
A type of FTTx network installation that makes upgrades or additions to existing legacy copper or coax installations.

Overfilled launch condition (OFLC)
When a light pulse floods the core of a fiber. Since LEDs produce erratic or incoherent burst of lights, they "overfill" the core when coupled to it. This condition produces inaccurately high losses where otherwise perfect links or assemblies appear to falsely fail. This is the primary reason that mandrels are to be used when testing with LED sources.

Packet
A data unit of variable length used in communications protocols such as Ethernet and IP. Packets allow some flexibility by allowing more data to be sent without breaking it up into pieces and then re-assembling it at the receiver, in turn reducing overhead.

Packet switching
Messages are divided into small chunks that fit easily into memory and reassembled into the original message at the destination, enabling communications channels to be used by multiple nodes simultaneously.

Passive
A component that requires no electrical power to operate, i.e., optical splitters, wavelength division multiplexers, filters, circulators, and attenuators.

Passive dispersion compensator
A passive component used to compensate the chromatic dispersion of an optical path. Can use dispersion compensating fiber or Bragg filters.

Passive optical network (PON)
A point-to-multipoint system, specified by the ITU, IEEE, and SCTE, that is made up of fiber optic cabling, passive splitters and WDMs that distribute an optical signal from the service provider to homes (FTTH) or buildings (FTTB).

Patchcord
A fixed length of cable with like connectors on both ends (or, in the case of a hybrid cable, different connectors). Sometimes called a cable assembly, patch cable or jumper.

Patch panel
A wall or rack-mounted cross-connect panel for interconnection of multiple cables or fibers.

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Pathway
A facility for the placement of telecommunications cable.

Photodetector
An electro-optic device that transforms light energy into electrical energy..

Photodiode
A semiconductor that converts light into an electrical signal, used in fiber optic receivers.

Photon
The packet or element of light exhibiting features of both particle and wave.

Photonic integrated circuit (PIC)
A collection of photonic components monolithically integrated to perform a function.

Physical contact (PC)
Refers to the endface polish of a ferrule. Designed to lower reflections by changing the spherical or angular geometry at the end of a ferrule and its internal fiber. Variations include PC, super PC (SPC), ultra PC (UPC), and angled PC (APC).

Pigtail
A short length of fiber cord or cable that has one end terminated with a connector.

PIN diode
Positive intrinsic negative diode, a type of photodiode used to convert optical signals in a receiver.

Pitting
An unacceptable polishing condition usually caused by the contamination of the lapping film from a combination of fiber optic and grit particles. Also a permanent defect caused by contaminate trapped between endfaces when mated.

Plain old telephone service (POTS)
Basic telephone service, dial tone without special features.

Plastic-clad silica fiber
A fiber composed of a silica glass core with a transparent plastic cladding.

Plastic optical fiber (POF)
An optical fiber type in which both the core and cladding are made from plastic. Their transmission is typically much poorer than glass fiber, and their lowest losses are in the visible region. GIPOF is the high bandwidth version using a graded index core.

Plenum
Defined in the NEC as the air handling space between walls, under structural floors, and above suspended drop ceilings, which can be used to route intra-building cabling. See *OFNP*.

Plug
Connector. The male side of a connection. Usually consists of three main parts: the body, ferrule and strain relief boot.

Point of presence (POP)
The physical location where a long-distance carrier terminates lines before connecting to the local exchange company, another carrier, or directly to a customer.

Point-to-multipoint (P2MP)
A star topology with optical splitters for PON systems in which an OLT is optically linked to multiple ONTs through entirely passive means. It provides branching optical fiber paths from a communication node to more than one premises such that a portion of the optical paths are shared by traffic to and from multiple premises.

Point-to-point (P2P, PtP, Pt-Pt)
A topology in which all fiber links are from one transmitter to one receiver. Branching can be done at an intermediate point via an active device located anywhere on the network, including the CO or a curb-side enclosure. It provides an uninterrupted optical fiber path from the communication switching equipment point to a single location at the premises. For FTTx systems, it is typically used in active Ethernet.

Polarization
The orientation of the electric and magnetic field vectors of a propagating electromagnetic wave. An electromagnetic wave theory describes in detail the propagation of optical signals (light).

Polarization mode dispersion (PMD)
Typical single-mode fibers support two perpendicular polarizations of the original transmitted signal, which may travel at different speeds and arrive at different times. The average difference in arrival times of the two polarization modes, normalized with length, is referred to as PMD.

Polarized dispersion loss (PDL)
The difference in dB between the maximum and minimum values of loss (attenuation) due to variation of the polarization states of light propagating through a device. The ITU defines PDL as polarization dependent loss, the maximum variation of insertion loss due to a variation of the state of polarization (SOP) over all SOPs.

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Polishing paper
See *lapping film*.

Polishing puck
A fixture manufactured to hold the fiber optic connector ferrule perpendicular to a lapping film surface while polishing the fiber optic endface.

Polyethylene (PE)
A thermoplastic used to jacket aerial and direct buried cables.

Polypropylene
A thermoplastic similar to PE but stiffer and with a higher softening point (temperature).

Polyurethane (PU)
A thermoplastic material used in cable jackets derived from the polymerization of ethylene gas. Basically, they are pure hydrocarbon resins with excellent dielectric properties.

Polyvinyl chloride (PVC)
A general-purpose thermoplastic jacket material used in the manufacture of riser-rated cable and cordage.

Polyvinylidene fluoride (PVDF)
A dielectric fluoropolymer that is resistant to corrosive chemicals and radiation. Used to jacket stranded cable.

Potting
Sealing by filling with a substance to exclude moisture.

Power
The rate at which energy is absorbed, received, transmitted, transferred, etc., per unit time. Optical power is measured in dBm or watts.

Power budget
The difference (in dB) between the transmitted optical power (in dBm) and receiver sensitivity (in dBm).

Power meter
Test equipment that measures the optical power (dBm) and attenuation (dB) in a fiber optic connector, fiber optic cable, or fiber optic system.

Premises
Defined as the subscriber's home or place of business. In a multiple dwelling unit, each apartment is counted as one.

Private branch exchange (PBX)
Customer premises version of central office switch. Switches calls between phones on premises and provides a second dial tone for calls over the public network.

Profile alignment system (PAS)
A core alignment technique for fusion splices in which light is injected at right angles. A CCD camera detects the fiber's refractive inlet profile in the X and Y axes for optimization.

Profile dispersion
Difference between maximum refractive index in the core and maximum refractive index in the cladding.

Protocol
A set of communications conventions that enable orderly and accurate transfer of data between stations.

Protrusion
According to IEC 61300-3-47, the fiber optic is either polished even with the endface or has a positive or negative protrusion, i.e., "sticks out" or is recessed.

Public switched telephone network (PSTN)
The traditional voice network infrastructure, including both local and long distance service, that has been in use in various parts of the world for the last century.

Pull point
A physical location where optical cable can be accessed and pulled, reducing friction and damage, and allowing for longer installed spans.

Pulling tension
The force that can be applied to a cable without affecting the specified characteristics for the cable, or the longitudinal force exerted on a cable during installation. Also known as pulling stress.

Pulse broadening
An increase in pulse duration resulting in optical dispersion.

Pulse code modulation (PCM)
A coding scheme for converting analog signals into a digital bit stream.

Pulse spreading
The dispersion of incoming optical signals along the length of an optical fiber.

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Pulse width
A measurement of the full width half maximum (FWHM) value of a light source's peak power and spectral width at the 3dB point. Lasers in OTDRs can change pulse width to create greater dynamic range.

Pulsed lasers
Lasers that emit energy in a series of short bursts, or pulses, and are inactive between each pulse. They typically deliver several watts of peak power per pulse.

Push/pull
Connector clip or locking device that holds the connector in a socket or interface. Uses a "push then pull" coupling technique. SC, LC, and MPO are common types of connectors using a push/pull coupling mechanism.

Quadplexer
Commonly known as a passive WDM, this transceiver package performs four multiplexing or demultiplexing functions. Used in 10 Gigabit OLTs when coexisting with legacy PON systems.

Quality of service (QoS)
A measure of the service quality, including but not limited to packet loss, latency, and jitter on a network, as measured by bit error rate and availability.

Raceway
A metal or plastic channel designed to hold and protect cables. Types include ladder, splice, and mesh trays. Fiber raceway systems are designed specifically for fiber optic cables.

Rack unit (RU)
A measurement of vertical space in an equipment rack. One rack unit is equal to 1.75 inches (4.45 cm).

Radio frequency interference (RFI)
The disruption of signals which can be caused by high voltage and lightning.

Radio frequency over glass (RFoG)
An SCTE 174 standard released in 2010, RFoG addresses PON network transmission for the CATV industry.

Radius
Half of the diameter of a circle measured from the center point.

Radius of curvature
Curvature of the endface Referenced in millimeters.

Raman fiber amplifier
These amplifiers use the Raman effect to transfer power from pump lasers to the amplified wavelengths.

Rayleigh scattering
The scattering of light into a direction generally reverse to the original one. The principle on which OTDRs operate; the scattering of light caused by index of refraction variations in the submicroscopic structure of the glass. One of the two major causes of attenuation in optical fibers.

Receive (Rx)
Refers to the detection of light from an optical source.

Receiver (RCVR)
An electronic unit that converts an optical signal to an electrical signal using an APD or PIN photodiode.

Receiver sensitivity
This tells how much optical power the photodetector must receive to achieve a specified base band performance, such as a specified bit error rate or signal-to-noise ratio. Expressed in dBm.

Receptacle
A connector adapter with an internal LED, laser or detector that connects to optical plug assemblies.

Reconfigurable OADM (ROADM)
Unlike OADMs, ROADMs can be managed via a network connection without need for a truck roll. They function as optical switches, allowing for remote service changes, and provide an express wavelength path and power monitoring.

Reference cables
Cables used as a reference for testing a fiber optic assembly on either an optical loss test set (OLTS) or an optical return loss (ORL) test set. Usually nulled or zeroed out to measure the loss of a fiber optic assembly. May also be called measurement quality jumpers, reference grade, reference quality, test quality, or launch and receive cables.

Reflectance
The percentage of light reflected from a component, such as a connector, splice, splitter, or WDM.

Reflection
The abrupt change in direction of a light beam at an interface between two dissimilar media that returns the light beam back into the medium where it originated, i.e., a mirror.

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Refraction
The bending of a beam of light in transmission between two dissimilar materials or in a graded index fiber where the refractive index is a continuous function of position.

Refractive index
The ratio of light velocity in a vacuum to its velocity in the transmitting medium.

Regional Bell operating company (RBOC)
A company formed from the forced breakup of AT&T and the Bell system.

Remote terminal (RT)
A POTS-related switching terminal that is remotely located in a pedestal or electronics cabinet.

Repeatability
The number of times a connector can be mated within an interface before the amount of insertion loss measured exceeds the Telcordia GR-20 standard. Detailed optical connector performance specifications may be found in Telcordia GR-326 (single fiber) and GR-1435 (multi-fiber).

Repeater/regenerator
A 3R repeater is a device inserted at intervals along a circuit that detects a weak signal, amplifies it, cleans it up, and retransmits it in optical form. A 3R regenerator is a receiver and transmitter combination used to reconstruct signals for digital transmission. Optical amplifiers are 2R regenerators.

Ribbon cable and fiber
A series of single fibers bonded or partially bonded together to facilitate mass fusion splicing..

Ribbon splice
A fusion or mechanical splice that aligns and fuses or mechanically bonds two ribbon fibers together. Ribbon splices require special stripping and cleaving tools.

Rights of way (ROW)
Legal right of passage over land owned by another.

Ring topology
A communications topology in which each station is logically arrayed in a ring and passes information to the next station in order. It provides a sequence of optical fiber paths in a closed loop that connects a series of communication nodes.

Ripcord
An internal element placed under the cable jacket to assist the technician in stripping and removing cable jackets.

Rise time
The time required for the leading edge of a pulse to rise from 10% to 90% of its amplitude; the time required for a component to produce such a result.

Riser cable
Cable installed in vertical runs and penetrating more than one floor or cables installed in vertical runs in a shaft. Rated by the NEC/CEC for resisting flame spread and smoke generation.

Roll-off
An OTDR trace of a fiber that gradually rolls off due to nonreflective breaks.

Router
Highly intelligent devices that connect networks, typically supporting multiple protocols.

Safety data sheet (SDS)
Technical bulletin required by OSHA detailing information about the physical or health hazards of a chemical or mixture. Formerly known as MSDS.

Sag
The distance measured vertically from the fiber optic cable to the straight line joining two points of support. Unless otherwise stated, the sag referred to is at the mid-point of the span.

Sag section
A section of line between two dead-end structures. One or more of these may be present in a stringing section.

Sag span
A span selected within a sag section as a control to determine proper sag, and therefore tension of the optical cable. At least two and normally three sag spans per section are required to properly sag. This may increase where span lengths vary greatly or for hilly terrain.

Sag tension
The tension at which the fiber optic cable is designed to be installed. Usually at the initial sag.

S-band
The “short” DWDM transmission band, which occupies the 1460-1530nm wavelength range.

SC connector
Subscriber connector, aka “Sam Charlie” Connector, is a push/pull connector style that is common in FTTH networks. The connector is keyed and is available in simplex, duplex or hardened styles.

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Scattering
Intrinsic fiber losses caused by undissolved particles, boundary roughness, and intrinsic material losses.

Scribe
When an optical fiber is scored and then broken to achieve a 90° endface.

Scribe tool
See *cleave tool*.

Self-healing ring (SHR)
A system architecture consisting of two counter-rotating directions for communications between nodes. In normal use, the data traffic is sent in both directions. In the event of a broken fiber in one of the fiber loops, the data will reach the affected remote device via the other fiber ring. In this way, data traffic can still travel to all surviving sections of the ring, even if the path is via a longer fiber route.

Sequential markings
Metric or footage designations located at periodic locations on the outer jacket of cables.

Service loop
(a) Allowing for "slack" in a splice tray, closure, or vault to accommodate future needs. (b) When a device is terminated to the wire in the communications outlet, a fair amount of "slack" should be left on the wire and wound in the box to accommodate future trimming when devices are changed out.

Serving area (SA)
An area defined by 32 optical network terminals.

Sheath
See *cable jacket*.

Sheave
A wheel, complete with arm or frame, suspended from structures to permit stringing of fiber optic cables. The sheaves must be lined with urethane or neoprene and have a diameter as required in specifications for each type of cable being installed for normal vertical suspension points. For increased deflection angles, large diameter sheaves or multiple sheave assemblies are required.

Short wavelength
Considered 850nm and lower in wavelength. Also covers the visible range (630-700 nm)

Signal-to-noise ratio (SNR)
The ratio of the power of the signal versus the power of the background noise, usually measured in decibels. Describes the quality of an electronic transmission system.

Silicon detector
A semiconductor that used absorbed photon energy to stimulate carriers from one energy level to a higher one. The change in charge across the junction is monitored as a current in the external photodiode circuit. Silicon photodetectors are commonly used in multimode systems operating at 850nm.

Simple network management protocol (SNMP)
Network management architecture initially designed for the Internet but easily applied or extended to any network type.

Simplex
Operation of a communications channel in one direction only with no capability of reversing.

Simplex cable
A cord containing only one fiber.

Single-longitudinal mode (SLM) laser
A laser, usually distributed feedback (DFB) type, where the spectral width is the width at the 20 dB down points divided by 6.07.

Single-mode
A step-index waveguide in which only one mode will propagate above the cutoff wavelength.

Single-mode fiber (SMF)
A fiber type that propagates a single mode of light through a defined mode field diameter. The most common types used in FTTx networks are those specified by the ITU as G.652 (standard SMF), G.652.D (low water peak SMF) and G.657 (bend-insensitive SMF).

Sleeve
A mating device of either split or solid construction, commonly made of ceramic or phosphor bronze, that is used to align two ferrules within an adapter.

Small form factor (SFF)
A connector family utilizing (in general) a 1.25mm ferrule that offers higher density than legacy 2.5mm ferrule connector types.

Snell's Law
The principle of the angle of incidence when light passes through materials with differing refractive indices.

Source
Usually an LED or laser used to convert an electrical information-carrying signal into a corresponding optical signal for transmission by an optical fiber.

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Spectral bandwidth
The difference between wavelengths at which the radiant intensity of illumination is half its peak intensity.

Spectral width
A full width half maximum (FWHM) measurement of a LED or laser light source to determine its optical width.

Speed of light
2.998×10^8 meters per second measured in a vacuum.

Splice
The mechanical or fusion means of joining two fibers together with a minimal loss and reflectance.

Splice closure
An inline or butt style cable and fiber management product that environmentally protects and houses optical splices. Splice closures can also hold connectors and optical splitters. Telcordia GR-771 specifies mechanical requirements and environmental specifications and tests.

Splice organizer
See *splice tray*.

Splice panel
A rack or wall-mounted panel for organizing or splicing cables. The panel holds splice trays, secures the cable, grounds any metallic members, and stores buffer tubes, fibers, and splices.

Splice protector
A device placed over a fusion splice to provide mechanical strength and protection to allow easy handling of the splice for organization in a splice tray or other storage. Two types are the heat shrink protector and the butterfly.

Splice tray
A protective tray that holds spliced fibers for slack and protection. A tray or other device used for the permanent storage of mechanical or fusion optical splices.

Splicing
Permanent joining of identical or similar fiber ends without a connector.

Splitter
A fiber device that optically splits signals. The splitters used in a PON are optical splitters that distribute optical signals from the OLT to the ONTs. Splitters used in FTTx installations are specified by the ITU G.671 standard as wavelength independent couplers (WIC), which provide the same attenuation regardless of wavelength or direction.

ST connector
A straight tip, keyed bayonet with 2.5mm ferrules. Available in ST I or ST II styles.

Stapler cleaver
A hand-held cleaver used for preparing fibers for mechanical splices and mechanical splice connectors. With proper technique, some may be able to use them for cladding align fusion splicing. They fall between a hand scribe and a precision cleaver. They get their name from their resemblance to a stapler, but should not be used in the same manner. They are also referred to as beaver tail or score and snap cleavers.

Star
A topology for communications networks that involves transmission of data through a central location to other users.

Star coupler
An optical splitter which mixes the signals from many fibers at a single optical element. The combined signals are then transmitted back through all the fibers. The name comes from the geometrical arrangement; all fibers come together at a single point.

Star topology
Also known as a point-to-multipoint (P2MP) topology, the star topology has one hub that connects all users. In FTTH, all PON systems are star topologies. Variations include the distributed star topology, which has two or more splitters cascaded from a single port.

Step-index fiber
A type of fiber where the refractive index of the core is uniformly higher than that of the surrounding cladding.

Storage area network (SAN)
A network which links host computers to storage servers and systems.

Strain relief
The method by which a cable's physical load is attached and addressed at the rear of a connector. In fiber optic cable assemblies, various methods of strain relief techniques are used to isolate loading stresses between cable, connectors, and other components that would impact performance.

Stranded cable
In stranded cables, individual color-coded buffer tubes are wrapped or "stranded" around the cable's central strength member.

Stripper (strip tool)
A mechanical tool used to remove primary and secondary coatings from fibers.

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Subminiature type A (SMA) connector
A nonkeyed, noncontacting, multimode threaded connector borrowed from the coax industry. Types include 905, 906, or OPTIMATE.

Subscriber line interface circuit (SLIC)
The line card that provides the interface between local loop and telco switching equipment.

Super physical contact (SPC)
The spherical endface polish of a ferrule and fiber that is performed on a polishing machine. Typically 50dB return loss. Superseded by the UPC polish.

Surface-emitting LED (SLED)
A diode that emits light perpendicular to the semiconductor chip. Most LEDs used in data communications are surface emitting.

Switch
See *optical switch*.

Swivel
Installation hardware used to eliminate winding and tangling of cables during installations.

Synchronous digital hierarchy (SDH)
A worldwide, high-speed synchronous protocol standard transmitting at up to 10Gb/s. Known as SONET in North America.

Synchronous optical network (SONET)
ANSI-standard physical interface defined by its optical line rates known as optical carrier (OC) signals, frame format and OAM&P protocol. Adopted by ITU as SDH.

Synchronous transfer mode (STM)
A transport and switching method that depends on information occurring in regular and fixed patterns with respect to a reference such as a frame pattern.

Synchronous transmission
A transmission method in which data characters are synchronized by timing signals generated at sending and receiving stations (as opposed to start/stop communications). Both stations operate continuously at the same frequency and are maintained in a desired phase relationship. Several codes may be used as long as they utilize the required line control characters. Also called “bi sync” or “binary synchronous.”

Synchronous transport signaling (STS)
The transmission speed of a SONET transmission medium, e.g., OC-48.

System margin
See *margin*.

T1
A North American data exchange protocol for constant bit rate systems. It operates at 1.544Mb/s and can handle up to 24 telephone calls or other data. The corresponding European protocol E1 operates at 2.048Mb/s and handles up to 30 telephone calls or other data.

T3
A faster implementation of T1. Using coaxial cable, T3 allows for data transmission rates of 45Mb/s and is used for WAN backbones, the Internet backbone and connections from Internet service providers to the Internet backbone.

Take rate
Subscribers divided by homes connected. Expressed as a percentage, it can also be based on each type of service, i.e., take rates for data, video, voice, or triple/quadruple services.

Tap
A coupler in which part of the light carried by one fiber is split off and inserted into another fiber. Essentially the same as a Tee coupler. An example would be a 10/90% optical splitter.

TCP/IP
Transport control protocol/Internet protocol. Originally developed by the U.S. government, this product is the de facto standard for Internet and internetwork communications.

Tee coupler
A fiber optic coupler in which three fiber ends are joined together, and a signal transmitted from one fiber is split between the other two.

Teflon®
DuPont trademark for fluorocarbon resins. Used in buffer and jacketing materials for high temperature and harsh environments.

Telcordia Technologies
Formerly known as Bell Communications Research (Bellcore). Originally created at the breakup of the Bell System in 1982, it was given a broad mandate to provide consulting services, R&D, and software development to the RBOCs. Telcordia was privatized in 1996 and later acquired by Ericsson in January 2012.

Telecommunications Industry Association (TIA)
An organization that participates in setting standards accredited by ANSI. Superseded the Electronic Industry Association (EIA).

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Telecommunications outlet (TO)
A single-piece cable termination assembly (typically on the floor or in the wall) that contains one or more modular telecom jacks (e.g., RJs, coaxial terminators, fiber optic connections).

Telecommunications space
A secure enclosed space that houses telecom equipment, cable terminations, and cross-connects. A generic term to include entrance facilities (EF), equipment rooms (ER), and telecommunications rooms (TR – ITR/MTR).

Tensile strength
The pull stress that is required to break a given specimen.

Termination
Endpoint, connection or the action of installing a connector to cordage or cable.

Termination tools
Tools used in preparing optical fibers for splicing and/or installation of connectors.

Terminator
An optical plug with the fiber dead ended so that there is no reflectance. Terminators measure component reflectance using the OTDR and also reduce Fresnel reflections at open connector ports.

Thermal rating
The temperature range in which a material will perform its function without undue degradation.

Thermoelectric cooler (TEC)
A device used in laser transmitters to maintain a cool, stable temperature for a laser diode prolonging its life, maintaining stable output power, and promoting wavelength stability.

Thermoplastic
A material that will soften, flow, or distort appreciably when subjected to sufficient heat and pressure, i.e., PVC or PE.

Threshold
A defined pass or fail value, i.e., the maximum or minimum value of insertion loss in dB or dBm.

Tight buffered cable
A type of cable typically rated for indoor use to meet plenum, riser and LSZH requirements. Designed for easier breakout and distributions styles. Internal fibers are commonly 900µm coated.

Tightly-coupled mode
A low order or axial mode from either a laser or a LED. Low order modes cause less differential mode delay (higher bandwidth).

Time division multiple access (TDMA)
A data transmission method in which a number of individual transmitters in different locations share a transmission channel, each occupying the channel for a portion of the total time. Used for upstream transmission on Passive Optical Networks (PON).

Time division multiplexing (TDM)
A digital technique for combining two or more signals into a single stream of data by sharing time. Used for downstream transmission on Passive Optical Networks (PON).

Topology
Physical and logical layout of a network.

Total internal reflection
The interface between core and cladding that acts like a mirror to keep the light reflecting and contained within the core.

Transmitter
An electronic unit that converts an electrical signal to an optical signal using LEDs or lasers.

Triple play
Voice, video, and data communications.

Triplexer
Commonly known as a passive WDM, this transceiver package performs three multiplexing or demultiplexing functions.

Trunk
A single circuit between two switching centers or individual distribution points. May also be used to describe a pre-terminated backbone cabling within a building (trunk cable).

Tunable laser
A laser that can change wavelength. Applications include research, OTDRs and protection in transmission systems.

Twisted pair
Cable with at least two insulated wires intertwined to reduce electromagnetic interference. Commonly used in four pair configurations. Referred to as a Category cable in network communication.

U-band
The “ultra-long” DWDM transmission band, occupying the 1625-1675nm wavelength range.

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Ultra physical contact (UPC)
The spherical endface polish of a ferrule and fiber that is performed on a polishing machine to reduce reflections. Typically 55dB return loss.

Undercut
According to TIA and IEC endface geometry specifications, a negative protrusion where the end of the fiber is lower than the endface or theoretical sphere of the finished ferrule.

Underfilled launch condition (ULC)
When a light pulse from an LED fails to fill the core of a fiber. This condition produces inaccurately low losses potentially masking misalignments or other loss-inducing concerns. Unlike overfilled conditions, mandrels will not correct underfilled LED sources. The only way to compensate for underfilled launch conditions is through mode scrambling, which is achieved with a mode conditioning cable assembly.

Underwriter's Laboratory (UL)
A nonprofit laboratory which examines and tests devices, materials and systems for safety, not for satisfactory operation.

Uninterruptible power supply (UPS)
An auxiliary power unit providing continuous power in case commercial power is lost.

Unitube cable
This type of cable has a large central tube in which the fibers are grouped using color-coded binder thread. Unitube cables are physically smaller than stranded-type cables. Also known as central tube or LXE cable.

User network interface (UNI)
The user end of an access network, similar to an ONU but not necessarily optical.

UV adhesive
Ultraviolet adhesive hardened by the use of ultraviolet radiation. Normally date coded.

UV connectors
Connectors manufactured with a clear body and ferrule to allow the curing of ultraviolet adhesive, bonding the fiber optic inside the ferrule.

Vapor axial deposition (VAD)
A method of optical fiber manufacturing where a the end of a bait rod is used to grow a preform of oxidized soot.

Variable optical attenuator (VOA)
A fiber system component with adjustable attenuation, often used to test system performance by increasing attenuation until the system degrades.

Vault
Storage product for excess cable slack and splice case.

Vertical-cavity surface-emitting laser (VCSEL)
A high-speed, low-cost laser operating at the 850nm wavelength for applications such as Gigabit Ethernet where the modulation rate of current LEDs is insufficient.

Video on demand
A video service that allows users to select a program and begin viewing it at any time.

Video over IP
The transmission of video programming over an IP network. If the source is digital, it is encapsulated into IP packets. Otherwise, it is digitized and usually compressed. It can then be converted back to analog by equipment at the customer's premises or viewed on a digital television.

Visible light
Electromagnetic wavelengths, ranging from 380nm to 770nm, that are visible to the human eye.

Voice over IP (VoIP)
Transmission of telephone calls over an IP network.

Water migration
The act of water traveling through a breach in the outer jacket(s) of a telecommunications cable, moving along the conductors due to capillary action. A corrosive action as the water reacts with the insulator and/or conductor. May also be referred to as water ingress.

Watts (W)
A linear measure of optical power, usually expressed in milliwatts (mW), microwatts (μW), or nanowatts (nW).

Waveguide
An older term for optical fiber.

Waveguide dispersion
Dispersion caused by the difference in the speed of light of the core and the cladding in single-mode fibers. Waveguide dispersion also changes with wavelength as the size of the mode field diameters increases with wavelength.

Wavelength
The color of light in the electromagnetic spectrum used in fiber transmission. The optical spectrum typically used in single-mode fiber typically used 1260nm to 1650nm wavelengths for transmission.

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Wavelength division multiplexing (WDM)
Combining two or more optical signals (different wavelengths) for transmission over a single fiber. WDM devices have specific channel wavelength spacing for CWDM (coarse WDM) and for DWDM (dense WDM) applications.

Wavelength independent coupler (WIC)
Defined in ITU G.671 as an optical splitter that provides the same attenuation regardless of wavelength or direction.

Wavelength selectable switch (WSS)
A type of ROADM used in DWDM networks to allow a network operator to change the direction of an added or dropped wavelength through the use of mirrors mounted on micro-electrical-mechanical positioners.

WDM coupler
A passive device designed to either (a) optimally combine light of multiple predetermined wavelengths into a single core; or (b) optimally sort and segment those wavelengths and couple them separately into output fiber cores.

WDM-PON
A passive optical network with utilization of wavelength division multiplexing on a physical layer - assigning different wavelengths for separate ONU units. Specified by the ITU T G.989 document, two variations of WDM-PON ARE: point-to-point (P2P) and time and wavelength division multiplexing (TWDM).

White light
A mixture of colors of visible light that appears white to the eye. In theory, a mixture of three colors is sufficient to produce white light.

Wide area network (WAN)
An integrated data network linking metropolitan or local networks over common carrier facilities.

Work area (WA)
A building space where the occupants may interact with telecommunications terminal equipment (computers, phones, etc.). A media or telecommunications outlet would be used here for fiber terminations or, in the case of multiple users, a MUTOA outlet.

Yield
The percentage of terminations that pass specifications and are good the first time. The higher the yield (e.g., 95%), the greater the installed cost benefit.

Zipcord
A separable, two-fiber, breakout-style cable with a diameter (per buffer) of 1.6mm (mini Zipcord), 2.0mm, or 3.0mm generally used for cable assemblies/patchcords.

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Acronyms

ABF	Air blown fiber
ADM	Add/drop multiplexer
ADSL	Asymmetric digital subscriber line
ADSS	All-dielectric self-supporting
AM	Amplitude modulation
ANSI	American National Standards Institute
AOC	Active optical cable
AON	All-optical network
APC	Angled physical contact
APD	Avalanche photodiode
APL	Allowable path loss
APON	Asynchronous transfer mode (ATM) PON
APS	Automatic protection switching
APVD	Advanced plasma and vapor deposition
ASE	Amplified spontaneous emission
ASOF	Application-specific optical fibers
ASQ	American Society for Quality
ATE	Automatic test equipment
ATM	Asynchronous transfer mode
AWG	Arrayed waveguide grating
BER	Bit error rate
BERT	Bit error rate tester
BFOC	Bayonet fiber-optic connector
BIF	Bend-insensitive fiber
BI-MMF	Bend-insensitive multimode fiber
B-ISDN	Broadband ISDN
BLEC	Building local exchange carrier
B-PON	Broadband passive optical network
CAP	Competitive access provider
CATV	Community antenna television
CCTV	Closed circuit television
CD	Chromatic dispersion
CEC	Canadian Electrical Code
CEV	Controlled environmental vault
CFP	100G form factor pluggable
CIL	Channel insertion loss
CIR	Cable index of refraction
CLEC	Competitive local exchange carrier
CNR	Carrier-to-noise ratio
CO	Central office
COBO	Consortium for On-Board Optics
CODEC	Coder/decoder
CORD	Center for Occupational Research and Development
CPE	Customer premises equipment
CSA	Canadian Standards Organization
CSF	Cutoff shifted fiber
CSM	Central strength member
CSMA/CD	Carrier sense multiple access / collision detection
CSO	Composite second order
CSRZ	Carrier suppressed return-to-zero
CTB	Composite triple beat
CW	Center wavelength; continuous wave
CWDM	Coarse wavelength division multiplexing
dB	Decibel
DBFA	Dual-band fiber amplifier
dBm	Decibels relative to one milliwatt
DCC	Data communication channel
DCE	Data communications equipment
DCF	Dispersion-compensating fiber
DCIM	Data center infrastructure management
DCM	Dispersion compensation module
DD	Double density
DFB	Distributed feedback (laser)
DGD	Differential group delay
DGE	Dynamic gain equalizer
DIB	Dual-insulated buffer
DIP	Dual inline package
DMD	Differential mode delay
DML	Directly-modulated laser
DOCSIS	Data-Over-Cable-Service Interface Specification
DOP	Degree of polarization
DOPL	Differential optical path loss
DP-QPSK	Dual polarization quadrature phase-shift keying

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DPSK Differential phase-shift keying
DPSS Diode-pumped solid-state
DQPSK Differential quadrature phase-shift keying
DSF Dispersion-shifted fiber
DSL Digital subscriber line
DSP Digital signal processing
DS-*x* Digital signal (level)
DTE Data terminal equipment
DWDM Dense wavelength division multiplexing
ECMA European Computer Manufacturers Association
EDA Equipment distribution area
EDFA Erbium-doped fiber amplifier
EF Encircled flux; entrance facility
EFM Ethernet in the first mile
ELED Edge-emitting diode
EMB Effective modal bandwidth
EMD Equilibrium modal distribution
EMI Electromagnetic interference
EMP Electromagnetic pulse
EO Electrical–optical
EPON Ethernet passive optical network
ERK Emergency restoration kit
ESCON Enterprise System Connection
ESL Estimated splice loss
ETSI European Telecommunications Standards Institute
EVC Equivalent voice channels
FAT Fiber access terminal
FBG Fiber Bragg grating
FBT Fused biconical taper
FC Fiber connector
FCIA Fibre Channel Industry Association
FDB Fiber demarcation box
FDDI Fiber distributed data interface
FDF Fiber distribution frame
FDH Fiber distribution hub
FDM Frequency division multiplexing
FDU Fiber distribution unit
FEC Fiber entrance cabinet; forward error correction
FET Field effect transistor
FIFM Fiber in the first mile
FILM Fiber in the last mile
FITL Fiber in the loop
FM Frequency modulation
FOCIS Fiber Optic Connector Intermateability Standard
FOCS Fiber optic communication system
FORJ Fiber optic rotating joint
FOTP Fiber optic test procedure
FOTR Fiber optic transceiver
FOTS Fiber optic transmission system
FP Fabry-Perot (laser)
FRP Fiberglass rodent protection
FSAN Full Service Access Network
FSWDM Full spectrum wavelength division multiplexing
FTTA Fiber to the antenna
FTTB Fiber to the building or business
FTTC Fiber to the curb or customer
FTTD Fiber to the desk
FTTH Fiber to the home
FTTN Fiber to the node
FTTO Fiber to the office
FTTP Fiber to the premises
FTTx Fiber to the user
FWHM Full width, half maximum
FWM Four wave mixing
GbE Gigabit Ethernet
GBIC Gigabit interface converter
GD Group delay
GEM G-PON encapsulation method
GFF Gain flattening filter
GI-MMF Graded-index multimode fiber
GI-POF Graded-index plastic optical fiber
G-PON Gigabit PON
GRIN Gradient index
HASB High air-speed blown
HC Horizontal cross-connect
HDA Horizontal distribution area
HDPE High-density polyethylene

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HDSL	High bit rate digital subscriber line
HDTV	High definition television
HETNET	Heterogeneous network
HFC	Hybrid fiber coax
HFOC	Hardened fiber-optic connector
HIPPI	High performance parallel interface
HMFOC	Hardened multifiber optical connector
HSTR	High-speed Token Ring
HVAD	Hybrid vapor axial deposition
IC	Integrated circuit; intermediate crossconnect
ICCF	Interexchange Carrier Compatibility Forum
ICEA	Insulated Cable Engineers Association
IDF	Intermediate distribution frame
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IFC	Intrafiber cabling
ILD	Injection laser diode
ILEC	Incumbent local exchange carrier
ILTA	Integrable tunable laser assemblies
InGaAsP	Indium gallium arsenide phosphide
IOR	Index of refraction
IoT	Internet of Things
IP	Internet protocol
IPA	Isopropyl alcohol
IPTV	Internet protocol television
ISDN	Integrated services digital network
ISI	Intersymbol interference
ISO	International Standards Organization
ISP	Internet service provider
ITS	Information transport system; intelligent transportation system
ITU	International Telecommunications Union
IVD	Inside vapor deposition
IXC	Interexchange carrier
kpsi	Thousand pounds per square inch
LAN	Local area network
LATA	Local access and transport area
LEC	Local exchange carrier
LED	Light-emitting diode
LIA	Laser Institute of America
LID	Local injection and detection
LSA	Least square approximation
LSZH	Low smoke zero halogen
LTGF	Loose tube gel filled
LWP	Low water peak
MAN	Metropolitan area network
Mb	Megabit
MC	Main cross-connect
MCPC	Mode conditioning patchcord
MCVD	Modified chemical vapor deposition
MDA	Main distribution area
MDF	Main distribution frame
MDPE	Medium-density polyethylene
MDU	Multiple dwelling unit
MEM	Micro-electro-mechanical
MFD	Mode-field diameter
minEMBc	Minimum calculated effective modal bandwidth
MiniBNC	Miniature bayonet Neill-Concelman
MLM	Multilongitudinal mode
MMF	Multimode fiber
MPD	Mode power distribution
MPEG	Moving Pictures Experts Group
MPLS	Multiprotocol label switching
MPLS-TP	MPLS transport profile
MPO	Multifiber push-on (connector)
MRCL	Maximum rated cable load
MSA	Multisource agreement
MSO	Multiple system operator
MSP	Managed service provider
MST	Multifiber service terminal
MSTP	Multiservice transport platform
MTBF	Mean time between failures
MTDC	Multitenant data center
MTP	Multiple transfer push-on
MTRJ	Mechanical transfer registered jack
MTU	Multiple tenant unit, or multi-terminal unit
MUTOA	Multiuser telecommunications outlet assembly

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NA	Numerical aperture
NAP	Network access point
NCC	Network control center
NEBS	Network equipment building system (Telcordia/iconectiv)
NEC	National Electrical Code (NFPA-70)
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NGI	Next generation Internet
NIC	Network interface card
NIST	National Institute of Standards and Technology
nm	Nanometer
NOC	Network operations center
NRZ	Nonreturn to zero
ns	Nanosecond
NTIS	National Technical Information Service
NTSC	National Television Standards Committee
NZDS	Nonzero dispersion-shifted fiber
OA	Optical amplifier
OADM	Optical add/drop multiplexer
OAM	Operations, administration, and maintenance
OAM&P	Operations, administration, maintenance, and provisioning
OAN	Optical access networking
OC	Optical carrier
OCDMA	Optical code division multiple access
OD	Outside diameter; optical density
ODN	Optical distribution network
ODU	Optical demultiplexer unit
OE	Optical-to-electrical
OEE	Optical entrance enclosure
OEIC	Optoelectronic integrated circuit
OEO	Optical–electrical–optical
OFCP	Optical fiber conductive plenum
OFCR	Optical fiber conductive riser
OFDM	Optical frequency division multiplexing
OFL	Overfilled launch
OFLC	Overfilled launch condition
OFNP	Optical fiber nonconductive plenum
OFNR	Optical fiber nonconductive riser
OFSTP	Optical fiber system test procedures
OI	Optical isolator
OLS	Optical line system
OLT	Optical line terminal
OLTS	Optical loss test set
OM	Optical multimode
OMU	Optical multiplexer unit
ONT	Optical network terminal
ONU	Optical network unit
OOK	On-off keying
OOO	Optical–optical–optical
OPGW	Optical ground wire
OPM	Optical power meter
OPS	Optical protection switch
ORL	Optical return loss
OS	Optical single-mode
OSA	Optical spectrum analyzer; optical subassembly; Optical Society of America
OSC	Optical supervisory channel
OSFP	Octal small form-factor pluggable
OSHA	Occupational Safety and Health Administration
OSI	Open system interconnection
OSNR	Optical signal-to-noise ratio
OSP	Outside plant
OSS	Operational support system
OTDM	Optical time-division multiplexing
OTDR	Optical time-domain reflectometer
OTN	Optical transport network
OTU	Optical translator unit
OVD	Outside vapor deposition
OXC	Optical cross-connect
P2MP	Point-to-multipoint
P2P	Point-to-point
PAS	Profile alignment system
PBX	Private branch exchange
PC	Physical contact

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PCM	Pulse code modulation
PCVD	Plasma chemical vapor deposition
PDC	Polarization dependence of the center wavelength
PDFA	Praseodymium-doped fiber amplifier
PDL	Polarized dispersion loss
PDLC	Polarization-dependent loss compensation
PDM	Polarization division multiplexing
PE	Polyethylene
PIC	Photonic integrated circuit
PIN	Positive-intrinsic-negative
PINFET	Positive-intrinsic-negative field-effect transistor
PLC	Planar lightwave circuit
PLOAM	Physical layer operations, administration, and maintenance
PMD	Polarization mode dispersion
PMDC	Polarization mode dispersion compensation
PMQPSK	Polarization multiplexed quadrature phase-shift keying
POF	Plastic optical fiber
PON	Passive optical network
POP	Point of presence
POTP	Passive optical transport platform
POTS	Plain old telephone service
PPE	Personal protective equipment
PSK	Phase-shift keying
PSTN	Public switched telephone network
PtP	Point-to-point
PTZ	Pan, tilt, zoom
PU	Polyurethane
PVC	Polyvinyl chloride; permanent virtual circuit
PVDF	Polyvinylidene fluoride
PXC	Photonic cross-connect
QAM	Quadrature amplitude modulation
QDM	Double-band amplitude modulation
QoS	Quality of service
QPSK	Quadrature phase-shift keying
RADSL	Rate adaptive digital subscriber line
RBOC	Regional Bell operating company
RBS	Rated breaking strength
RCVR	Receiver
RF	Radio frequency
RFI	Radio frequency interference
RFoG	Radio frequency over glass
RFTS	Remote fiber test system
RIN	Relative intensity noise
RML	Restricted mode launch
ROADM	Reconfigurable optical add/drop multiplexer
ROSA	Receiver optical subassembly
ROW	Rights of way
RT	Remote terminal
RTM	Reference test method
RTU	Remote test unit
RU	Rack unit
Rx	Receive; receiver
SA	Serving area
SAN	Storage area network
SBS	Stimulated Brillouin scattering
SCTE	Society of Cable Telecommunications Engineers
SDH	Synchronous digital hierarchy
SDM	Spatial division multiplexing
SDS	Safety data sheet
SDSL	Symmetric digital subscriber line
SDV	Switched digital video
SERDES	Serializer/deserializer
SFF	Small form factor
SFP	Small form factor pluggable
SHR	Self-healing ring
SLED	Surface-emitting LED
SLIC	Subscriber line interface circuit
SLM	Single longitudinal mode (laser)
SMA	Subminiature type A connector
SMDS	Switched multimegabit data service
SMF	Single-mode fiber
SNMP	Simple (or signaling) network management protocol
SNR	Signal-to-noise ratio
SOA	Semiconductor optical amplifier

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SONET	Synchronous optical network
SOP	State of polarization
SPC	Super physical contact
SPIE	Society of Photographic Instrumentation Engineers
SPM	Self phase modulation
SSB	Single side band
STM	Synchronous transfer mode
STP	Shielded twisted pair
STS	Synchronous transport signaling
SVC	Switched virtual circuit
SVOD	Switched video on demand
SWDM	Short wavelength division multiplexing
TAXI	Transparent asynchronous transmitter receiver interface
TC	Telecommunications closet
TCP/IP	Transport control protocol/Internet protocol
TDM	Time division multiplexing
TDMA	Time division multiple access
TEC	Thermoelectric cooler
TIA	Telecommunications Industry Association
TMC	Traffic management center
TO	Telecommunications outlet
TOSA	Transmitter optical subassembly
TPON	Telephony passive optical network
TTL	Transistor-transistor logic
Tx	Transmit; transmitter
UHDTV	Ultra high definition television
UL	Underwriters Laboratory
ULC	Underfilled launch condition
UNI	User network interface
UPC	Ultra physical contact
UPS	Uninterruptible power supply
UTP	Unshielded twisted pair
UV	Ultraviolet
VAD	Vapor axial deposition
VCSEL	Vertical-cavity surface-emitting laser
VFC	Voice frequency channels
VFL	Visual fault locator
VOA	Variable optical attenuator
VOD	Video on demand
VoIP	Voice over Internet protocol
VPN	Virtual private network
VPON	Video passive optical network
VSB	Vestigial sideband
VT	Virtual tributary
WA	Work area
WAN	Wide area network
WBMMF	Wideband multimode fiber
WDM	Wavelength division multiplexing
WHMIS	Workplace Hazardous Material Information System
WIC	Wavelength independent coupler
WSS	Wavelength selectable switch
WXC	Wavelength cross-connect
XFP	10 Gigabit small form factor pluggable
XMD	10 Gb/s miniature device
XPM	Cross phase modulation
ZDA	Zone distribution area
ZWP	Zero water peak

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