

Network Interface Options with CFP Ethernet Testers



APPLICATION NOTE

How Teledyne LeCroy Xena's 100 Gbps, 40 Gbps, and 10 Gbps Ethernet testers can provide network interfaces for each of these speeds.

The CFP transceiver form factor can provide network interfaces supporting both 100 Gbps, 40 Gbps, and 10 Gbps Ethernet interfaces. This application note explains how Teledyne LeCroy Xena's CFP based 100/40/10 Gbps Ethernet testers can provide network interfaces for each of these speeds.

Multiple Port Speeds in CFP based Teledyne LeCroy Xena testers

Teledyne LeCroy Xena's CFP based testers can support 100 Gbps, 40 Gbps, and 10 Gbps port speeds. To change the port speed, the user must configure the port speed and change the physical configuration of the CFP transceiver and optical cables. A summary of the port speeds supported by the 100/40G Teledyne LeCroy Xena testers is shown in Table 1.

Teledyne LeCroy Xena tester P/N	100 Gbps Interfaces	40 Gbps Interfaces	10 Gbps Interfaces
Odin-100G-3S-1P (1 CFP cage)	1 x 100GBASE-LR4/ER4 1 x 100GBASE-SR10	1 x 40GBASE-LR4 2 x 40GBASE-SR4	4x10GBASE-LR 8x10GBASE-SR
Odin-40G-2S-2P-B (1 CFP cage)	-	1 x 40GBASE-LR4 2 x 40GBASE-SR4	4x10GBASE-LR 8x10GBASE-SR

Table 1 Port speeds supported by Teledyne LeCroy Xena's CFP based testers

The 100/40/10G XenaCompact and XenaBay test modules are shown in Figure 1 and Figure 2.



Figure 1 XenaBay Module Odin-100G-3S-1P / Odin-40G-2S-2P-B



Figure 2 XenaCompact C-Odin-100G-3S-1P / C-Odin-40G-2S-2P-B

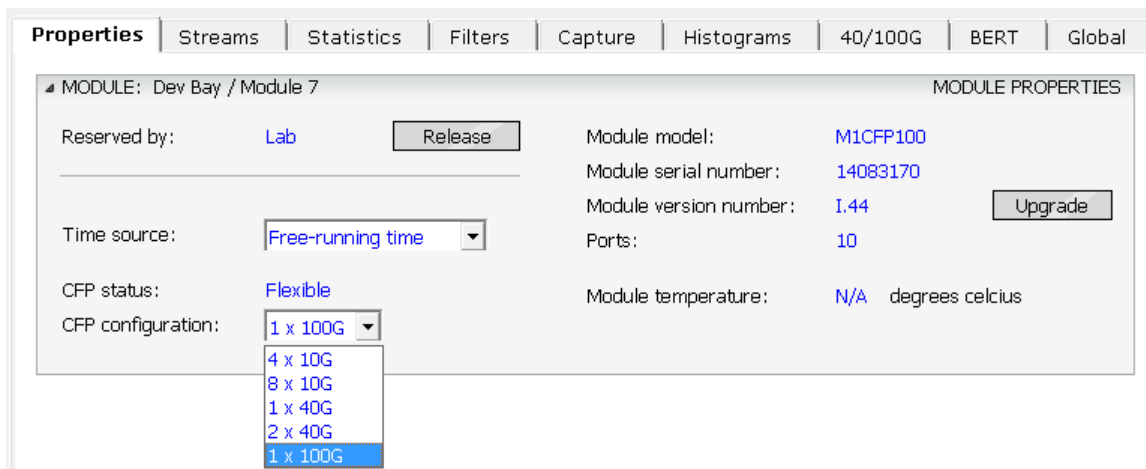
The Teledyne LeCroy Xena CFP based testers can support CFP transceivers meeting these criteria:

- CFP MSA form factor
- Power < 30W
- CAUI Electrical Host Interface (100 Gbps), or XLAUI Electrical Host Interface (40 Gbps)

The following sections will outline options for configuring the Teledyne LeCroy Xena testers for 100 / 40 / 10 Gbps Ethernet port interfaces using CFP transceivers and optical cables.

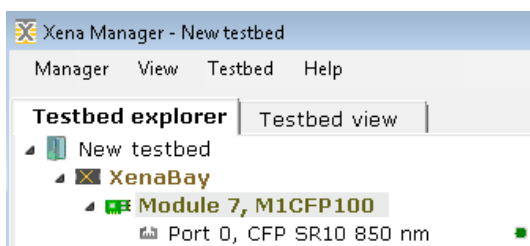
Configuring 100 Gbps Port Speeds

The first step in configuring the tester's port speed to 100 Gbps is to select and reserve the test module in XenaManager, and then configure the test module to 1 x 100 Gbps test port, in the drop-down menu shown in Figure 3.



- Figure 3 Select 1 x 100 Gbps CFP test module configuration in XenaManager

In the XenaManager Testbed explorer window, you now see one 100GBASE-SR10 test ports as shown in Figure 4.

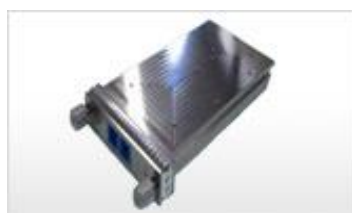


- Figure 4 1 x 100 Gbps test port in XenaManager Testbed explorer window

The tester's CFP cage must be equipped with a CFP transceiver supporting the 100 Gbps Ethernet standards and a CAUI compatible host interface. Examples of both short and long reach commercially available 100 Gbps CFP transceivers are shown in Table 2.

100 Gbps Interface Type	Examples of commercially available CFP transceivers	
1 x 100GBASE-SR10	Reflex Photonics CF-X12	100G Ethernet, 100GBASE-SR10, CFP Fiber Optic Transceiver, MPO receptacle
1 x 100GBASE-SR10	Finisar FTLC8281SCNM	100G Ethernet, 100GBASE-SR10, CFP Fiber Optic Transceiver, MPO receptacle
1 x 100GBASE-LR4	Excelight (Sumitomo) SCF1000L4	100G Ethernet, 100GBASE-LR4, CFP Fiber Optic Transceiver, SC connector

▪ Table 2 Examples of 100 Gbps Ethernet CFP Transceivers



▪ Figure 5 100 Gbps LR4 Excelight (Sumitomo) SCF1000L4



▪ Figure 6 100 Gbps SR10 Reflex Photonics CF-X12

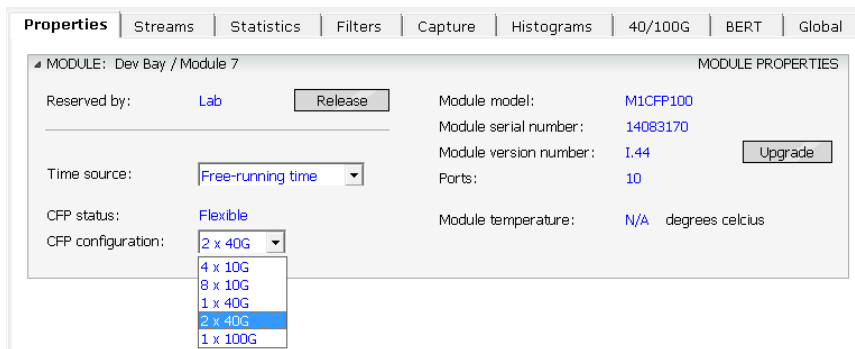


▪ Figure 7 100 Gbps SR10 Finisar FTLC8281SCNM

The final step is now to simply connect the CFP transceiver to the Device Under Test (DUT) with an optical cable, and verify with XenaManager that link synchronization is achieved.

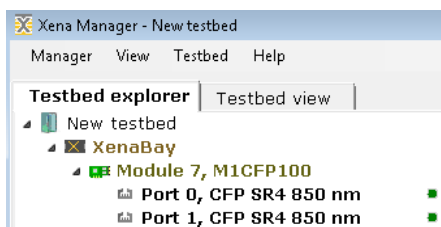
Configuring 40 Gbps Port Speeds

The first step in configuring the tester's port speed to 40 Gbps is to select and reserve the test module in XenaManager, and then select 2 x 40 Gbps as the CFP configuration in the drop-down menu as shown below in Figure 8.



- Figure 8 Select 2 x 40 Gbps CFP test module configuration in XenaManager

In the XenaManager Testbed explorer window, you now see two 40GBASE-SR4 test ports as shown in Figure 9.



- Figure 9 2 x 40 Gbps test port in XenaManager Testbed explorer window

For 40 Gbps port speeds, there are two approaches for how to equip the CFP cage with an optical module:

- a) Equip the tester with a 40 Gbps Ethernet CFP module with native 40 Gbps LR4/SR4 network interfaces.
- b) Equip the tester with a 100 Gbps 100GBASE-SR10 module, and use optical splitter cables to bring out optical connectors for two 40 Gbps SR4 network interfaces.

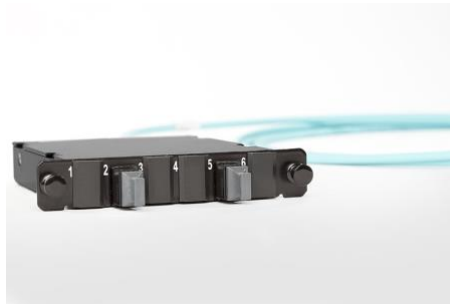
For approach a), examples of both short and long reach 40 Gbps commercially available CFP modules are shown in Table 3.

40 Gbps Interface Type	Examples of commercial available CFP transceivers	
1 x 40GBASE-LR4	Excelight (Sumitomo) SCF1000L4	40G Ethernet, 40GBASE-LR4, CFP Fiber Optic Transceiver, SC connector receptacle
1 x 40GBASR-SR4	Finisar FTLQ8181EBLM	40G Ethernet, 40GBASE-SR4, CFP Fiber Optic Transceiver, MPO connector receptacle
2 x 40GBASE-SR4	Reflex Photonics CF-X08	Dual 40G Ethernet, 40GBASE-SR4, CFP Fiber Optic Transceiver, MPO connector receptacle
1 x 40GBASE-SR4	Reflex Photonics CF-X04	40G Ethernet, 40GBASE-SR4, CFP Fiber Optic Transceiver, MPO connector receptacle

▪ Table 3 Examples of CFP transceivers with 40 Gbps Ethernet network interfaces

With approach b), the combination of a parallel optics 100 Gbps 100GBASE-SR10 transceiver and optical splitter cables, can be used to provide optical connectors for 40 Gbps SR4 Ethernet network interfaces. When the tester is configured to operate in 2 x 40 Gbps port speed mode (see Figure 8), the tester's electrical CFP host interface operates as two fully independent XLAUI interfaces on the electrical host interface SerDes lane 0-3 (XLAUI #0) and SerDes lane 5-8 (XLAUI #1), corresponding to the two logical test ports shown in Figure 9.

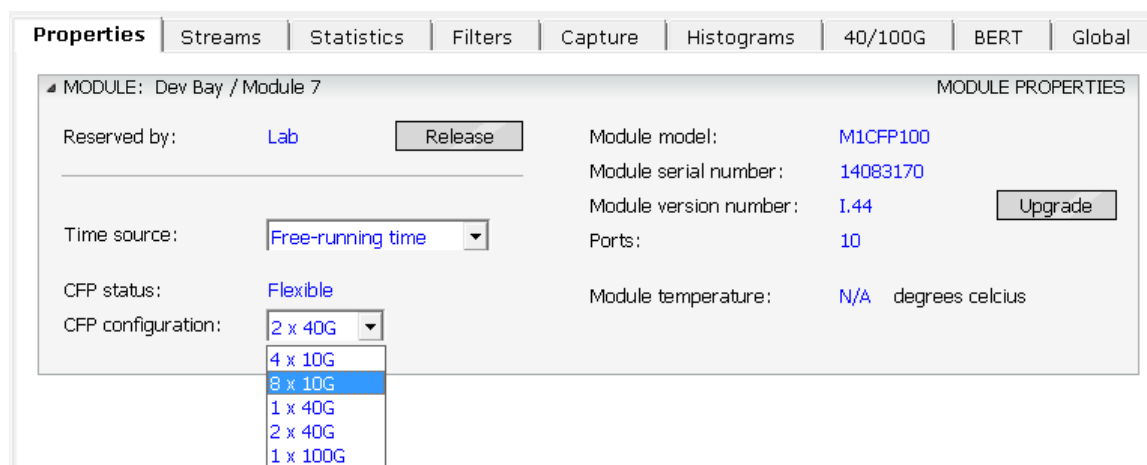
By using an optical splitter cable, these two 40 Gbps Ethernet interfaces can be made available as two standard 40 Gbps MPO receptacles. Vendor Molex/ Teledyne LeCroy Xena provides splitter cable products for that purpose, see Figure 10.



▪ Figure 10 Splitter Cassette for 100GBASE-SR10 (MPO) <-> 2 x 40GBASE-SR4 MPO receptacles (P/N SR10-2xSR4)

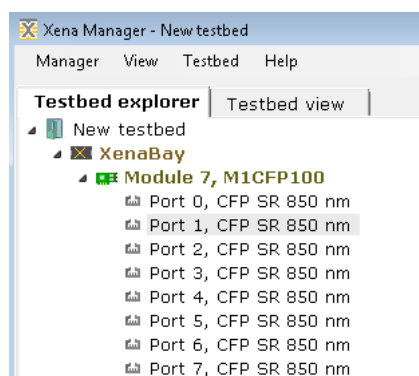
Configuring 10 Gbps Port Speeds

The first step in configuring the tester's port speed to 10 Gbps is to select and reserve the test module in XenaManager, and then select 10 Gbps as the CFP configuration in the drop-down menu as shown below in Figure 11.



- Figure 11 Select 8 x 10 Gbps CFP test module configuration in XenaManager

In the XenaManager Testbed explorer window, you now see eight 10GBASE-SR test ports as shown in Figure 9.

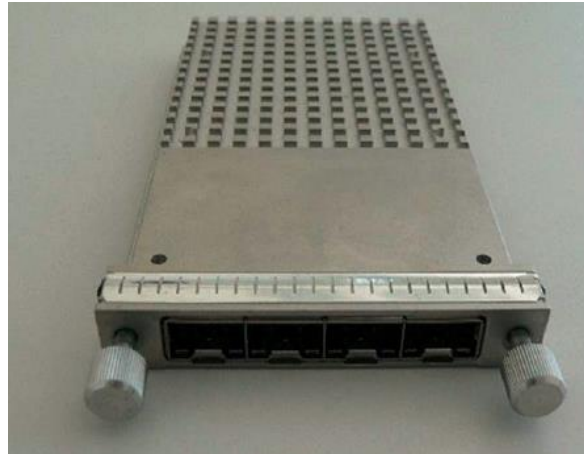


- Figure 12 8 x 10 Gbps test ports in XenaManager Testbed explorer window

For 10 Gbps port speeds, there are two approaches for how to equip the CFP cage with an optical module:

- Equip the tester with a “FourX” CFP module providing native 10 Gbps SFP+ cages integrated into the CFP MSA form factor (Cisco P/N CVR-CFP-4SFP10G).
- Equip the tester with a 100 or 40 Gbps 100GBASE-SR10 or 40GBASE-SR4 module, and use optical splitter cables to provide 10 Gbps Ethernet network interfaces compatible with 850 nm 10GBASE-SR.

The advantage of approach a) is that both SR 850 nm and LR 1310 nm 10 Gbps interfaces are supported. The FourX CFP-to-SFP+ adapter is sold by Cisco, and is shown in Figure 13.



▪ Figure 13 “FourX” converter for 4x10GbE (SFP+)

Each of the four SFP+ cages in the “FourX” converter module can be equipped with either a SR 850 nm or LR 1310 nm SFP+ transceiver.

The advantage of approach b) is that the same cabling can support both 100/40G and 10G so that the test port speed can be changed without requiring re-cabling between the Teledyne LeCroy Xena tester and the DUT (device under test). The number of 10 Gbps interfaces per parallel optics CFP transceiver depends on the type of CFP module, as shown in Table 4.

CFP parallel optics module	Number of 10GBASE-SR interfaces
CFP 1 x 100GBASE-SR10	8
CFP 2 x 40GBASE-SR4	8
CFP 1 x 40GBASE-SR4	4

▪ Table 4 Examples of parallel optics CFP transceivers which can be split into 10GBASE-SR interfaces

When the tester is configured to operate in 10 Gbps port speed mode (see Figure 11), the electrical CFP host interface operates as 8 individual 10GBASE interfaces on SerDes lanes 0, 1, 2, 3, 5, 6, 7, 8.

By using an optical splitter cable, these 10 Gbps interfaces can be made available as standard 10 Gbps LC connectors. Vendor Molex provides the following off-the-shelf splitter cable products for that purpose, as listed in Table 5.

Cable Splitter Type	Host connector	Partner connector	Cable Length	Vendor, P/N
SR4 -> 4 x LC MMF (cable, LC)	MPO	4 x LC MMF	3m	Molex 106283-5003
SR10 -> 12 x LC MMF (cable, LC)	MPO	12 x LC MMF	5m	Molex 1062845003

▪ Table 5 Cable Splitter Types

The combination of which parallel optics CFP module to use with which optical splitter cable is shown in Table 6

CFP parallel optics transceivers	Cable splitter type
1 x 100GBASE-SR10	1 pcs of SR10 -> 12 x LC MMF LC cable
2 x 40GBASE-SR4	2 pcs. of SR4 -> 4 x LC MMF LC cables
1 x 40GBASE-SR4	1 pcs. of SR4 -> 4 x LC MMF LC cable

▪ Table 6 CFP and Cable Splitter Combinations



▪ Figure 14 SR4 -> 4 x LC MMF Cable Splitter

When using the SR10 -> 12 x LC MMF splitter cable, the 8 x 10 Gbps test ports are mapped to the 12 LC connectors as shown in Table 7 below.

When using CFP SR10 parallel optics modules from vendor Reflex Photonics, all of the eight 10 Gbps ports must be connected to the device under test. If the DUT has less than eight 10 Gbps ports, the redundant 10 Gbps ports must be connected with optical loop cables, or connected port-to-port using a LC-assembly link between.

Test Port	Cable LC Numbering scheme: #1 - #12	Cable LC Numbering scheme: #0 - #9, #A, #B
0	Cable LC #2	Cable LC #0
1	Cable LC #3	Cable LC #1
2	Cable LC #4	Cable LC #2
3	Cable LC #5	Cable LC #3
4	Cable LC #7	Cable LC #5
5	Cable LC #8	Cable LC #6
6	Cable LC #9	Cable LC #7
7	Cable LC #10	Cable LC #8
Comment:	Cable LC #1, #6, #11, #12 are not connected (unused)	Cable LC #4, #9, #A, #B are not connected (unused)

- Table 7 SR10 -> 12 x LC MMF cable port mapping