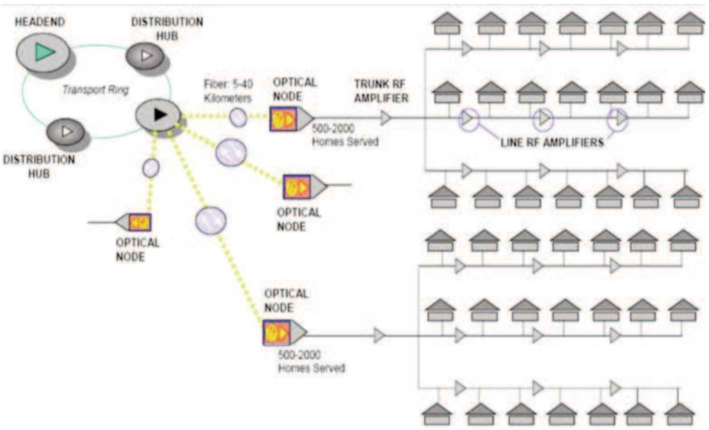
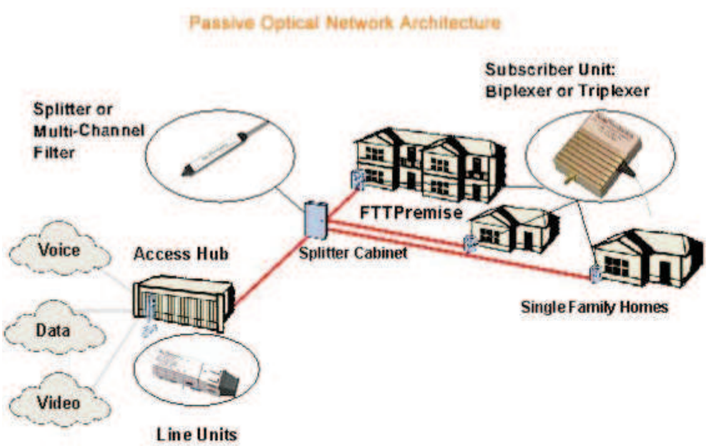
Engineering Standards & Technology Overview

Optical Splitters Product Notes

Optical splitters are used in CATV and FTTH PON (Passive Optical Network) architectures.

CATV/HFC (Hybrid Fiber-Coax)





PON (Passive Optical Networks)

A hybrid fiber coaxial (HFC) network is a telecommunication technology in which optical fiber cable and coaxial cable are used in different portions of a network to carry broadband content (such as video, data, and voice). Optical splitters are used to split the signal coming from the Erbium Doped Fiber Amplifier (EDFA). In this way, one EDFA can feed several nodes (up to 12 depending on distance limitations). The splitters are located in the Headend/CO.

The leading FTTH technology is PON or Passive Optical Network technology. This approach differs from most of the telecommunications networks in place today by featuring "passive" operation. Active networks like DSL, VDSL and cable have active components in the network backbone equipment, in the central office, in the neighborhood network infrastructure, and in the customer premises equipment. PONs have only passive light transmission components in the neighborhood infrastructure with active components only in the central office and the customer premises equipment. The elimination of active components means that the access network consists of one bi-directional light source and a number of passive splitters that divide the data stream into the individual links to each customer. At the central office, the termination point is in PON optical line terminal (OLT) equipment. At the customer premises, the termination point is in optical network terminals or ONTs also called optical network units or ONUs. These are in the customer premises equipment or CPE. Between the OLT and the ONT/ONUs is the passive optical network comprising fiber links and passive splitters and couplers.

Two primary technologies are commonly used to fabricate splitters and couplers.

Planar Lightwave Circuit (PLC or Planar). A light circuit on an 'optical chip' is mounted on a carrier and fibers, usually in ribbon form, are bonded to the edges of the chip. The assembly is encapsulated in a protective enclosure. PLC devices support direct split counts up to 32. In planar fabrication technology, devices are made using ion-exchange or photolithography techniques that replicate solid-state circuit methods. Ultimately, the per-unit cost for the expected high volumes will become advantageous for planar technology, especially for higher port devices. A difficult manufacturing problem involves a low-loss method for attaching the optical fibers to the chip and then passing the market's qualification and reliability requirements.

Type	IL	RL	PDL	Uniformity	Directivity	Operating Temp	Storage Temp
1x32	< 16.8 dB	> 50 dB	< .3 dB	< 1.7 dB	> 55 dB	-40 to 85 C	-40 to 85 C
2x32	< 17.8 dB	> 50 dB	< .3 dB	< 1.8 dB	> 55 dB	-40 to 85 C	-40 to 85 C
1x16	< 13.8 dB	> 50 dB	< .3 dB	< 1.2 dB	> 55 dB	-40 to 85 C	-40 to 85 C
1x8	< 10.8 dB	> 50 dB	< .3 dB	< 0.8 dB	> 55 dB	-40 to 85 C	-40 to 85 C
1x4	< 7.5 dB	> 50 dB	< .3 dB	< 0.6 dB	> 55 dB	-40 to 85 C	-40 to 85 C

**Terminated Specifications

FBT Splitter Specifications

Fused Biconic Technology (FBT). Two or more fibers are twisted together, heated and drawn to bring the optical cores into near contact. The combined fibers are mounted on a low-expansion carrier and encapsulated in a low expansion tube. FBT devices allow direct splitting up to 4 ways. Higher split counts are achieved by splicing multiple devices to form multi-stage, concatenated splitters. Concatenated splitters are also called tree splitters. The fused-biconic tapered technology directly bonds or melts the fibers together so that the final splitter can be mounted in small diameter (approximately 3-millimeter) stainless-steel tubes. This technology produces small, low-cost, high-performance devices. A tough fabrication obstacle involves the small and delicate final coupling region. However, when properly mounted and packaged, these devices meet long-term stability and reliability requirements.

Dual Window – Wavelength Flattened (Terminated Specifications)						
		1x2	1x4	1x8	1x16	1x32
Max. Insertion Loss	dB	3.6	7.2	10.7	14.0	17.6
Max. Uniformity	dB	0.8	1.0	1.3	1.6	1.9
Max. PDL	dB	0.2	0.3	0.4	0.5	0.6
Center Wavelengths	nm	1310 and 1550				