

SYSTIMAX® Solutions

InstaPATCH® 360 System

Seven Basic Rules for Configuration, Installation and Administration

White Paper

July 2010

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Introduction

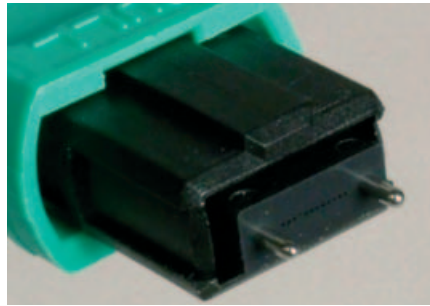
The SYSTIMAX InstaPATCH® 360 System utilizes MPO array fiber connectors for plug-and-play connectivity. The InstaPATCH® 360 System is intentionally flexible in its implementation of array fiber technology, component design and component portfolio to allow network designers almost infinite network topology options. This white paper provides relevant background information regarding MPO connectors and array connectivity and introduces seven basic rules to be followed for proper design configuration, installation and administration of an InstaPATCH® 360 System.

The MPO Connector, MPO Pins, Keys and Polarity

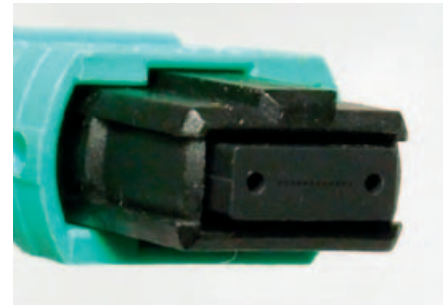
The MPO connector was developed by NTT-AT in the mid-1980's and is internationally standardized in IEC 61754-7 as well as TIA/EIA 604-5.

InstaPATCH® 360 MPO connectors are factory terminated in pinned and unpinned versions, as shown in Figure 1.

FIGURE 1. PINNED AND UNPINNED MPO CONNECTORS



MPO (m) pinned connector

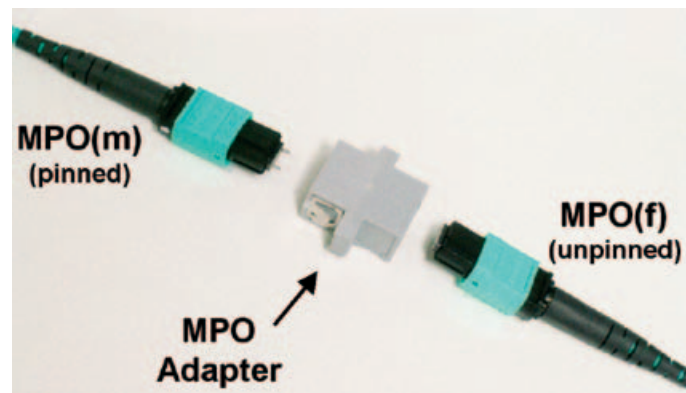


MPO (f) unpinned connector

The pinned MPO is commonly referred to as male, or MPO(m), while the MPO without pins is referred to as female, or MPO(f). With the exception of the presence of pins, the MPO connectors are identical. A pair of MPO connectors are mated by aligning the precision guide pins on the MPO(m) connector with the pin holes on the MPO(f) connector.

Just like simplex or duplex fiber connectors, MPO connectors mate with a symmetrical adapter. The MPO adapter provides coarse connector alignment and orientation and includes retention features to maintain ferrule-to-ferrule contact. The MPO adapter is a passive device; it has no active components, no optical components and no precision alignment features (no pins, holes, or sleeves).

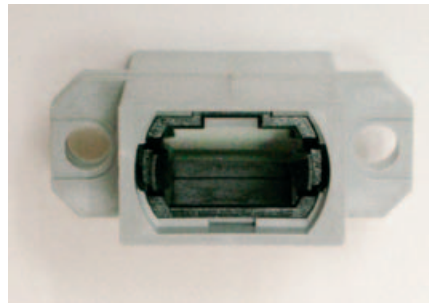
FIGURE 2. MPO CONNECTORS AND MPO ADAPTER



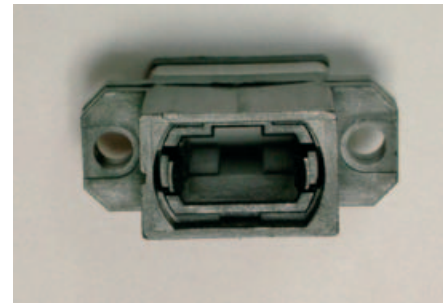
Note that two MPO(f) connectors will insert and latch in an MPO adapter; however due to the lack of the precision guide pins required for proper array alignment significant channel loss will result. Damage to the fiber endfaces is also likely due to axial ferrule movement. Conversely, two MPO(m) connectors will not insert and latch in an MPO adapter without inflicting permanent damage to one (or both) of the connectors due to the precision pins present on both connectors.

MPO connectors and adapters have interlocking lugs and notches (commonly referred to as keys) that ensure proper orientation of the mating connectors. MPO keys function exactly the same as single-fiber connector keys (SC, LC, etc). Keys are a critical component of the InstaPATCH® 360 System in assuring correct system polarity regardless of the network design topology. Polarity refers to the basic fiber optic design premise that every fiber must connect a signal source at one end, to a signal receiver at the other end. The InstaPATCH® 360 System keying convention of “aligned keys” ensures correct signal polarity. Key orientation on MPO connectors is established in the factory based on specific design criteria. The InstaPATCH® 360 System is the first (and currently the only) MPO-based system to take advantage of the TIA/EIA FOCIS 5 adapter keying option k=2; commonly referred to as “aligned keys” or “key-up to key-up.” Therefore, an aligned-key MPO adapter (keying option k=2, or key-up to key-up) shall be present for each mated pair of MPO connectors in an InstaPATCH® 360 link. InstaPATCH® 360 MPO adapters are easily recognized by their light gray color.

FIGURE 3. MPO ALIGNED-KEY AND OPPOSED-KEY ADAPTERS



**Aligned-key MPO Adapter
(also known as “key-up to
key-up adapter)**



**Opposed-Key MPO Adapter
(also known as “key-up to
key-down adapter)**

Use of an opposed-key MPO adapter (keying option k=1, key-up to key-down), recognizable by their black color, in an InstaPATCH® 360 link will alter the link polarity, making the channels inoperable. Therefore, opposed-key MPO adapters (keying option k=1, key-up to key-down) are not allowed anywhere in an InstaPATCH® 360 link.

InstaPATCH® 360 Rule Number 1

Each mated pair of InstaPATCH® 360 MPO connectors shall consist of an MPO(m) connector, an MPO(f) connector and an aligned-key MPO adapter (keying option k=2, key-up to key-up).

InstaPATCH® 360 Rule Number 2

Adding or removing MPO alignment pins in the field constitutes an extremely high risk to the integrity of the optical fiber and ferrule endface and will void the warranty .

SYSTIMAX InstaPATCH® 360

Product Descriptions

Shelves and Modules

InstaPATCH® 360 modules and shelves are self-contained, rack mountable assemblies that transition the 12-fiber MPO connectors on the trunk cable into simplex or duplex connectors. All InstaPATCH® 360 pre-terminated shelves and modules contain assemblies with MPO(m) connectors internal to the shelf/module (reflective of the precedent set by equipment/transceiver manufacturers of pinning all MPO array transceivers).

MPO Adapter Panels

InstaPATCH® 360 Adapter Panels are 360 panels with aligned-key (gray) MPO adapters installed.

MPO-MPO Trunk Cables

InstaPATCH® 360 trunk cables are high density fiber cables used to distribute large numbers of fibers from one area of an installation to another. Trunk cables have MPO(f) on both ends, for connection to InstaPATCH® 360 modules, shelves or MPO(m) rugged fanouts. MPO(f) to MPO(f) pre-terminated trunks are offered in all configurable options.

MPO(m)-MPO(f) Trunk Extensions

InstaPATCH® 360 trunk extensions are used to distribute some or all of the fibers in a trunk cable to other areas in the site. For example, a high fiber count trunk can be run from the main distribution area to an intermediate distribution area. Smaller trunk extension cables can then be used to route fibers in groups of 12 to cabinets. Trunk extensions have MPO(m) on one end and MPO(f) on the other. The MPO(m) is mated to the trunk cable and the MPO(f) is mated to an InstaPATCH® 360 module, shelf, MPO(m) rugged fanout, or parallel equipment interface.

MPO(m) to MPO(m) Cross-Connect Cable Assemblies

MPO(m) to MPO(m) cable assemblies are called Cross-Connect Cords and serve the function of an array "jumper" between two traditional MPO trunks terminated in MPO Adapter Panels, MPO(m) to MPO(m). InstaPATCH® 360 Cross-Connect Cords are currently offered in LazrSPEED 550, LazrSPEED 300, LazrSPEED 150, OptiSPEED, and TeraSPEED in 12f round (IPD) cordage types.

MPO-LC/SC/ST Ruggedized Fanouts

Ruggedized Fanout Cable Assemblies are also commonly referred to as hydra cables, direct attach cables and breakout cables. InstaPATCH® 360 rugged fanouts are used to transition 12 fiber MPO connectors into simplex or duplex connectors for direct connection to electronic equipment. Ruggedized fanouts are most commonly configured with MPO(m) connectors to connect to a trunk cable with MPO(f) connectors. For the less common application of connecting to an InstaPATCH 360 module, a MPO(f) ruggedized fanout should be used. Care must be taken to order the correct fanout type, or an incompatible mating will result (See Rule Number 1). InstaPATCH® 360 Rugged Fanout cable assemblies are offered in LazrSPEED 550, LazrSPEED 300, LazrSPEED 150, OptiSPEED, and TeraSPEED in 12f, 24f, 48f and 72f round (IPD) cordage types. Ruggedized fanouts have an outer sheath to protect the fiber on longer runs between racks/cabinets.

MPO-LC/SC/ST Array Cords

Array cords are designed for use with InstaPATCH 360 trunk cables, modules, and shelves. Array cords can be terminated with MPO connectors on both ends or MPO connectors on one end and paired LC, SC, or ST connectors on the other end. Array cords utilize 3.0 mm 12-fiber cordage that is protected with aramid yarn for durability and allowing maximum flexibility within a rack/cabinet.

SYSTIMAX InstaPATCH® 360 Typical MPO Connectivity Configurations

Using InstaPATCH® 360 Trunks to Interconnect Modules or Shelves

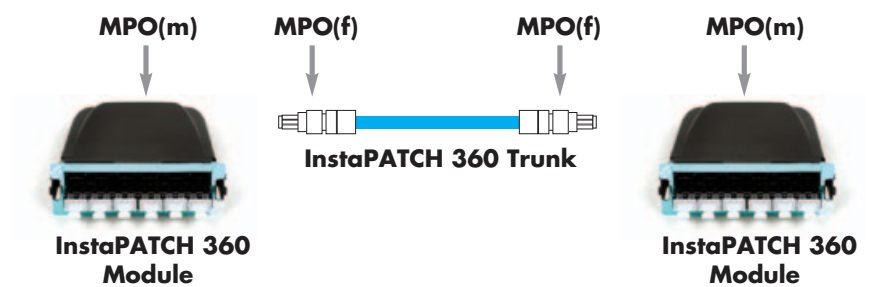
InstaPATCH® 360 modules and shelves are manufactured with MPO(m) connectors, just like parallel optical equipment transceivers.

InstaPATCH® 360 Rule Number 3

Any InstaPATCH® 360 direct connection to an InstaPATCH Shelf or Module, or to an MPO optical array transceiver, shall be made with an MPO(f) connector.

The basic InstaPATCH® 360 network design uses InstaPATCH® 360 MPO(f) to MPO(f) Trunks to interconnect pre-terminated InstaPATCH® 360 modules or shelves. Figure 4 illustrates two InstaPATCH® 360 Modules connected with an InstaPATCH® 360 Trunk. InstaPATCH® 360 MPO(f) to MPO(f) trunks can also be used for direct connections between equipment MPO array transceivers.

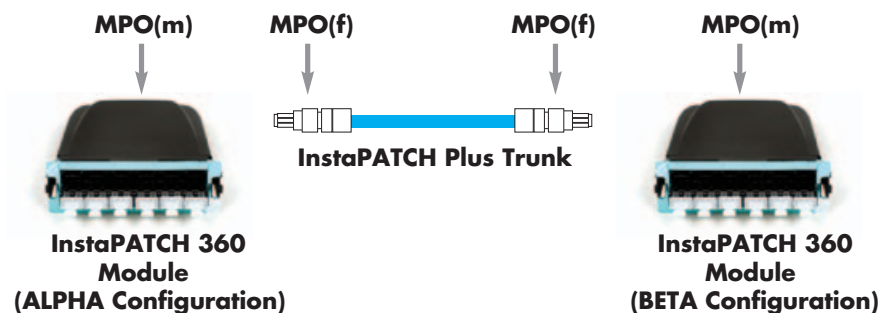
FIGURE 4. MPO(F) TO MPO(F) TRUNK CONNECTING TWO MODULES



InstaPATCH® 360 Rule Number 4

In order to maintain simple port management and mapping, all InstaPATCH® 360 links shall consist of an "ALPHA" oriented module/shelf/fanout on one end of the link to a "BETA" oriented module/shelf/fanout on the other end of the link. Figure 5 illustrates a basic configuration with modules in "ALPHA" and "BETA" orientations.

FIGURE 5. MODULES IN ALPHA AND BETA ORIENTATIONS

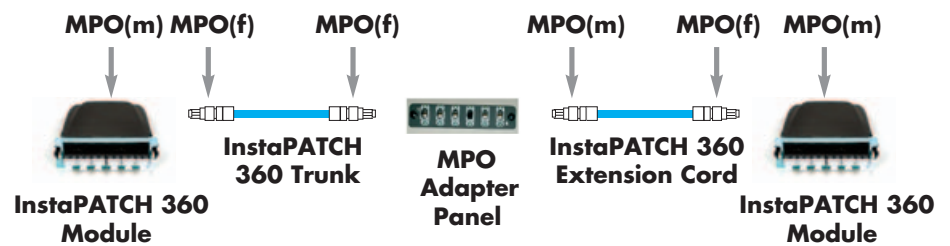


Using InstaPATCH® 360 Trunk Extensions / Equipment Cords

InstaPATCH® 360 MPO(f) to MPO(m) cable assemblies are called InstaPATCH® 360 Trunk Extensions or InstaPATCH® 360 Equipment Cords based on their intended function. A common network design utilizes high fiber count trunks (MPO(f) to MPO(f)) from a central cross-connection area with pre-terminated shelves or modules to equipment rack rows, to accomplish a zone distribution strategy. The zone distribution enclosure includes MPO Adapter Panels, with the incoming trunks connected into the rear of the MPO Adapter Panels.

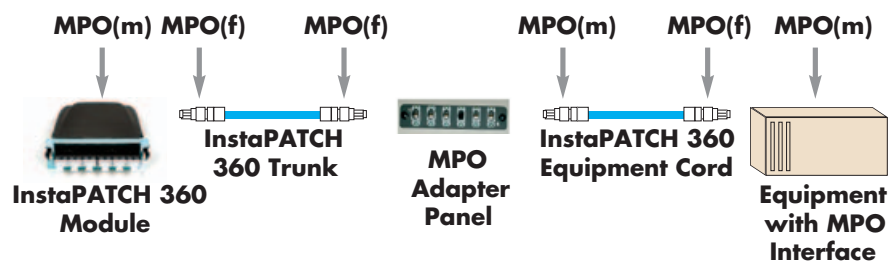
When used as an Extension Cable, as illustrated in Figure 6, the MPO(m) end of the cable assembly mates in the MPO Panel to the MPO(f) trunk, with the MPO(f) end of the Cord “extending” the link to an equipment rack for patching.

FIGURE 6. INSTAPATCH® 360 EXTENSION CORD



When used as an Equipment Cord, as illustrated in Figure 7, the “extension” terminates the MPO(f) end directly into array-transceiver equipment.

FIGURE 7. INSTAPATCH® 360 EQUIPMENT CORD

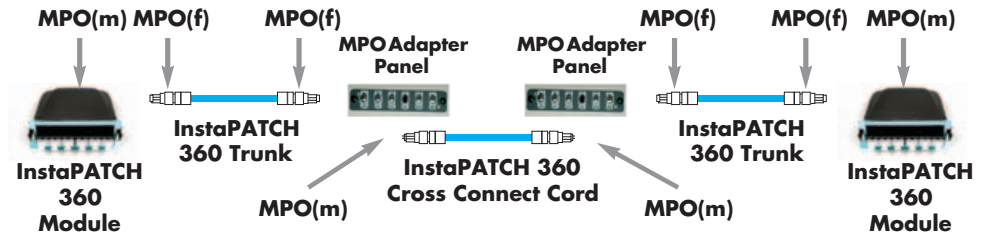


Therefore, Equipment/Extension cords are always MPO(m) to MPO(f), since one end connects to an InstaPATCH® 360 trunk that has an MPO(f) interface and the other end connects to an InstaPATCH® 360 Module, InstaPATCH® 360 Shelf, or Equipment that all have MPO(m) interfaces.

Using InstaPATCH® 360 Cross-Connect Cords

MPO(m) to MPO(m) cable assemblies are called Cross-Connect Cords, and serve the function of an array “jumper” between two traditional MPO trunks terminated in MPO Adapter Panels, as illustrated in Figure 8.

FIGURE 8. INSTAPATCH® 360 CROSS-CONNECT CORD



InstaPATCH® 360 Cross-Connect Cords must always be MPO(m) to MPO(m), since they connect on both ends to MPO(f) trunks.

InstaPATCH® 360 Rule Number 5

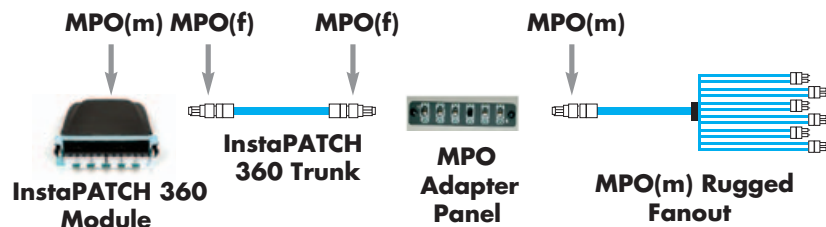
Any InstaPATCH® 360 connection to traditional InstaPATCH® 360 trunks terminated in MPO Adapter panels shall be made with an MPO(m) connector.

Using MPO(f) or MPO(m) to LC/SC/STII Rugged Fanouts

InstaPATCH® 360 Rugged Fanout cables are available with either MPO(f) or MPO(m) for nearly unlimited network design possibilities. The network designer must correctly specify the pin configuration of the Rugged Fanouts.

When Rugged Fanouts mate to traditional InstaPATCH® 360 trunks through an MPO Adapter Panel as illustrated in Figure 9, the Rugged Fanout MPO must be MPO(m) (See Rule Number 5).

FIGURE 9. INSTAPATCH® 360 MPO(M) RUGGED FANOUT



When Rugged Fanouts mate to the MPO adapter in InstaPATCH® 360 pre-terminated shelves or modules as illustrated in Figure 10, the Rugged Fanout MPO must be MPO(f) (See Rule Number 3).

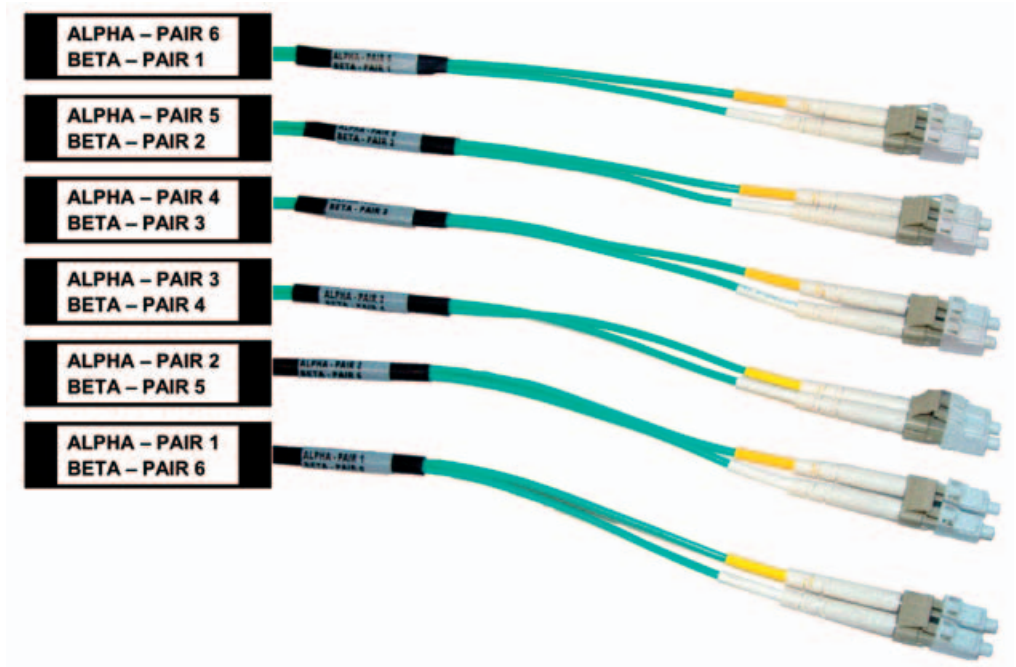
FIGURE 10. INSTAPATCH® 360 MPO(F) RUGGED FANOUT



Labelling of Duplex Ends in InstaPATCH® 360 Rugged Fanouts

InstaPATCH® 360 Rugged Fanouts can be connected to InstaPATCH® 360 modules or shelves in either "ALPHA" or "BETA" configurations. The duplex connector ends of InstaPATCH® 360 Rugged Fanouts are identified with both "ALPHA" and "BETA" labels to maintain correct port mapping, as shown in Figure 11.

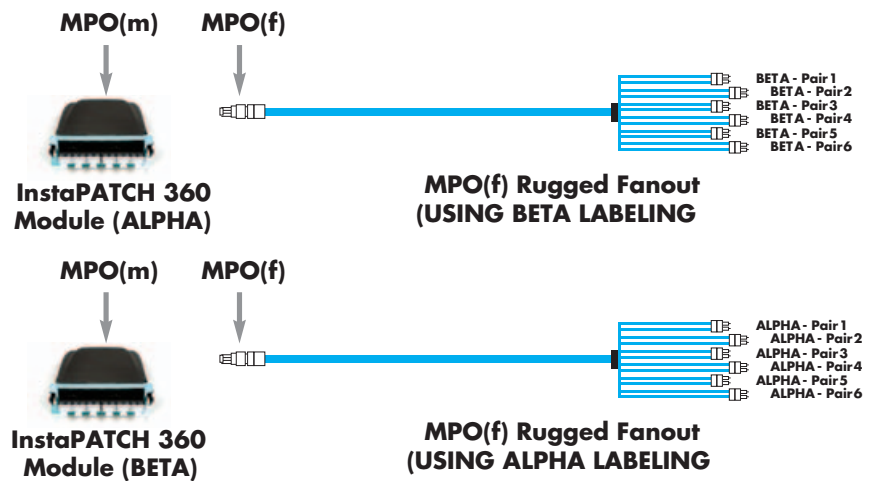
FIGURE 11. LABELLING OF DUPLEX END IN RUGGED FANOUT



InstaPATCH® 360 Rule Number 6

When an InstaPATCH® 360 Rugged Fanout is connected to a module or shelf that is in the “ALPHA” orientation, the duplex connector sequencing follows the “BETA” duplex labelling. Conversely, when an InstaPATCH® 360 Rugged Fanout is connected to a module or shelf that is in the “BETA” orientation, the duplex connector sequencing follows the “ALPHA” duplex labelling. Both configurations are illustrated in Figure 12.

FIGURE 12. MODULE ORIENTATION AND USE OF ALPHA/BETA LABELLING IN RUGGED FANOUT



SYSTIMAX InstaPATCH® 360 Warranty and Supported Applications

Registered InstaPATCH® 360 Systems designed and installed in accordance with SYSTIMAX design and installation guidelines are covered by the SYSTIMAX 20-Year Extended Product Warranty and Applications Assurance.

InstaPATCH® 360 Rule Number 7

Only SYSTIMAX® Solutions’ factory manufactured InstaPATCH® 360 components are allowed in a registered InstaPATCH® 360 installation.

Supported InstaPATCH® 360 applications, channel lengths and maximum number of connections are detailed in the InstaPATCH® 360 Performance Specification and the SYSTIMAX Link Loss calculator (version 3.3) can be used to determine attenuation Pass/Fail criteria for LazrSPEED and TeraSPEED InstaPATCH® 360 installations.

SYSTIMAX InstaPATCH® 360 Configuration, Installation and Administration

The 7 Basic Rules

- InstaPATCH® 360 Rule Number 1:** In each mated pair of InstaPATCH® 360 MPO connectors there shall be an MPO(m) connector, an MPO(f) connector and an aligned-key MPO adapter (keying option k=2, key-up to key-up).
- InstaPATCH® 360 Rule Number 2:** Adding or removing MPO pins in the field is not allowed for the InstaPATCH® 360 System.
- InstaPATCH® 360 Rule Number 3:** Any InstaPATCH® 360 direct connection to an InstaPATCH® 360 Shelf or Module, or to an MPO optical array transceiver shall be made with an MPO(f) connector.
- InstaPATCH® 360 Rule Number 4:** In order to maintain simple port management and mapping, all InstaPATCH® 360 links should consist of an "ALPHA" oriented module/shelf/fanout on one end of the link to a "BETA" oriented module/shelf/fanout on the other end of the link.
- InstaPATCH® 360 Rule Number 5:** Any InstaPATCH® 360 connection to traditional InstaPATCH® 360 trunks terminated in MPO Adapter panels shall be made with an MPO(m) connector.
- InstaPATCH® 360 Rule Number 6:** When an InstaPATCH® 360 Rugged Fanout is connected to a module or shelf that is in the "ALPHA" orientation, the duplex connector sequencing follows the "BETA" duplex labelling. Conversely, when an InstaPATCH® 360 Rugged Fanout is connected to a module or shelf that is in the "BETA" orientation, the duplex connector sequencing follows the "ALPHA" duplex labelling.
- InstaPATCH® 360 Rule Number 7:** Only SYSTIMAX Solutions® factory-manufactured InstaPATCH® 360 components shall be used in an InstaPATCH® 360 channel or link.

Ordering Information for InstaPATCH® 360 Cable Assemblies

InstaPATCH® 360 cable assemblies are custom configurable to provide maximum flexibility for network design and installation. Configuration options include fiber type (OptiSPEED, LazrSPEED 550, LazrSPEED 300, LazrSPEED 150, and TeraSPEED); MPO configuration (MPO(m) or MPO(f)); cordage type (IPD-12, 24, 48, 72, 96 and 144 fiber distribution cable); length (foot or meter increments); and other options. MPO pin/hole configuration is included in the InstaPATCH 360 Ruggedized and Array Cord Configurators:

where "MP" designates un-pinned-MPO(f) and "MX" designates pinned-MPO(m).

For example:

FGXMPMPAF-MBMxxx is an un-pinned-MPO(f) to un-pinned-MPO(f) Trunk Cable

FGXMPMXAF-MBMxxx is an un-pinned-MPO(f) to pinned-MPO(m) Equipment/Extension Cord

FGXMXMXGD-MDMxxx is a pinned-MPO(m) to pinned-MPO(m) Cross-connect Cord

FLXMXLCAD-MEMxxx is a pinned-MPO(m) to LC Rugged Fanout Cable



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