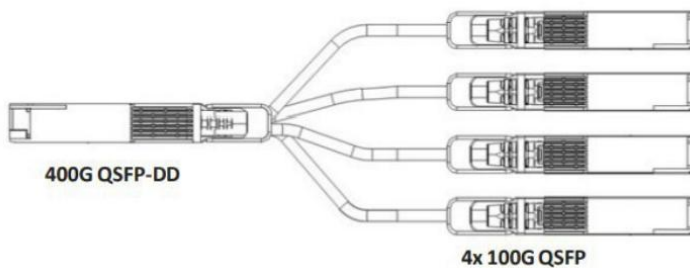


## How to use NRZ <-> PAM4 converter cable

Xena offers a number of products that support 100G NRZ. With a converter cable, it is possible to convert NRZ links to PAM4 and vice versa. The products include:

- E100 Chimera Network Emulator
- Z100 Loki Ethernet Traffic Generator
- Z400 Thor Ethernet Traffic Generator
- Z800 Freya Ethernet Traffic Generator

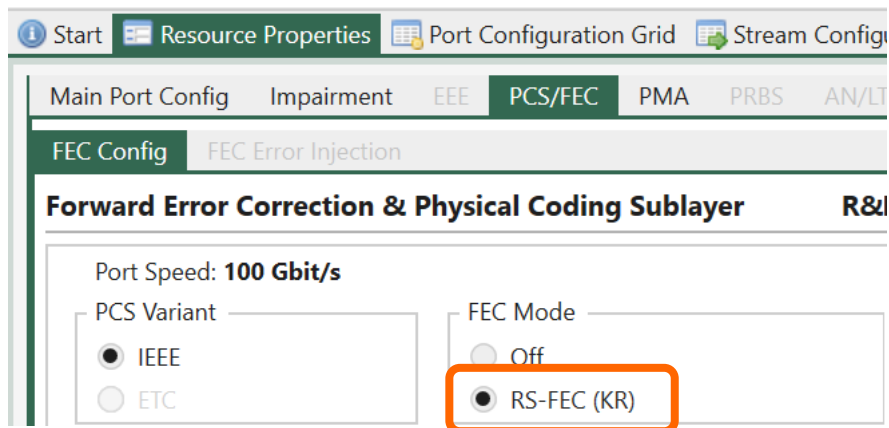
The converter cable is an Active Electrical Cable (AEC) cable from Credo that supports [400G QSFP-DD PAM4 to 4x100G QSFP NRZ](#).



The 400G cable breaks out from 1 x 400G (8x56G-PAM4) QSFP-DD end into 4 x 100G (4x28G-NRZ) QSFP ends with a built-in gearbox feature.

The cable is plug & play, and works out of the box, with FEC enabled on the network port.

FEC can be enabled on the modules using XenaManager under "Resource Properties → PCS/FEC → FEC Configuration":



XOA Python API for FEC enabling and FEC modes:

```
# FEC Mode
await port.fec_mode.set(mode=enums.FECMode.RS_FEC)
await port.fec_mode.set(mode=enums.FECMode.RS_FEC_KP)
await port.fec_mode.set(mode=enums.FECMode.RS_FEC_KR)
await port.fec_mode.set(mode=enums.FECMode.FC_FEC)
await port.fec_mode.set(mode=enums.FECMode.OFF)
await port.fec_mode.set(mode=enums.FECMode.ON)

resp = await port.fec_mode.get()
resp.mode
```

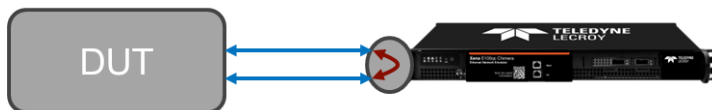
The cable can be used to provide these options:

Speed	QSFP-DD	QSFP
400G	4 x 100G (8x56G-PAM4)	4 x 100G (4x28G-NRZ)
300G	3 x 100G (6x56G-PAM4)	3 x 100G (4x28G-NRZ)
200G	2 x 100G (4x56G-PAM4)	2 x 100G (4x28G-NRZ)
100G	1 x 100G (2x56G-PAM4)	1 x 100G (4x28G-NRZ)

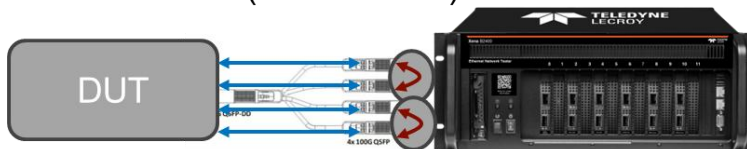
**Loopback Impairment:** The cable can also be used as an impairment loopback cable, where the DUT sends traffic into the E100 Chimera and receives the impaired traffic looped back. This can be done on 1x100G or up to 4x100G with one cable.

100G PAM4 -> Impairment loopback -> 100G PAM4

2 x 100G (56G SerDes) PAM4



4 x 100G (56G SerDes) PAM4



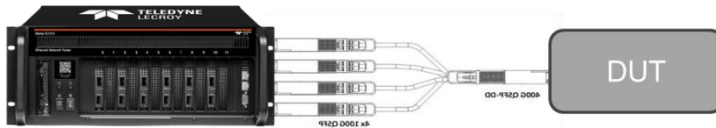
The cable can also be used for Nx100G PAM4 impairment, with E100 Chimera between two endpoints, where one of the endpoints can also be a traffic generator.

1 - 4x100G PAM4 <-> Impairment <-> 1 - 4x100G PAM4



Convert from Nx100G NRZ <-> Nx100G PAM4 e.g. 2 x Z100 Loki to 400G (4x100G PAM4)

4x100G NRZ <-> 4x100G PAM4



Instead of using a cable, you can use a switch that supports both NRZ and PAM4.

PAM4 <-> NRZ



<100G (NRZ) Impairment



The switch can be used directly between devices or include Impairment on all or part of the traffic.

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