

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 preterminated 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 transitions the transmitter or receiver of an optical loss test set (OLTS) to the fiber optic cable assembly.

Add/drop multiplexer (ADM)

A mid-span electronic element that provides optoelectric/electro-optic conversion to add, drop, or multiplex photonic signals.

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., a 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 connector endface in the air to polish the fiber stub just above the ferrule endface.

Alignment sleeve

An appliance for mating and holding two connector ferrules in alignment. Also known as a C-clip.

All-dielectric

No metal elements.

All-dielectric self-supporting (ADSS)

A loose tube cable structure without any metallic elements. Specified by the IEEE P-1222 standard, ADSS cable is designed for long spans up to 10,000 feet. Six variations are listed, based on the cable's outside diameter.

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.

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 (APC)

A ferrule endface at 8° that minimizes Fresnel reflections when in contact with another APC termination. APC polishes normally have a component reflectance value of 60-70 dB. They are most often used in analog, DWDM, and FTTx installations.

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.

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 to provide protection and mechanical bonding. Usually consists of Kevlar™.

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, GEAPON, 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 (absorption, scattering, microbends, etc.), or extrinsically by components (connectors, splices, splitters, etc). 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

The loosely-used term covers optical return loss (ORL) for spans, reflectance for components, and Fresnel reflectance.

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 by the ITU: O (original), E (enhanced), S (short), C (conventional), L (long), and U (ultra). These cover the optical spectrum from 1260 nm to 1675 nm.

Bandwidth

A measure of the maximum frequency by which light intensity can be modulated before the signal experiences 3 dB 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 ST-type connector.

Bayonet fiber-optic connector (BFOC)

The formal name for the ST connector, a specific slotted twistlock connector with 2.5-mm ferrule.

Bend-insensitive 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 over a single fiber.

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 (BER) 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.

Breakout cable

A tight buffered cable with 900-micron coated 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 couplers (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 coating

A protective material with no optical function that covers and protects a fiber. A secondary plastic coating adhered around the coating of the optical fiber to provide additional protection against damage. Normally 250 or 900 microns.



Buffer tube

Part of a loose tube cable structure, buffer tubes accommodate 250-micron coated fibers in a loose configuration. The buffer tubes can be filled with gel, powder, or tapes to resist moisture intrusion.

Bulge splice

Slight overfeed results in bulging at the splice point. Bulging is not always lossy. Splice strength requires a solid fusion joint; monitor splice strength if you are reducing feed to eliminate bulging. 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 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 1530 to 1565 nm wavelength range, as specified by the ITU-T G.692. Most EDFAs operate in the C-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 referred to as dielectric, it provides a directional form 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 scratched 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 20-nm separation from 1471 nm to 1611 nm. With multimode fibers, the wavelengths are 778, 800, 825, and 850 nm.

Coating

A plastic or acrylate coating, normally up to 245-250 microns, that is placed over the cladding during the manufacturing process. After this process, the fiber can be colored or upper coated to 900 microns for use in tight buffered cables. See *buffer coating*.

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 television (CATV)

Assumed to be 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

A cable with a combination of optical fibers and copper (coaxial, twisted pair, or power). Often confused with hybrid cables.

Compression

Any technique for reducing a transmission bandwidth requirement by reduction of the data stream needed to convey the information. Compression standards are identified by MPEG.

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

Most fiber optic connectors consist of two plugs and one adapter. Connectors can be push/pull types (SC, LC, MPO etc.), bayonet (ST), or threaded (FC). Most use a 2.5-mm ferrule but small form factor types use the smaller 1.25-mm ferrule. Other features include a key and keyway that provide critical alignment for repeatability and for strain relief internally and at the rear boot. Bonding techniques include thermal cure, anaerobic adhesive, and UV adhesive. Splice-on plugs use a prepolished fiber stub and then are mechanically or fusion spliced. Military, industrial, and heavy-duty specialized connectors may use expanded beam lenses and termini contacts (instead of ferrules) based on standard Mil/Aero dimensions. Key specifications for all connectors include attenuation, reflectance, and repeatability.

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 to provide 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.

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 1-3 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

That wavelength greater than 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 1260 nm. For G.655 fibers, it can range from 1260 nm to 1450 nm.

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 loss (or attenuation) of quality, reflectance, and amplification of optical signals. The ratio of two power levels, P_1 and P_2 , expressed by $-10 \log_{10}(P_1/P_2)$.

dB/km

A logarithmic unit describing the ratio of loss of power per kilometer distance. These values are always referenced to a specific wavelength, e.g., 0.35 dB/km at 1310 nm, and are used by fiber and cable manufacturers to define the optical 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, and they are most commonly sold in lengths of 500 or 1,000 meters.



Demarcation point

The point of interconnection between telephone company 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 200 GHz (1.6 nm), 100 GHz (0.8 nm), or 50 GHz (0.4 nm). 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 as a photodiode or photodetector that converts optical energy into electrical energy. They can be made from silicon, germanium, gallium arsenide, indium gallium arsenide or from other semiconductors, 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.

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 is the delay 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 (64 kb/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 FTx optical network terminal filters the downstream 1490-nm wavelength and multiplexes the upstream 1310-nm 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 0 dBm signal passes through a coupler with 50 dB directionality, only -50 dB (0.01 μ m) will pass in the wrong direction.

Directly-modulated laser (DML)

A laser directly modulated by electrical voltage and current.

Dispersion

The cause of bandwidth limitations in fiber. In multimode systems, modal dispersion is caused by differential optical path lengths known as differential path delay. For single-mode systems, chromatic dispersion is a combination of material dispersion (caused by the line width of the laser source) and waveguide dispersion (caused by the difference in the speed of light in the core and the cladding of the fiber). Another type of dispersion is polarization mode dispersion (PMD), which is caused by random vibration, temperature variations, and bending of the fibers known as birefringence.

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 an 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 1550 nm. It could not be used with DWDM as it caused four wave mixing, and has been obsolete 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.

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 in-line package (DIP)

Only refers to pigtailed dual in-line packaged devices.

Duct

A small pathway, generally 4” or smaller in diameter. Smaller inner ducts or Maxcell are installed to allow cables to be pulled through. It may be buried, installed aerially, or within a building. Common types include smoothwall, ribbed, and corrugated.

Duplex

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

Duplex transmission

Transmission in both directions, either one direction at a time (half duplex) or both directions simultaneously (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 keep the connector endface clean.

Dynamic range

For an optical instrument, defined (in dB) as the ratio of the smallest signal that can be observed at a specified wavelength separation in the presence of a strong nearly-saturating signal.

E-band

Defined by ITU-T G.692 as “extended” for wavelengths between 1360 and 1460 nm. This band includes the high OH peak in single-mode fibers. G.652D fiber is designed for transmission within the extended 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 1560 nm for RF overlay transmission of video signals.

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. Most often used in factory environments due to its complexity and equipment costs.

Endface

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.

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

An adhesive that uses chemical reaction to “cure” or “dry”, bonding two materials together.

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.

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 1565 nm).

Ethernet

A data communications protocol for premises and local access networks, 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 1,000 Mb/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 multilongitudinal 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 10 Gb/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 900- μ m tubing over each 250- μ m coated fiber strand, which allows for additional protection.

Fast Ethernet

IEEE 802.3 standard operating at 100 Mb/s.

Fault

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

Fault finder

A simplified OTDR used to locate breaks in spans of fiber. 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 OTDR used to locate breaks in optical cables.



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 250 µm for outside plant cables and 900 µm for indoor cables.

Fiber connector (FC)

A keyed connector with threaded coupling mechanism that has 2.5-mm 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 power 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

The links used for voice, video, data, medical, sensing, and illumination applications. All use optical fibers to transmit or receive optical signals or power.

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.

Fiber surface finish

The quality of the polishing at the end of the fiber (1 mm, 0.3 mm, etc.). Some terms that describe a poor surface finish are: mist, hackle, chipped, or cracked.

Fiber to the antenna (FTTA)

See *fiber to the cell*.

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.

Fiber to the cell (FTTCell)

Fiber to the cell tower. Used to provide greater bandwidth and to transition to IP requirements using Ethernet.

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 the 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)

Distribution of communication services by providing fiber optic links all the way to each house. Protocols include active Ethernet and PON systems as defined by the IEEE, ITU, and SCTE.

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.

Fibre Channel

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

Figure-8 cable

A type of cable with a built-in messenger designed for aerial installations.

Figure-8 polishing

When a connector is polished on a lapping film/plate combination in a Figure-8 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.

Flat polish

A highly-reflection ferrule endface condition where fiber optic and ferrule tip are polished flat. Normally used with multimode fibers.

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 mechanical device that optically joins optical fibers by discharging voltage between two electrodes. Variations include the single fiber and ribbon fixed V-groove types, the profile alignment splicer (PAS) and the local injection detection (LID), both of which are categorized as core alignment splicers.

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.

Giga (G)

A prefix meaning one billion.

Gigabit Ethernet

IEEE 802.3z. A standard for a high-speed Ethernet, capable of transmitting data at one billion bits per second. 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 2.5 Gb/s and allows 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 provided by 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 wider aspect ratio.

High-density connector

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

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)

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 epoxy. The connector must be heated to liquefy epoxy for fiber optic insertion. The ferrule is then cooled to re-harden the epoxy. Manufactured by 3M.

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

Hybrid cable

A cable with multiple types of optical fibers (e.g., multimode and single-mode). Often confused with composite cable.

Hybrid cable assembly

A jumper assembly with different connections on each end.

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

The gel added inside a cable that 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 fluid

A gel or liquid 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 770 nm 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.

Insertion loss

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

Inspection scope

A microscope or digital scope that inspects ferrule and termini fiber endfaces for polishing quality, damage, or contamination.



Institute of Electrical and Electronics Engineers

IEEE is 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 is a professional society that promotes the reliability of covered and insulated conductors for the transmission and distribution of electric energy, control, and instrumentation of equipment and communications.

Interbuilding backbone

A network that provides communications between buildings, e.g., college campus, office park, etc.

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.

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)

A metal rack located in an equipment room or closet that is designed to connect cables. It consists of components that provide the connection between interbuilding cabling and the intrabuilding cabling.

International Electrotechnical Commission (IEC)

An international standards body responsible for 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)

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 grip

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 adapter are fixed in alignment to prevent rotation and 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.

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; typically over 90% of the light output power concentrated within one angstrom.

Laser-optimized multimode fiber

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

Lashing

Wrapping a cable and its supporting strand or cable together via a steel or dielectric filament.

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 is traditionally copper-based and suffers from the bandwidth limitations of that media.

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 1565 nm to 1625 nm wavelength range.

Least square approximation (LSA)

A technique used by OTDRs to automatically measure splice attenuation.

Light

The region of the electromagnetic spectrum that can be perceived by human vision, designated by the visible spectrum and nominally covering the wavelength range of 400-770 nm. In optical communications, it includes the much broader portion of the electromagnetic spectrum that can be handled by the basic optical techniques used for the visible spectrum. This region is not clearly defined but may be considered to extend from the near-ultraviolet region of approximately 300 nm, through the visible region, and into the mid-infrared region to 30,000 nm.

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 622 Mb/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 2 kHz.

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 stations, usually computers, in a relatively small geographical location such 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 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.



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 1300-nm, 1550-nm, and 1625-nm 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 1625 nm. 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. The newer term "bands" is used to define optical windows that match up with optical amplifiers and their optimum transmission wavelengths. The history of the usage comes from the availability of sources and detectors and their operating characteristics over an optical fiber due to the absorption effects at different wavelengths.

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 a distribution or patch panel.

Main distribution frame (MDF)

A wiring arrangement that connects the outside telephone lines on one side to the internal lines on the other. A main distribution frame may also carry protective devices as well as function as a central testing point.

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.

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.

Mean time between failure (MTBF)

Developed by the military to estimate maintenance or replacement times for various pieces of high-end equipment, MTBF is based upon statistical evidence derived from in-use testing under extreme conditions (simulated or actual environment). Testing is performed by the manufacturer of the equipment or an independent test facility.

Mechanical splice

A fiber splice accomplished by fixtures or materials, rather than by thermal fusion. Index matching material may be applied between the two fiber ends.



Media outlet

A small patch panel 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 localized geographical areas 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 16 mm 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 5-16 mm. 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, or their internal hard disk.

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)

Designed for GbE and Fibre Channel links using legacy multimode fibers and VCSEL light sources operating at 850 nm. 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 "offset" fusion spliced to MMF so the light is coupled outside of the center core defect of the MMF. 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.

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.

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.

Monomode

See *single-mode*.

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 cable

An optical cable having more than one fiber.

Multifiber push-on connector (MPO)

A high-density connector that can terminate up to 24 single-mode or 72 multimode fibers in a single termination.

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 20 dB 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.

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.

Multiuser 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.

Network access point (NAP)

A major Internet connection point that allows organizations to interconnect and 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.

Network equipment building system (NEBS)

A 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 all terms describing this characteristic.

Nylon

An abrasion-resistant thermoplastic with good chemical resistance.

O-band

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

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 2000 MHz-km. Designated by IEC 11801.

OM4

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

Open system interconnection (OSI)

A seven-layered 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.

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 BASE-10 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 have the ability to track the signal wavelength variation over its operating wavelength range while untunable 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 PON controller card or unit located at the service provider. The laser at the OLT is frequently a DFB laser that transmits at 1490 nm or 1550 nm and is always on. Signals from the OLT tell the ONTs when to send upstream traffic to it. Several OLTs may be located in a single chassis.

Optical loss

The amount of optical power lost as light is transmitted through fiber, splices, couplers, etc. Also known as attenuation; measured in dB.

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 in the home. The ONT located either inside or outside the home or business converts the signals from light to electrical signals and contains ports to distribute signals on the existing home wiring (or wirelessly).

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.

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, accessed at each optical line amplifier site, used for maintenance purposes including but not limited to remote site alarm reporting, communications necessary for fault location, and orderwire. Not used to 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.

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

G.652 single-mode fiber designation by IEC 11801.

OS2

G.652D single-mode fiber designation by IEC 11801.

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., 2.5 mm.



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

Network deployment in an area that is served by an incumbent network operator. Although the services offered by the new provider may differ from those offered by the incumbent provider(s), some degree of competition is usually implicit.

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.

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 simultaneously by more than one node.

Passive

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

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 angle 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 cable that has one end terminated with a connector. The pigtail is spliced to existing cable and placed into a splice tray in a patch panel. Pigtails are generally manufactured for single-mode fiber with machine polished endfaces for low backreflection.

PIN diode

Positive intrinsic negative diode, a type of photodiode used to convert optical signals in a receiver. Can be used with both analog and digital systems.

Pitting

An unacceptable polishing condition usually caused by the contamination of the lapping film from a combination of fiber optic and grit particles.

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. GI-POF 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 intrabuilding 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.

Point-to-point (P2P, PtP)

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. For FTTx installations, 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.

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 standardized communications convention enabling the orderly and accurate transfer of data between stations.

Protrusion

According to the TIA, 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.

Pulse width

A measurement of the full width half maximum (FWHM) value of a light source's peak power and spectral width at the 3 dB 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/MTP 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 telephone service quality provided to a subscriber.

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 measured from the side of the connector ferrule. 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.

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 beam into the medium where it originated, i.e., a mirror.

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 amount of times a connector can be mated within an interface before the amount of attenuation measured exceeds the Telcordia GR-20 standard.

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 cable that has internal optical fiber ribbons. Up to 24 fibers (250 μm) are spaced evenly, sandwiched between two layers of matrix. Normally there are up to 12 fibers per ribbon.

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.

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 1460-1530 nm wavelength range.

SC connector

Subscriber connector, a push/pull connector recognized as the preferred optical fiber connector standard. It is available in simplex, duplex, hybrid, or hardened styles.

Scattering

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

Scribe

When an optical fiber is slightly scratched and then broken (scribing) to achieve a 90° endface. For splicing, the scribe tool needs to cleave as close as possible without angles, chips, or cracks. These tools are more expensive than hand scribe tools used for connectorization, where the final polish will be performed by machine or hand.

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) 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 (ONTs).

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 850 nm 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 850 nm.

Simple/signalling 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 tight buffered breakout cable with 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 at a single wavelength.

Single-mode fiber (SMF)

A type of optical fiber specified by the ITU as G.652 (standard), G.652D (low water peak), G.657 (bend-insensitive), and G.655 (nonzero dispersion shifted). G.652 and G.652D fibers are also specified by the IEC 11801 standard as OS1 and OS2 fibers.

Sleeve

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

Small form factor (SFF)

A connector that offers higher density electronic equipment, enclosures, and distribution panels, lower connector costs, easier termination, and better optical performance.

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.

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

A cable and fiber management product that environmentally protects and houses optical splices. Available as inline or butt style, the closure is usually in a dome or clamshell configuration. Splice closures can also hold connectors and optical splitters. Telcordia GR-771 specifies mechanical requirements and environmental specifications and tests.

Splice organizer

A tray or other device used for the permanent storage of mechanical or fusion optical splices.



Splice panel

A rack or wall-mounted panel that allows cables to be organized and spliced. The panel holds splice trays, secures the cable, grounds any metallic members, and organizes and stores buffer tubes, fibers, and splices.

Splice protector

A device which is placed over the 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.

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 outside plant network are optical splitters that distribute optical signals from the OLT into 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 2.5 mm ferrules. Available in ST I or ST II styles.

Stapler cleaver

Shaped similar to a stapler, its blade is made from a material sharp enough to nick the fiber optic and, by pressing down on a flexible tongue, cleaving the fiber optic. Most often used in a cleave and crimp style connector, and for acceptance testing.

Star

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

Star coupler

An optical splitter in which many fibers have their signals mixed at a single optical element. The mixed 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

How a cable's physical load is attached and addressed at the rear of a connector. In fiber optic cable assemblies using a 3-mm cordage, the aramid yarn is epoxied or crimped to provide the strongest level of strain relief while protecting the cable's internal optical fiber(s).

Stranded cable

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

Stripper

Mechanical tool used to remove buffer coatings from fibers.

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 50 dB 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

A device for re-routing signals from one optical fiber into others. Types include MEMs, matrix, bypass, optical cross-connect, and electrical network switches.

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 10 Gb/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 the 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 1.544 Mb/s and can handle up to 24 telephone calls or other data. The corresponding European protocol E1 operates at 2.048 Mb/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 45 Mb/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 inter-network 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.

Telcordia Technologies (Bellcore)

Formerly known as Telcordia-Bell Communications Research, it is the unofficial standards development body providing technical specifications for the RBOCs.

Telecommunications closet (TC)

An enclosed, secure space that houses telecom equipment, cable terminations, and cross-connects. Recognized for backbone and horizontal cable facilities.

Telecommunications Industry Association (TIA)

An organization that participates in setting standards.

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., RJ45s, coaxial terminators, fiber optic connections. If more than one type of connector is used, it is called a multiuser telecommunications outlet assembly (MUTOA).

Telecommunications space

The area where telecommunications equipment and cable are housed, installed, and terminated; e.g., work areas, telecommunications closets, and handholes.

Tensile strength

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

Termination

Connection.

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 subject 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 with internal 900-micron coated fibers, such as breakout and distribution styles. Jacket materials vary but they are normally rated for indoor use to meet plenum, riser, and LSZH requirements.

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.

Time division multiplexing (TDM)

A digital technique for combining two or more signals into a single stream of data by sharing time.

Topology

Physical and logical layout of a network.

Total internal reflection

100% reflection and 0% transmission of light at the interface of two optical media.

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 and/or individual distribution points.

Tunable laser

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

Twisted pair

Cable with at least two insulated wires intertwined to reduce electromagnetic interference.

U-band

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

Ultra physical contact (UPC)

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

Undercut

According to Telecommunications Industry of America (TIA), a negative protrusion where the fiber optic is lower than the endface of the connector within the ferrule.

Underfilled launch condition (ULC)

When a laser diode in a Gigabit transmission system only fills a small percentage of the fiber core.

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 to a telephone system 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 attenuator with adjustable attenuation; often used to test system performance by increasing attenuation until the system fails.

Vault

Storage product allowing for excess cable slack and splice case.

Vertical-cavity surface-emitting laser (VCSEL)

A high-speed, low-cost laser operating at the 850-nm wavelength that is used 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. It can allow VCR-like playback control.



Video over IP

The transmission of video programming over an IP network. If the source programming 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 380-770 nm, that are visible to the human eye.

Voice over IP (VoIP)

The 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.

Watts (W)

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

Waveguide

An older term for optical fiber; a dielectric material structure able to support and propagate modes.

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 optical term for frequency. Fiber optics generally uses the 850 nm, 1300/1310 nm, 1550 nm and 1625 nm wavelengths for transmission purpose due to the marriage of performance with light sources, optical fibers, and optical detector technologies.

Wavelength division multiplexing (WDM)

The combining of two or more optical signals for transmission over a common optical path, usually a single fiber. WDM devices have a channel wavelength spacing greater than or equal to 50 nm. They typically separate a channel in one conventional transmission window (e.g., 1310 nm) from another (e.g., 1550 nm). Types include wide WDM, coarse WDM, and dense WDM.

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

Defined by FSAN as a next generation (NG2) network in which each subscriber is assigned their own wavelength.

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, faxes, phones, etc.). A media or telecommunications outlet would be used here for duplex fiber terminations or, in the case of multiple users, a MUTOA outlet.

Yield

The percentage of completed splices or assemblies 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 1.6 mm (mini Zipcord), 2.5 mm, or 3.0 mm (standard cable assembly cordage).



Acronyms

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



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



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



- NCC** Network control center.
- NEBS** Network equipment building system.
- NEC** National Electrical Code.
- NECA** National Electrical Contractors Association.
- NEMA** National Electrical Manufacturers Association.
- NESC** National Electrical Safety Code.
- NFPA** National Fire Protection Association.
- NGI** Next generation Internet.
- 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 power 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.
- 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.
- 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.	RFoG	Radio frequency over glass.
PDLC	Polarization-dependent loss compensation.	RFTS	Remote fiber test system.
PDM	Polarization division multiplexing.	RIN	Relative intensity noise.
PE	Polyethylene.	RML	Restricted mode launch.
PIC	Photonic integrated circuit.	ROADM	Reconfigurable optical add/drop multiplexer.
PIN	Positive-intrinsic-negative.	ROSA	Receiver optical subassembly.
PIN-FET	Positive-intrinsic-negative field-effect transistor.	ROW	Rights of way.
PLC	Planar lightwave circuit.	RT	Remote terminal.
PLOAM	Physical layer operations, administration, and maintenance.	RTM	Reference test method.
PMD	Polarization mode dispersion.	RTU	Remote test unit.
PMDC	Polarization mode dispersion compensation.	RU	Rack unit.
PM-QPSK	Polarization multiplexed quadrature phase-shift keying.	Rx	Receive; receiver.
POF	Plastic optical fiber.	SA	Serving area.
PON	Passive optical network.	SAN	Storage area network.
POP	Point of presence.	SBS	Stimulated Brillouin scattering.
POTP	Passive optical transport platform.	SCTE	Society of Cable Telecommunications Engineers.
POTS	Plain old telephone service.	SDH	Synchronous digital hierarchy.
PPE	Personal protective equipment.	SDM	Spatial division multiplexing.
PSK	Phase-shift keying.	SDS	Safety data sheet.
PSTN	Public switched telephone network.	SDSL	Symmetric digital subscriber line.
PtP	Point-to-point.	SDV	Switched digital video.
PTZ	Pan, tilt, zoom.	SERDES	Serializer/deserializer.
PU	Polyurethane.	SFF	Small form factor.
PVC	Polyvinyl chloride; permanent virtual circuit.	SFP	Small form factor pluggable.
PVDF	Polyvinylidene fluoride.	SHR	Self-healing ring.
PXC	Photonic cross-connect.	SLED	Surface-emitting LED.
QAM	Quadrature amplitude modulation.	SLIC	Subscriber line interface circuit.
QDM	Double-band amplitude modulation.	SLM	Single longitudinal mode (laser).
QoS	Quality of service.	SMA	Subminiature type A connector.
QPSK	Quadrature phase-shift keying.	SMDS	Switched multimegabit data service.
RADSL	Rate adaptive digital subscriber line.	SMF	Single-mode fiber.
RBOC	Regional Bell operating company.	SNMP	Simple (or signalling) network management protocol.
RBS	Rated breaking strength.	SNR	Signal-to-noise ratio.
RCVR	Receiver.	SOA	Semiconductor optical amplifier.
RF	Radio frequency.	SONET	Synchronous optical network.
RFI	Radio frequency interference.	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.
- Tx** Transmit; transmitter.
- TTL** Transistor-transistor logic.
- 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.
- VOA** Variable optical attenuator.
- VOD** Video on demand.
- VoIP** Voice over Internet protocol.
- VPN** Virtual private network.
- VPON** Video passive optical network.
- VSF** 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.

