# Optical: Multi-fiber Push On (MPO)


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## Info

- MPO cables are typically 12 strands of singlemode or multimode fiber housed within a single jacket or trunk (other fiber counts are available). It has its own IEC spec.
- MTP is a brand name that falls within the MPO spec
- FS has a good polarity how to on their website (some of the below images came from FS)

## Hardware

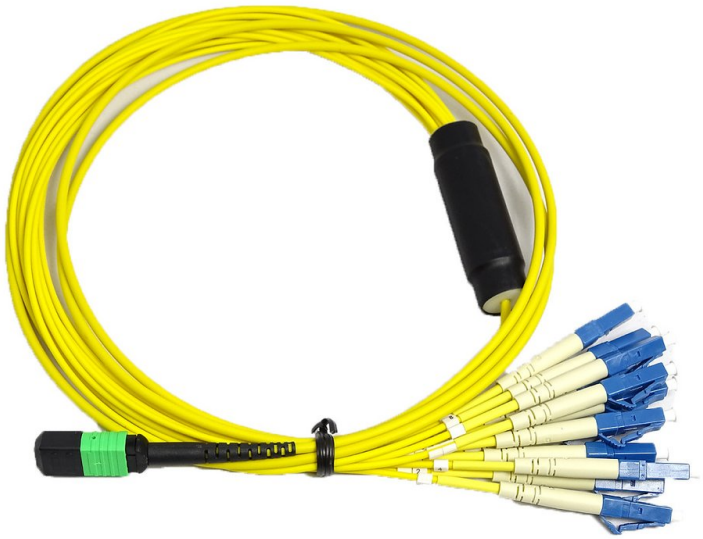
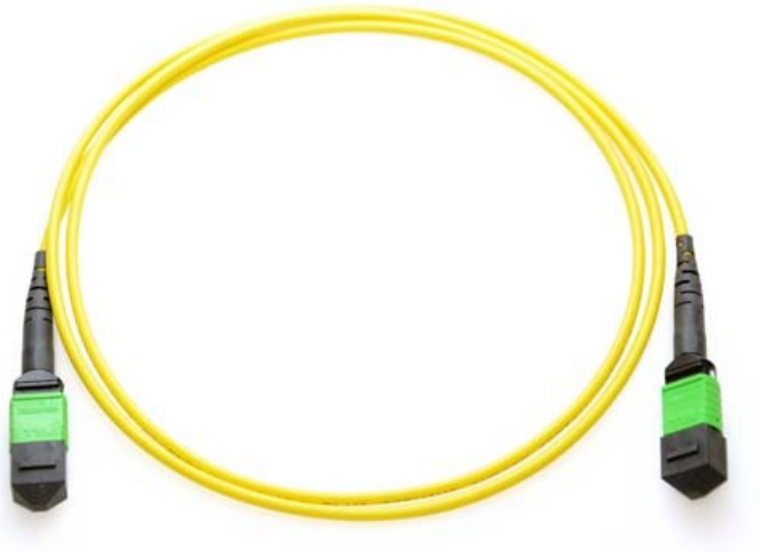
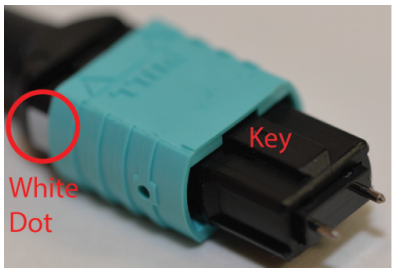
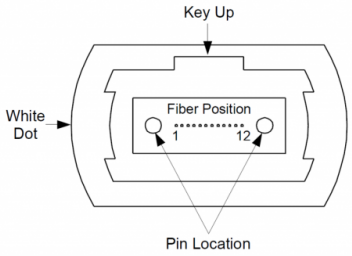
### Optics

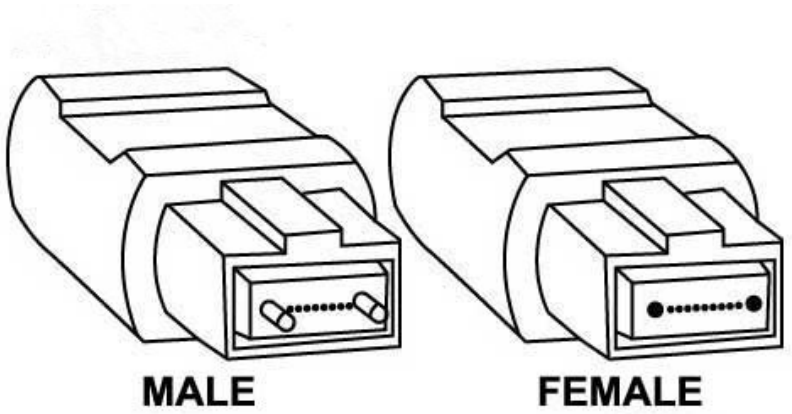
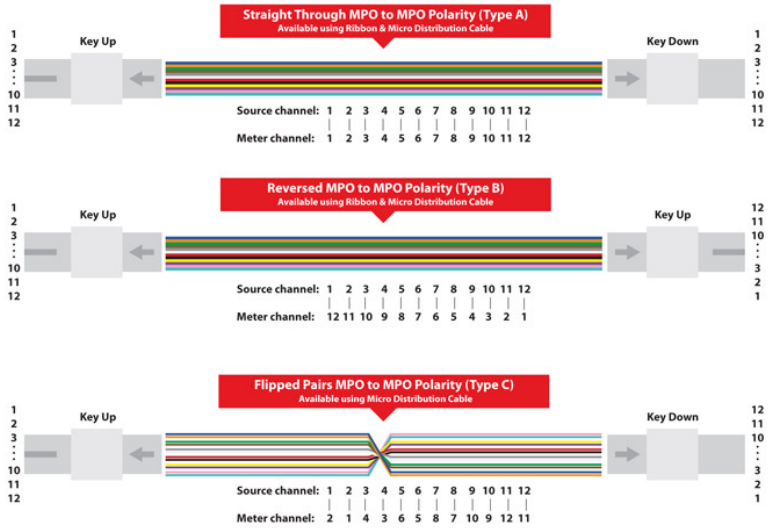
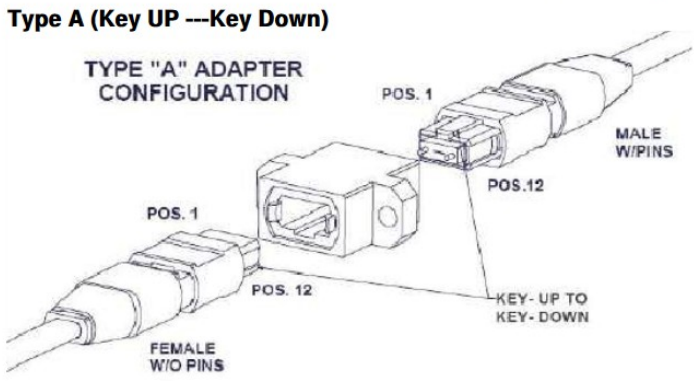
- 40G QSFP+ can have the ability to breakout into 4x10G interfaces
- See FlexOptix PLR4/QSFP+ 10G LR optics
- Juniper QSFP+ 10G LR breakout RX/TX mapping
    - interface 0 transmits on fiber strand #1 and receives on fiber strand #12

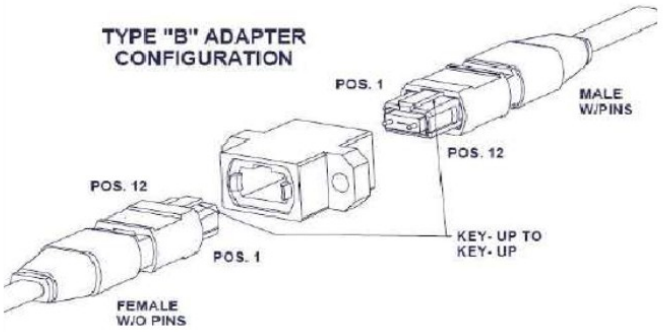
| Strand | Router Interface | Interface Rx/Tx |
|---|---|---|
| 1 | 0 | Tx0 (Transmit) |
| 2 | 1 | Tx1 (Transmit) |
| 3 | 2 | Tx2 (Transmit) |
| 4 | 3 | Tx3 (Transmit) |
| 5 | Unused | Unused |
| 6 | Unused | Unused |
| 7 | Unused | Unused |
| 8 | Unused | Unused |
| 9 | 3 | Rx3 (Receive) |
| 10 | 2 | Rx2 (Receive) |
| 11 | 1 | Rx1 (Receive) |
| 12 | 0 | Rx0 (Receive) |

### Cables

| Description | Image |
|---|---|

| | |
|---|---|
| Example<br><br>SM APC MPO to SM UPC LC breakout cable |  |
| Example<br><br>SM APC MPO to SM APC MPO |  |
| Key |  <br>  |

| | |
|---|---|
| Male vs Female<br><br>Coupled connectors must be matched male/female |  |
| Polarity |  |
| Couplers |  |

| | |
|---|---|
| | **Type B (Key-UP ---Key Up)**<br>  <br> |

### WiscNet Hardware

Note: Type B/Method B seems to be the standard cable type

| Hardware | Requires | Notes |
|---|---|---|
| PLR4 | MPO/MTP APC Female | Method B/Type B cable to connect MPO breakout boxes to PLR4 |
| MPO QSFP+ 4x10G to LC Breakout Box | MPO/MTP APC Female | Method B/Type B cable to connect MPO breakout boxes to PLR4 |

To help item creation:

| End A Type | Male/Female (M/F) | APC/UPC | End Z Type | Male/Female (M/F) | APC/UPC | Cable Type | Number of Fiber Strands (F) | Cable Length |
|---|---|---|---|---|---|---|---|---|

Example:
MPO F APC to MPO F APC Type A 12F 6m = MPO Female pinned APC to  MPO Female pinned APC Type A 12 strands 6 meters