MPO/MTP technology, which is of high density, flexibility and reliability with scalable, upgradeable properties, is one of the contributors that lead the migration to 40/100GbE. However, the network designers face another challenge which is how to assure the proper polarity of these array connections using multi-fiber MPO/MTP components from end-to-end. Maintain the correct polarity across a fiber network ensures that a transmit signal from any type of active equipment will be directed to receive port of a second piece of active equipment – and vice versa. To ensure the MPO/MTP systems work with correct polarity, the TIA 568 standard provided three methods, which will be introduced in this article.

**MPO Connector**

To understand the polarity in 40/100 GbE Transmission, the key of MPO technology—MPO connector should be first introduced. MPO connector usually has 12 fibers. 24 fibers, 36 fibers and 72 fibers are also available. Each MTP connector has a key on one of the flat side added by the body. When the key sits on the bottom, this is called key down. When the key sits on top, this is referred to as the key up position. In this orientation, each of the fiber holes in the connector is numbered in sequence from left to right and is referred as fiber position, or P1, P2, etc. A white dot is additionally marked on one side of the connector to denote where the position 1 is. (shown in the following picture) The orientation of this key also determines the MPO cable’s polarity.
Three Cables for Three Polarization Methods

The three methods for proper polarity defined by TIA 568 standard are named as Method A, Method B and Method C. To match these standards, three type of MPO trunk cables with different structures named Type A, Type B and Type C are being used for the three different connectivity methods respectively. In this part, the three different cables will be introduced firstly and then the three connectivity methods.

MPO Trunk Cable Type A: Type A cable also known as straight cable, is a straight through cable with a key up MPO connector on one end and a key down MPO connector on the opposite end. This makes the fibers at each end of the cable have the same fiber position. For example, the fiber located at position 1 (P1) of the connector on one side will arrive at P1 at the other connector. The fiber sequence of a 12 fiber MPO Type A cable is showed as the following:

MPO Trunk Cable Type B: Type B cable (reversed cable) uses key up connector on both ends of the cable. This type of array mating results in an inversion, which means the fiber positions are reversed at each end. The fiber at P1 at one end is mated with fiber at P12 at the opposing end. The following picture shows the fiber sequences of a 12 fiber Type B cable.
MPO Trunk Cable Type C: Type C cable (pairs flipped cable) looks like Type A cable with one key up connector and one key down connector on each side. However, in Type C each adjacent pair of fibers at one end are flipped at the other end. For example, the fiber at position 1 on one end is shifted to position 2 at the other end of the cable. The fiber at position 2 at one end is shifted to position 1 at the opposite end etc. The fiber sequence of Type C cable is demonstrated in the following picture.

Three Connectivity Methods
Different polarity methods use different types of MTP trunk cables. However, all the methods should use duplex patch cable to achieve the fiber circuit. The TIA standard also defines two types of duplex fiber patch cables terminated with LC or SC connectors to complete an end-to-end fiber duplex connection: A-to-A type patch cable—a cross version and A-to-B type patch cable—a straight-through version.
The following part illustrates how the components in MPO system are used together to maintain the proper polarization connectivity, which are defined by TIA standards.

**Method A:** the connectivity Method A is shown in the following picture. A type-A trunk cable connects a MPO module on each side of the link. In Method A, two types of patch cords are used to correct the polarity. The patch cable on the left is standard duplex A-to-B type, while on the right a duplex A-to-A type patch cable is employed.

**Method B:** in Connectivity Method B, a Type B truck cable is used to connect the two modules on each side of the link. As mentioned, the fiber positions of Type B cable are reversed at each end. Therefore standard A-to-B type duplex patch cables are used on both sided.

**Method C:** the pair-reversed trunk cable is used in Method C connectivity to connect the MPO modules one each side of the link. Patch cords at both ends are the standard duplex A-to-B type.

**Conclusion**
Network designer using MPO/MTP components to satisfy the increasing requirement for higher transmission speed, during which one of the big problems—polarity, can be solved by selecting the right types of MPO cables, MPO connectors, MPO cassette and patch cables. The three different polarization methods can be applied according to the satisfy requirements in different situations. For more information about polarity in MPO systems and 40/100GbE transmission polarity solutions, please visit Fiberstore tutorial at "Polarity and MPO Technology in 40/100GbE Transmission".

Tags: 40/100 GbE, MPO, MPO/MTP cassettes, MTP, MTP cable, MTP trunk cable, polarity

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