



CORNING

Coexistence Elements

Solutions Guide

PON Evolution for Existing ODNs

Today, communication service providers (CSPs) are evolving their FTTH networks from GPON (2.5 Gbps) to 10 Gbps and higher. This PON (passive optical network) evolution includes higher bandwidth services such as XGS-PON (10 Gbps symmetrical), NGPON2 (multiwavelength TWDM 10 Gbps to 40 Gbps), 25GS-PON (25 Gbps symmetrical), and even 50G-PON.

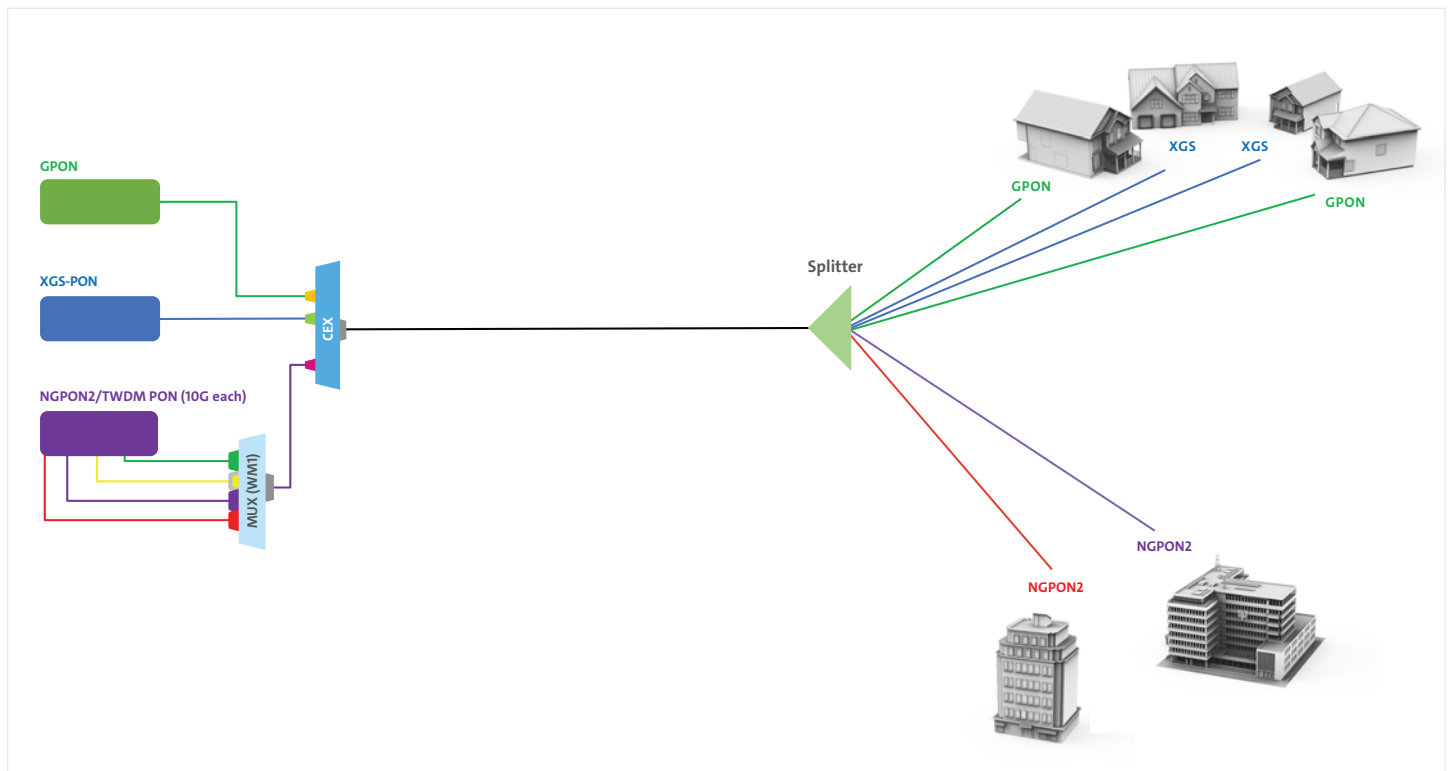
Leveraging investments in GPON services continues to have value for most residential subscribers. However, when using the same FTTH ODN (optical distribution network) for enterprise level services (small and medium businesses) or even mobile x-haul, 10G+ services are desired as well. CSPs have options for how to introduce and operate multiple generations of PON on an existing ODN infrastructure. The network provider could keep the PON technologies separate on dedicated feeder fibers and splitters. The appropriate splitter outputs would then be directed to the respective subscriber based on their subscribed bandwidth (i.e., GPON vs XGS-PON).

In order to preserve existing feeder fibers, the concept of coexistence is utilized. Coexistence is the ability to have two or more services transported together on the same fiber. This is made possible by using wavelength division multiplexing (WDM) technologies (filters) to overlay the different wavelengths of the multiple services. WDM devices that overlay PON services are referred to as Coexistence Elements (CEX).

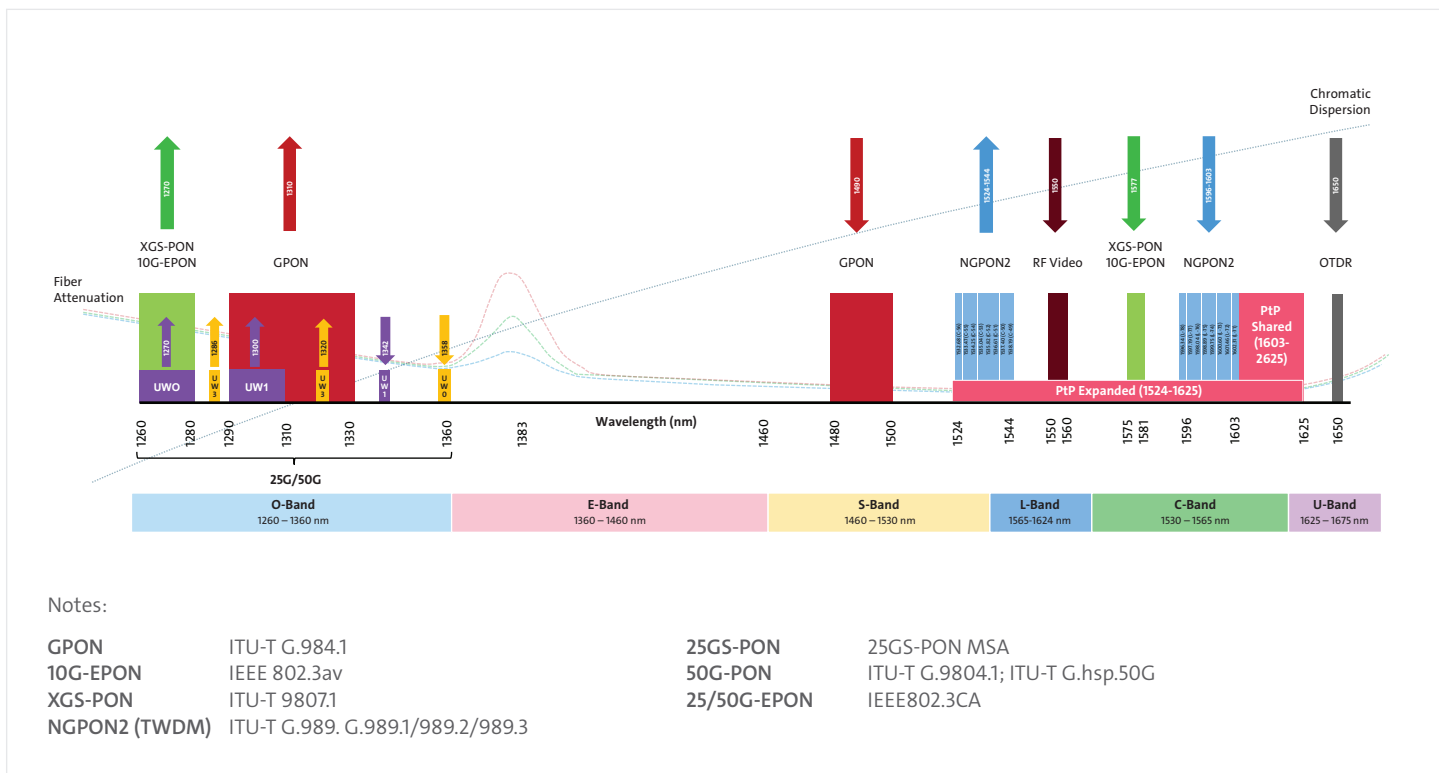
Corning Optical Communications has integrated our micro-optics devices into various industry recognized hardware platforms, such as Centrix™, Eclipse®, and LGX.

Corning's CEX portfolio has solutions from basic coexistence scenarios to complex network convergence architectures.

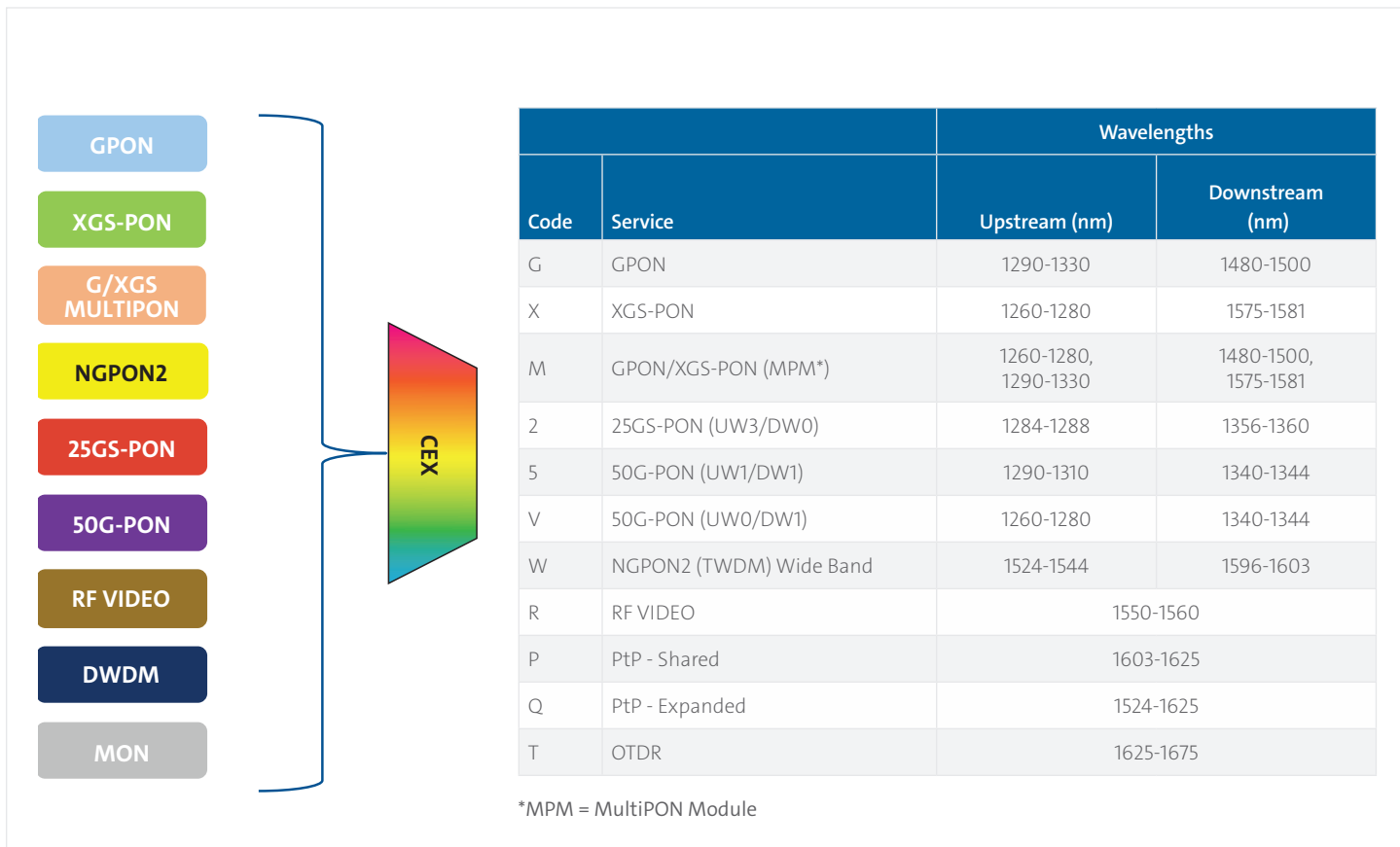
PON Coexistence – Example



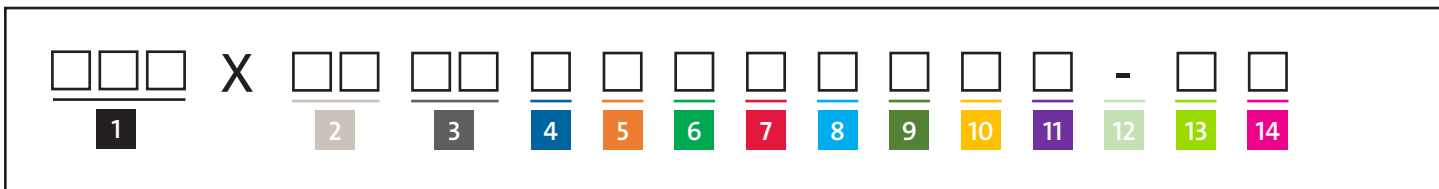
Understanding Spectrum for Coexistence and Convergence



Service Options



Ordering Information | Next Gen PON Coexistence Elements (CEX)



- 1 Select product family.**
 CTX = Centrix™ Cassette
 ECL = Eclipse® Module
 EG1 = EDGE™ WDM Module
 LG1 = LGX Single Width Module
 EMR = EMF/FMS Right Hand Module
 EML = EMF/FMS Left Hand Module
 RAK = 1 RU Shelf
- 2 Select COM connector.**
 B3 = LC APC 6C = SC APC
 A9 = LC UPC 3C = SC UPC
- 3 Select service connector.**
 B3 = LC APC A9 = LC UPC
 6C = SC APC 3C = SC UPC
- 4 Select GPON service option.**
 0 = None
 G = GPON 1290-1330 nm, 1480-1500 nm
 M = MultiPON: GPON+XGS-PON
 1290-1330 nm and 1480-1500 nm
 1260-1280 nm and 1575-1581 nm
 D = GPON/25G-PON 1290-1500 nm
- 5 Select RF Video service option.**
 0 = None
 R = RF Video 1550-1560 nm
- 6 Select XGS-PON service option.**
 0 = None
 X = XGS-PON 1260-1280 nm, 1575-1581 nm
- 7 Select NGPON2/TWDM service option.**
 0 = None
 W = Wide Band 1524-1544 nm, 1596-1603 nm
 R = Reduced Band 1528-1540 nm, 1596-1603 nm
 N = Narrow Band 1532-1540 nm, 1596-1603 nm
- 8 Select 25GS-PON option.**
 0 = None
 2 = 25GS-PON: UW3 1284-1288 nm;
 DW0 1356-1360 nm
- 9 Select 50G-PON or NGPON2 WM1 MUX service option.**
 0 = None
 W = 4 Channel NGPON2 MUX
 1532.68/1596.34 nm; 1533.47/1597.19 nm;
 1534.25/1598.04 nm; 1535.04/1598.89 nm
 5 = 50G-PON: UW1 1290-1310 nm;
 DW1 1340-1344 nm
 V = 50G-PON: UW0 1260-1280 nm;
 DW1 1340-1344 nm
See Note 1 on Page 5
- 10 Select PtP option.**
 0 = None
 P = PtP Shared 1603-1625 nm
 Q = PtP Expanded 1524-1625 nm
See Note 2 on Page 5
- 11 Select Integrated Splitter option.**
 0 = None
 2 = Integrated 1x2 splitter
 4 = Integrated 1x4 splitter
See Note 3 on Page 5
- 12 Reserved for Serialization.**
 - = None
- 13 Select OTDR port option.**
 N = None
 T = OTDR 1625-1675 nm
 L = OTDR 1615-1635 nm
- 14 Select number of total CEXs in solution.**
 1 = 1 7 = 7 D = 13
 2 = 2 8 = 8 E = 14
 3 = 3 9 = 9 F = 15
 4 = 4 A = 10
 5 = 5 B = 11
 6 = 6 C = 12

PN Configurator Notes

Note 1 – NGPON2 MUX (WM1) OR 50G-PON. **Cannot have both WM1 and 50G-PON.**

The WM1 is typically built as a standalone device to multiplex the 4 channels of NGPON2 prior to other CEX devices.

When configuring a WM1, select “NONE” for other PON/TF/PtP services. An integrated splitter may be selected if desired to take advantage of higher split ratios.

For custom solutions that integrate the NGPON2 WM1s with a Coexistence Element and/or splitter, please contact Corning Engineering Services for configuration assistance.

Note 2 – Point-to-Point (PtP). Reference ITU-T G.989.2 (02/2019) table 9-1.

This recommendation specifies PtP WDM PON anywhere in the Expanded or Shared spectrum identified by G.989.2, subject to spectrum otherwise being used.

Whenever a particular subset of the spectrum in either band is unused by TWDM PON and/or legacy systems, PtP WDM PON is permitted to make use of that particular sub-band in upstream and/or downstream direction. However, the isolation requirements for the TWDM PON and/or legacy systems must be considered when determining the expanded spectrum wavelengths to be occupied by PtP WDM PON.

When TWDM PON and PtP WDM PON are both present, wavelength channels of both technologies may occupy adjacent wavelength bands; however, TWDM and PtP WDM channels must not be interleaved. The required guard band between TWDM PON and PtP WDM PON is a minimum of 3 nm when using separate mux/demux devices. In the shared spectrum case, the PtP WDM PON upstream channels use the shorter wavelengths in the shared spectrum. When a single device is used to multiplex PtP WDM PON and TWDM PON, the required guard band is a minimum of 100 GHz.

Note 3 – Integrated splitter option. An integrated splitter can be included to split the COMMON leg into multiple outputs. This is utilized as the first level split in ODNs leveraging higher split ratios, distributed split architectures or distributed tap architectures.

Configurations

The capacity for various configurations are listed for Centrix™, EDGE™, Eclipse®, and LGX solutions.

Hardware	Maximum LC Ports	Maximum Number of CEX Devices					
		2 services	3 services	4 services	5 services	6 services	NGPON2 WM1
Centrix Cassette	36	12	9	7	6	5	4
Eclipse Single Wide Module	12	4	3	2	2	1	2
LGX Single Wide Module	24	8	6	4	4	3	3
EDGE	12	4	3	2	2	1	2

Hardware	Maximum SC Ports	Maximum Number of CEX Devices					
		2 services	3 services	4 services	5 services	6 services	NGPON2 WM1
Centrix Cassette	24	8	6	4	6	3	4
Eclipse Single Wide Module	12	4	3	2	2	1	2
LGX Single Wide Module	12	4	3	2	2	1	2

Note: This option allows for multiple instances of a particular CEX in one module/cassette. The maximum number of devices allowed is dependent on the form factor of the module/cassette, the connector type chosen, and the number of services being combined.

Specifications

ID	Services	Service Passband	Max Insertion Loss (with LC or SC APC connectors) (dB)	Port Isolation Minimum (dB)	Return Loss (dB) (LC APC, SC APC)	Directivity (dB)	PDL (dB)	Optical Power Max. (mW)	Operating Temp Range (°C)
CEX A	GPON + XGS	GPON 1290-1330 nm and 1480-1500 nm XGS-PON 1260-1280 nm and 1575-1581 nm	COM to GPON: 1.0 COM to XGS-PON: 1.2	COM to GPON: 30 COM to XGS-PON: 30	45	50	0.2	300	-5 to +65
CEX B	GPON + XGS + RF	GPON 1290-1330 nm and 1480-1500 nm XGS-PON 1260-1280 nm and 1575-1581 nm RF VIDEO 1550-1560 nm	"COM to GPON: 1.0 COM to XGS-PON: 1.2 COM to RFVIDEO: 1.5"	COM to GPON: 30 COM to XGS-PON: 30 COM to RFVIDEO: 30	45	50	0.2	300	-5 to +65
CEX C	GPON + XGS + NGPON2	GPON 1290-1330 nm and 1480-1500 nm XGS-PON 1260-1280 nm and 1575-1581 nm NGPON2 (TWDM) Wide Band 1524-1544 nm and 1596-1603 nm	COM to GPON: 1.0 COM to XGS-PON: 1.2 COM to NGPON2: 1.5	COM to GPON: 30 COM to XGS-PON: 30 COM to NGPON2: 30	45	50	0.2	300	-5 to +65
CEX D	GPON/XGS (MPM*) + RF	XGS/GPON (MPM*) 1260-1280 nm, 1290-1330 nm and 1480-1500 nm, 1575-1581 nm RF VIDEO 1550-1560 nm	COM to XGS/GPON (MPM*): 1.0 COM to RF VIDEO: 1.0	COM to XGS/GPON (MPM*): 30 COM to RF VIDEO: 30	45	50	0.2	300	-5 to +65
CEX E	GPON + XGS + 25GS	GPON 1290-1330 nm and 1480-1500 nm XGS-PON 1260-1280 nm and 1575-1581 nm 25GS-PON 1284-1288 nm and 1356-1360 nm	COM to GPON: 1.6 COM to XGS-PON: 1.6 COM to 25GS-PON: 2.5	COM to GPON: 30 COM to XGS-PON: 30 COM to 25GS-PON: 30	45	50	0.2	300	-5 to +65
CEX F	GPON/XGS (MPM*) + 25GS	XGS/GPON (MPM*) 1260-1280 nm, 1290-1330 nm and 1480-1500 nm, 1575-1581 nm 25GS-PON 1284-1288 nm and 1356-1360 nm	COM to XGS/GPON (MPM*): 1.5 COM to 25GS: 1.5	COM to XGS/GPON (MPM*): 30 COM to 25GS: 30	45	50	0.2	300	-5 to +65
CEX G	GPON + XGS + 25GS + RF	GPON 1290-1330 nm and 1480-1500 nm XGS-PON 1260-1280 nm and 1575-1581 nm 25GS-PON 1284-1288 nm and 1356-1360 nm RF VIDEO 1550-1560 nm	COM to GPON: 1.6 COM to XGS-PON: 1.6 COM to 25GS-PON: 2.5 COM to RF VIDEO: 2.5	COM to GPON: 30 COM to XGS-PON: 30 COM to 25GS-PON: 30 COM to RF VIDEO: 30	45	50	0.2	300	-5 to +65
CEX H	GPON/XGS (MPM) + 25GS + RF	XGS/GPON (MPM*) 1260-1280 nm, 1290-1330 nm and 1480-1500 nm, 1575-1581 nm 25GS-PON 1284-1288 nm and 1356-1360 nm RF VIDEO 1550-1560 nm	COM to XGS/GPON (MPM*): 2.1 COM to 25GS-PON: 1.5 COM to RF VIDEO: 1.6	COM to XGS/GPON (MPM*): 30 COM to 25GS-PON: 30 COM to RF VIDEO: 30	45	50	0.2	300	-5 to +65
WM1	NGPON2 MUX (A1-A4)	Ch1: C56/L78 (1532.68 nm/1596.34 nm) Ch2: C55/L77 (1533.47 nm/1597.19 nm) Ch3: C54/L76 (1534.25 nm/1598.04 nm) Ch4: C53/L75 (1535.04 nm/1598.89 nm)	Com to DWDM Port ** Max: 2.0dB Com to DWDM Port Min: 0.8dB Uniformity: 0.8dB	DWDM adjacent Iso: 32 DWDM non-adjacent Iso: 36	45	50	0.2	300	-5 to +65

*MPM - MultiPON Module

** DWDM Passband Width +/-0.16nm

Notes:

- 1) Maximum insertion loss includes one pair of connector loss.
- 2) Maximum insertion loss covers entire operating temperature range.
- 3) All components must be RoHS compliant.
- 4) All WDM and other fiber-based components must be compliant to their pertinent Telcordia requirements, including GR-1209, GR-1221 and others as appropriate to the specification.

Centrix™ Configurations*



Centrix™					
CEX Type	Services	Part Number	With LC APC and Maximum Number Devices	Part Number	With SC APC and Maximum Number Devices
CEX A	GPON + XGS	CTXXB3B3G0X00000-NC	GPON, XGS, LC APC, 12 devices	CTXX6C6CG0X00000-N8	GPON, XGS, SC APC, 8 devices
CEX B	GPON + XGS + RF	CTXXB3B3GRX00000-N9	GPON, RF, XGS, LC APC, 9 devices	CTXX6C6CGRX00000-N6	GPON, RF, XGS, SC APC, 6 devices
CEX C	GPON + XGS + NGPON2	CTXXB3B3G0XW0000-N9	GPON, XGS, NGPON2 Wide Band, LC APC, 9 devices	CTXX6C6CG0XW0000-N6	GPON, XGS, NGPON2 Wide Band, SC APC, 6 devices
CEX D	GPON/XGS (MPM*) + RF	CTXXB3B3MR000000-NC	GPON/XGS-PON MultiPON, RF, LC APC, 12 devices	CTXX6C6CMR000000-N8	GPON/XGS-PON MultiPON, RF, SC APC, 8 devices
CEX E	GPON + XGS + 25G	CTXXB3B3G0X02000-N9	GPON, XGS, 25G, LC APC, 9 devices	CTXX6C6CG0X02000-N6	GPON, XGS, 25G, SC APC, 6 devices
CEX F	GPON/XGS (MPM*) + 25G	CTXXB3B3M0002000-NC	GPON/XGS-PON MultiPON, 25G, LCAPC, 12 devices	CTXX6C6CM0002000-N8	GPON/XGS-PON MultiPON, 25G, SC APC, 8 devices
CEX G	GPON + XGS + 25G+RF	CTXXB3B3GRX02000-N7	GPON, RF, XGS, 25G, LC APC, 7 devices	CTXX6C6CGRX02000-N4	GPON, RF, XGS, 25G, SC APC, 4 devices
CEX H	GPON/XGS (MPM) + 25G + RF	CTXXB3B3MR002000-N9	GPON/XGS-PON MultiPON, RF, 25G, LC APC, 9 devices	CTXX6C6CMR002000-N6	GPON/XGS-PON MultiPON, RF, 25G, SC APC, 6 devices
WM1	NGPON2 MUX (λ1-λ4)	CTXXB3B300000W00-N4	NGPON2 MUX, WM1, 4 channel, LC APC, 4 WM1 devices	CTXX6C6C00000W00-N4	NGPON2 MUX, WM1, 4 channel, SC APC, 4 WM1 devices

*Other configurations possible. Please contact Corning.

Eclipse® Configurations*



Eclipse®					
CEX Type	Services	Part Number	With LC APC and Maximum Number Devices	Part Number	With SC APC and Maximum Number Devices
CEX A	GPON + XGS	ECLXB3B3G0X00000-N4	GPON, XGS, LC APC, 4 devices	ECLX6C6CG0X00000-N4	GPON, XGS, SC APC, 4 devices
CEX B	GPON + XGS + RF	ECLXB3B3GRX00000-N3	GPON, RF, XGS, LC APC, 3 devices	ECLX6C6CGRX00000-N3	GPON, RF, XGS, SC APC, 3 devices
CEX C	GPON + XGS + NGPON2	ECLXB3B3G0XW0000-N3	GPON, XGS, NGPON2 Wide Band, LC APC, 3 devices	ECLX6C6CG0XW0000-N3	GPON, XGS, NGPON2 Wide Band, SC APC, 3 devices
CEX D	GPON/XGS (MPM*) + RF	ECLXB3B3MR000000-N4	GPON/XGS-PON MultiPON, RF, LC APC, 4 devices	ECLX6C6CMR000000-N4	GPON/XGS-PON MultiPON, RF, SC APC, 4 devices
CEX E	GPON + XGS+ 25G	ECLXB3B3G0X02000-N4	GPON, XGS, 25G, LCAPC, 4 devices	ECLX6C6CG0X02000-N4	GPON, XGS, 25G, SCAPC, 4 devices
CEX F	GPON/XGS (MPM*) + 25G	ECLXB3B3M0002000-N4	GPON/XGS-PON MultiPON, 25G, LC APC, 4 devices	ECLX6C6CM0002000-N4	GPON/XGS-PON MultiPON, 25G, SC APC, 4 devices
CEX G	GPON + XGS + 25G+RF	ECLXB3B3GRX02000-N2	GPON, RF, XGS, 25G, LC APC, 2 devices	ECLX6C6CGRX02000-N2	GPON, RF, XGS, 25G, SC APC, 2 devices
CEX H	GPON/XGS (MPM) + 25G + RF	ECLXB3B3MR002000-N3	GPON/XGS-PON MultiPON, RF, 25G, LCAPC, 3 devices	ECLX6C6CMR002000-N3	GPON/XGS-PON MultiPON, RF, 25G, SC APC, 3 devices
WM1	NGPON2 MUX (λ1-λ4)	ECLXB3B300000W00-N2	NGPON2 MUX, WM1, 4 channel, LC APC, 2 WM1 devices	ECLX6C6C00000W00-N2	NGPON2 MUX, WM1, 4 channel, SCAPC, 2 WM1 devices

*Other configurations possible. Please contact Corning.

LGX Configurations*



LGX					
CEX Type	Services	Part Number	With LC APC and Maximum Number Devices	Part Number	With SC APC and Maximum Number Devices
CEX A	GPON + XGS	LG1XB3B3G0X00000-N8	GPON, XGS, LCAPC, 8 devices	LG1X6C6CG0X00000-N4	GPON, XGS, SC APC, 4 devices
CEX B	GPON + XGS + RF	LG1XB3B3GRX00000-N6	GPON, RF, XGS, LCAPC, 6 devices	LG1X6C6CGRX00000-N3	GPON, RF, XGS, SC APC, 3 devices
CEX C	GPON + XGS + NGPON2	LG1XB3B3G0XW0000-N6	GPON, XGS, NGPON2 Wide Band, LCAPC, 6 devices	LG1X6C6CG0XW0000-N3	GPON, XGS, NGPON2 Wide Band, SC APC, 3 devices
CEX D	GPON/XGS (MPM*) + RF	LG1XB3B3MR000000-N8	GPON/XGS-PON MultiPON, RF, LCAPC, 8 devices	LG1X6C6CMR000000-N4	GPON/XGS-PON MultiPON, RF, SC APC, 4 devices
CEX E	GPON + XGS+ 25G	LG1XB3B3G0X02000-N6	GPON, XGS, 25G, LCAPC, 6 devices	LG1X6C6CG0X02000-N3	GPON, XGS, 25G, SC APC, 3 devices
CEX F	GPON/XGS (MPM*) + 25G	LG1XB3B3M0002000-N8	GPON/XGS-PON MultiPON, 25G, LCAPC, 8 devices	LG1X6C6CM0002000-N4	GPON/XGS-PON MultiPON, 25G, SC APC, 4 devices
CEX G	GPON + XGS + 25G+RF	LG1XB3B3GRX02000-N4	GPON, RF, XGS, 25G, LCAPC, 4 devices	LG1X6C6CGRX02000-N2	GPON, RF, XGS, 25G, SC APC, 2 devices
CEX H	GPON/XGS (MPM) + 25G + RF	LG1XB3B3MR002000-N6	GPON/XGS-PON MultiPON, RF, 25G, LCAPC, 6 devices	LG1X6C6CMR002000-N3	GPON/XGS-PON MultiPON, RF, 25G, SC APC, 3 devices
WM1	NGPON2 MUX (A1-A4)	LG1XB3B300000W00-N3	NGPON2 MUX, WM1, 4 channel, LCAPC, 3 WM1 devices	LG1X6C6C00000W00-N2	NGPON2 MUX, WM1, 4 channel, SCAPC, 2 WM1 devices

*Other configurations possible. Please contact Corning.

EDGE™ Configurations*



EDGE™			
CEX Type	Services	Part Number	With LC APC and Maximum Number Devices
CEX A	GPON + XGS	EG1XB3B3G0X00000-N4	GPON, XGS, LCAPC, 4 devices
CEX B	GPON + XGS + RF	EG1XB3B3GRX00000-N3	GPON, RF, XGS, LCAPC, 3 devices
CEX C	GPON + XGS + NGPON2	EG1XB3B3G0XW0000-N3	GPON, XGS, NGPON2 Wide Band, LCAPC, 3 devices
CEX D	GPON/XGS (MPM*) + RF	EG1XB3B3MR00000-N4	GPON/XGS-PON MultiPON, RF, LCAPC, 4 devices
CEX E	GPON + XGS + 25G	EG1XB3B3G0X02000-N3	GPON, XGS, 25G, LCAPC, 3 devices
CEX F	GPON/XGS (MPM*) + 25G	EG1XB3B3M0002000-N4	GPON/XGS-PON MultiPON, 25G, LCAPC, 4 devices
CEX G	GPON + XGS + 25G+RF	EG1XB3B3GRX02000-N2	GPON, RF, XGS, 25G, LCAPC, 2 devices
CEX H	GPON/XGS (MPM) + 25G + RF	EG1XB3B3MR002000-N3	GPON/XGS-PON MultiPON, RF, 25G, LCAPC, 3 devices
WM1	NGPON2 MUX (λ1-λ4)	EG1XB3B300000W00-N2	NGPON2 MUX, WM1, 4 channel, LCAPC, 2 WM1 devices

*Other configurations possible. Please contact Corning.



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For further information

refer to Application Engineering Note: **Selecting Passive Wavelength Division Multiplexing Hardware – AEN177**, or contact Customer Care at 1-800-743-2675, CCSAmericas@corning.com.

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