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Applications
Engineering Note

Optical Tap Module Connectivity Solutions for Network Monitoring

AEN164, Revision 2

This Application Engineering Note discusses the different Corning Optical Communications Optical Tap module offerings and how to integrate them in the different infrastructure networks for effective passive network monitoring solutions. Optical taps are used to extract data from optical networks for network performance and optimization, security threats and for troubleshooting purposes. This is accomplished by inserting the optical tap within the cable infrastructure system either as a standalone optical split inside an LC/LC module, or the optical split is integrated in a MTP®/LC or an all MTP module as part of the infrastructure component. Corning tap modules use high performance, thin-film splitter technology which does not induce any BER penalties in Multimode applications. This splitter technology allows for the flexibility of installing them anywhere in the system without BER effect. The tap module infrastructure connectivity systems discussed in this application note are based on Corning's Base-8 (eight fiber) and Base-12 (12 fiber) cabling product solutions found in the EDGE8®, EDGE™ and Plug and Play™ pre-terminated solutions. For examples of fiber optic systems utilizing Base-12 pre-terminated connectivity solutions, please refer to AEN151 "Four-Channel Parallel Optic Connectivity Solutions Utilizing Base-12 Structured Cabling" and AEN152 "Four-channel Parallel to Duplex Optical Connectivity Solutions Utilizing Base-12 Structured Cabling". For Base-8 solutions, please refer to AEN156 "Connectivity Solutions Utilizing Base-8 Structured Cabling". The different Tap module offerings and connectivity within the infrastructure will be illustrated.

A Bill of Materials (BOMs) to implement the different scenarios, with product part numbers, will be provided with OM4 Laser-Optimized 50µm multimode and OS2 single-mode fiber in both the EDGE8 and EDGE product families. The tap modules in the BOMs will have 50/50 split ratios, but additional split ratios are available depending on fiber type and application requirements. The phrase, remote monitoring, will be used to represent optical links where the tapping equipment is not located in the rack or adjacent racks to the location of the tap modules, hence it will be cabled across the data center through trunk cables. The polarity drawing for the scenarios are presented in appendix A.

Corning Tap Module Configurations

An optical tap could either be integrated or non-integrated into infrastructure cabling. The different tap module configurations are optimized for use in different cable infrastructure systems for monitoring different protocol data rate transmissions. These different configurations come in different split ratio e.g. 50/50, 70/30 in Multimode and 50/50, 70/30, 80/20, 90/10 in Single mode. For considerations and guidance in establishing the maximum supportable link distances for the different protocol data rate transmissions based on the tap

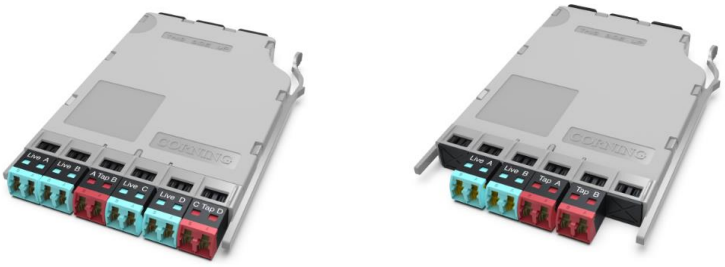
Published: 4/1/2023

splitter ratio and the number of loss connectivity component in the system please refer AEN162 –“Maximum Distance Capabilities for Corning Optical Communications’ Pre-Terminated Solutions”. Tap modules are characterized with three types of ports – Two LIVE ports for live traffic in/out of the module and TAP port for the tapped/filtered signals. These ports are in either LC or MTP representation, with the LIVE port connector in the color code of the fiber type and the TAP Port connector in the red color. Corning tap modules come in both Non-Integrated and Integrated and are grouped into three configurations based on the connecter type representation of the signal port sequence – LIVE/TAP/LIVE.

Configuration A Tap Module

The first tap module configuration that will be discussed is the LC/LC/LC non-integrated tap module configuration, see Figure 1. The input live LC port fibers are split inside the module and routed to the output live port and two receive monitor LC ports in front of the module. Configuration A tap modules are deployed as standalone modules requiring an additional housing to tap an already existing duplex infrastructure system. Connections are made to both the live and monitor devices via LC duplex jumpers. Specific non-integrated tap modules are capable of splitting WDM/CWDM data rate transmissions at the different applicable wavelength lanes for tapping, e.g. 40G BiDi and 40G LR4. Non-integrated taps are available in the EDGE and EDGE8 module footprint.

Figure 1: Configuration A EDGE Tap Modules



Standard BiDi

Configuration B Tap Module

The next configuration is the MTP/MTP/LC Integrated tap module configuration, see Figure 2. The LIVE MTP port is located at the rear of the module. The fibers from the MTP are split inside the module and routed to LIVE LC ports in front of the module and TAP MTP port in the rear of the module. Configuration B Tap module is wired in accordance with the Corning Universal polarity making them compatible with all Corning Universal polarity system components. Tapped signals are routed to the monitor device via a tap MTP to LC simplex harness breakout. Configuration B tap modules can be used to support and monitor serial duplex transmissions and Parallel transmission breakout applications, e.g. 10G and 40G to 4 X 10G port breakout respectively. Within the infrastructure system, a Configuration B tap module functions like a normal Universal wired module, while also sending the split signal to the MTP TAP port. This allows for the flexibility to monitor via the TAP port at any time without disrupting the live network. Configuration B tap modules can also be used as a standalone item to port replicate duplex equipment ports using MTP/LC harness and cross-connect to a duplex infrastructure system with LC jumpers.

Published: 4/1/2023

Figure 2: Configuration B EDGE Tap Modules

Standard

BiDi

Configuration C Tap Module

The last configuration is the MTP/MTP/MTP integrated tap module configuration, see Figure 3. The two MTP LIVE ports are located in the front and rear of the module. Input signals from the LIVE Port are filtered and routed to the TAP MTP port that can be front or rear facing. Configuration C Tap modules are wired as a TIA 568 Type B component on the LIVE link and either TIA 568 Type A or B to the TAP port. The integrated MTP TAP port allows for the flexibility to monitor at any time without disrupting the live network. Configuration C tap modules can be used to support and monitor duplex transmissions and Parallel transmission protocols using MTP to LC harness breakouts or MTP jumpers respectively. The modules can be used to future proof the infrastructure components when planning to migrate from serial 10G to higher data rate using parallel transmission protocol.

Figure 3: Configuration C EDGE Tap Modules

Front TAP

Rear TAP

Tap Module System Design Configurations

There are different possible ways to design and integrate tap in a cable infrastructure system. When designing or implementing a cabling system that will support tap monitoring the following should be taken into consideration which are also basic considerations for Infrastructure designs.

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Manageability – The ability to manage the monitoring of an infrastructure without disrupting the network to ensure improved troubleshooting and reconfiguration of ports during Moves, Adds and Changes (MACs). This is achieved by using the Integrated tap module component as part of the structured cabling system. The use of the Non-integrated tap will often require network disruption during network reconfiguration and MACs.

Scalability – A structured cabling solution based on a MTP cabling solution will enable the infrastructure to support both serial duplex transmission and high data rate parallel transmission speeds. The Configuration B and C tap modules enable scalability with the MTP LIVE and MTP TAP port capability. The Tap split ratio and placement of the Tap in the network will affect the distance reach of the network. The reach of the network decreases with increasing data rate speeds. The tap module can be placed anywhere in the different spaces of the network – MDA, HDA and EDA. However, placing the tap at the central point of the network, e.g. MDA, will ensure optimal distance reach while also enabling equipment interconnection and cross-connection to the different equipment spaces.

Flexibility - The modular nature of the tap module enables flexibility in design. Configuration A tap modules can be used to tap both structured and non-structure systems. With the MTP ports on the Configuration B and C tap modules, they can be integrated into a structured cabling system or integrated into a non-structured cable system via equipment port replication using MTP/LC harness.

Tab Module Cabling Scenarios

Configuration A – Non-integrated LC/LC/LC

This is deployed to monitor an existing cabling system, structured or unstructured, in support of serial duplex transmission protocol. It can be used when only a few ports are being tapped or for temporary monitoring purposes. The tap module sits outside of the cabling system in a separate housing if no module space is available, or a disparate product solution housing is being used. The near end equipment is interconnected to the input LIVE port of the tap module and the output LIVE port is then cross-connected to the far end equipment via the cabling system with the appropriate duplex jumpers. The TAP port is interconnected to the monitor equipment via duplex jumpers with the monitor end in simplex connector style, connected to two receive ports on the monitor device. Refer to the cabling solution shown in Figure 4.

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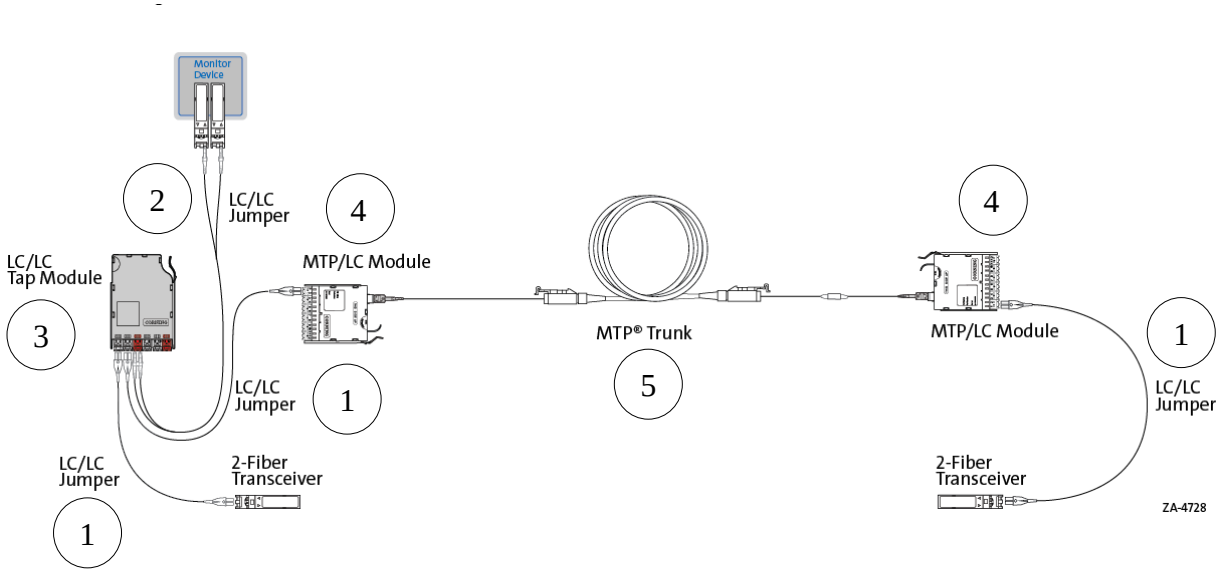
Figure 4: Non-Integrated LC/LC/LC Tap Module Deployment



Bill of Materials for Figure 4 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
2	030502Q5120xxxF	020402G5120xxxF	Fiber Optic Patch Cord, 2 Fibers, LC Simplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, xxx feet
3	ETM-5A-Q	ETM-5A-G	EDGE™ Tap Module, 50/50 split ratio (live/tap), 12F, four standard LC duplex adapters and two red LC duplex adapters at the front of the module, enables monitoring of two ports
4	ECM-UM12-05-93Q	ECM-UM12-04-89G	EDGE 12F MTP/LC Connector Module
5	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)

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Bill of Materials for Figure 4 – EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
2	030502Q5120xxxF	020402G5120xxxF	Fiber Optic Patch Cord, 2 Fibers, LC Simplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, xxx feet
3	ETM8-50A-Q	ETM8-50A-G	EDGE8® Tap Module, 50/50 split ratio (live/tap), 6F, two LC duplex adapters and one red LC duplex adapters at the front of the module, enables monitoring of one port
4	ECM8-UM08-05-E6Q-ULL	ECM8-UM08-04-E8G-ULL	EDGE8® Solutions Module, LC Duplex to MTP (non-pinned), 8 Fiber, Universal Polarity
5	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored

Configuration A – Non-integrated LC/LC/LC – BiDi

This is deployed to monitor an existing cabling system, structured or unstructured, in support of 40G BiDi transmission protocol. BiDi tap module splits each of the Bi-Directional (BiDi) wavelength signal lanes into two, at the different wavelengths, and are routed to the respective wavelength LIVE and TAP ports. Just like the non-integrated tap module, the BiDi tap modules sit outside of the cabling system in a separate housing if no module space is available, or a disparate product solution housing is being used. The near end equipment is interconnected to the input LIVE port of the Tap module and the output LIVE port cross-connected to the far end equipment via the cabling system with the appropriate duplex jumpers. The four splits receive wavelength TAP ports are interconnected to the monitor equipment via two duplex jumpers with the monitor ends in simplex connector style, connected to four receive ports on the monitor device. Refer to the cabling diagram shown in Figure 5.

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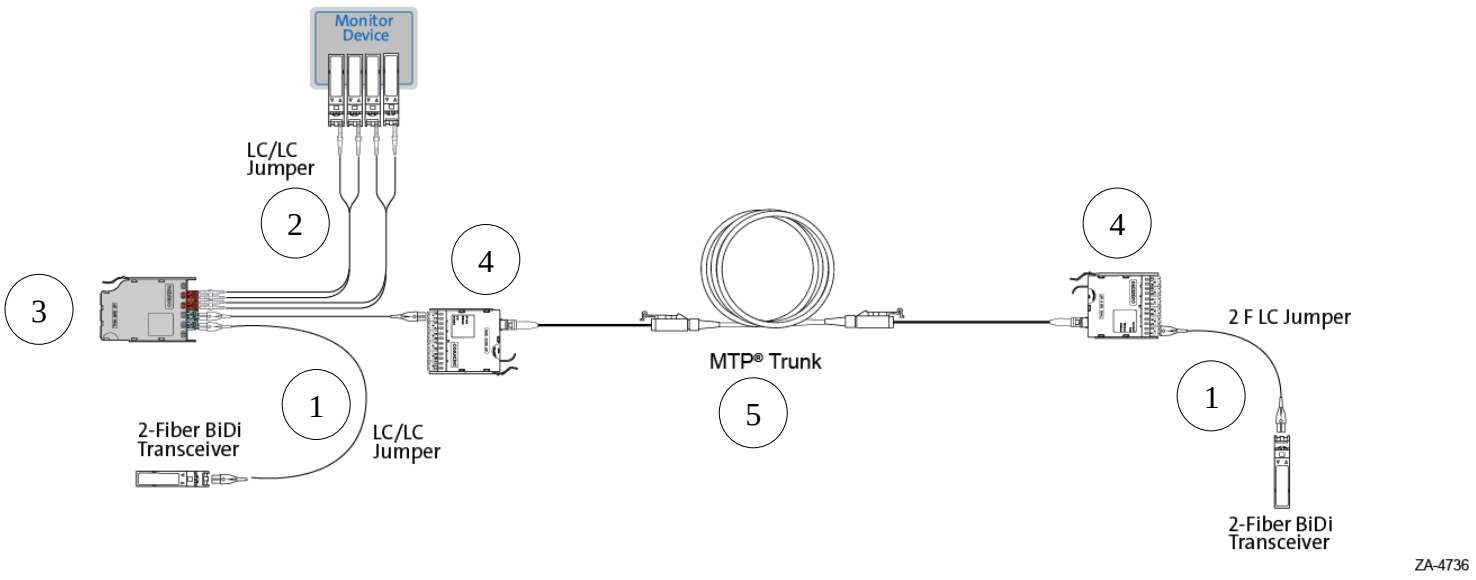
Figure 5: Non-integrated LC/LC/LC BiDiTap Module Deployment



Bill of Materials for Figure 5 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	797902QD120xxxF	NA	2F LC Uniboot Jumper; xxx feet
2	030502Q5120xxxF	NA	Fiber Optic Patch Cord, 2 Fibers, LC Simplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, xxx feet
3	ETM-5A-Q-BD	NA	EDGE™ Bidirectional Tap Module, 50 µm MM (OM4), 50/50 split ratio (live/tap), two red LC duplex adapters labeled TAP, two aqua LC duplex adapters labeled LIVE, supports Cisco's Bi-directional transceivers only
4	ECM-UM12-05-93Q	NA	EDGE 12F MTP/LC Connector Module
5	G757548QPNDDUxxxF	NA	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)

Published: 4/1/2023

Bill of Materials for Figure 5 - EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	797902QD120xxxF	NA	2F LC Uniboot Jumper; xxx feet
2	030502Q5120xxxF	NA	Fiber Optic Patch Cord, 2 Fibers, LC Simplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, xxx feet
3	ETM8-50A-Q-BD	NA	EDGE8® Bidirectional Tap Module, 50 µm MM (OM4), 50/50 split ratio (live/tap), two red LC duplex adapters labeled TAP, two aqua LC duplex adapters labeled LIVE, supports Cisco's Bi-directional transceivers only
4	ECM8-UM08-05-E6Q-ULL	NA	EDGE8® Solutions Module, LC Duplex to MTP (non-pinned), 8 Fiber, Universal Polarity
5	GE5E548QPNDDUxxxF	NA	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored

Configuration A – Non-integrated LC/LC/LC – DeMux Tap

This is deployed to monitor an existing cabling system, structured or unstructured, in support of Wave Division Multiplexing (WDM) signals such as 40G LR4 where the monitoring device is 10G. DeMux tap is deployed when there is no WDM capable monitor device, necessitating the need to breakout and monitor the different multiplexed signals on different monitor receive ports. In the DeMux Tap module, the four different wavelength signal channels on the transmit fibers are each filtered out and routed to the receive TAP ports on the module in four LC duplex port representation. Like non-integrated tap, the DeMux tap modules sit outside of the cabling system in a separate housing if no module space is available, or a disparate product solution housing is being used. The near end equipment is interconnected to the input LIVE port on the Tap module and the output LIVE port is then cross-connected to the far end equipment via the cabling system with the appropriate duplex jumpers. The four receive Tap ports are interconnected to the monitor equipment via four duplex jumpers with the monitor ends of the jumper in simplex connector style, connecting eight receive ports on the monitor equipment. Refer to the cabling diagram shown in Figure 6.

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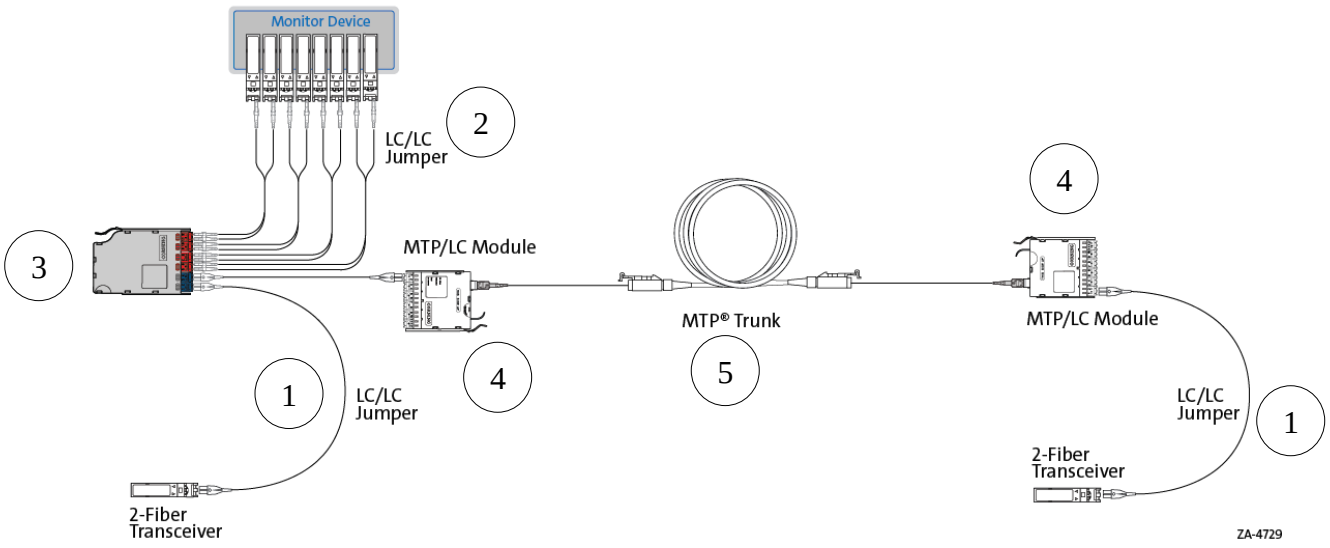
Figure 6: Non-integrated LC/LC/LC – DeMux Tap



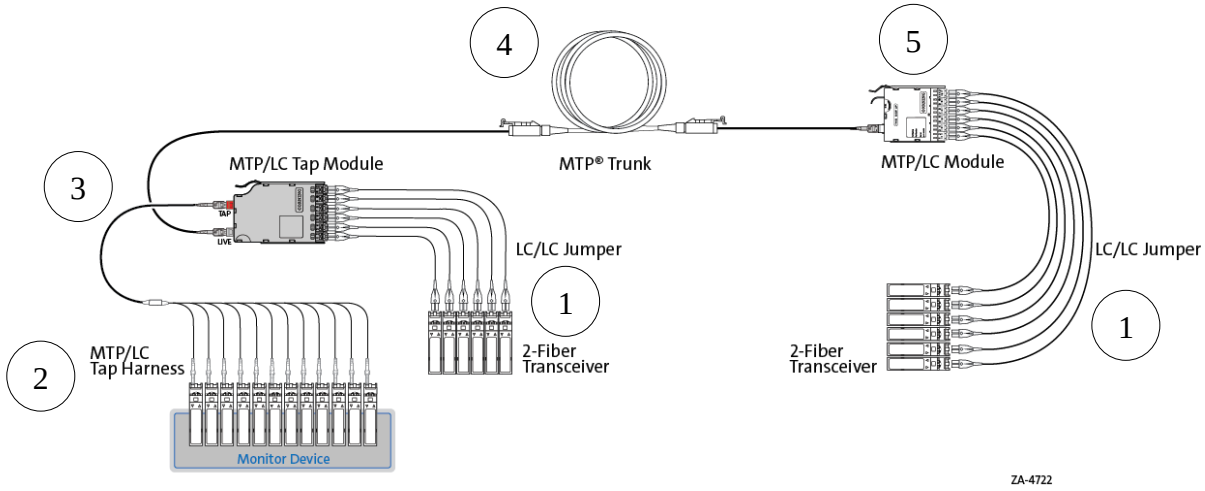
Bill of Materials for Figure 6 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	NA	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
2	NA	020402G5120xxxF	Fiber Optic Patch Cord, 2 Fibers, LC Simplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, xxx feet
3	NA	ETM-5A-G-DMX	EDGE™ LR4 Tap Module, 50/50 split ratio (live/tap), four red LC duplex adapters for TAP, two blue LC duplex adapters for LIVE, enables monitoring of one port. Supports LR4 l transceivers only
4	NA	ECM-UM12-04-89G	EDGE 12f MTP/LC Connector Module
5	NA	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)

Published: 4/1/2023

Configuration B – Integrated MTP/MTP/LC

In this scenario, the MTP/MTP/LC tap module is deployed as a component part of the structured cabling to support serial duplex transmission. This deployment eliminates the use of extra rack space and maximizes the channel reach by reducing the number of loss components in the system. Within the infrastructure, the integrated tap module operates as a regular Corning Universal module with the addition of the MTP TAP port for monitoring. This allows the flexibility to monitor anytime without disrupting the network. Near-end equipment is connected to the module LIVE LC port via duplex jumpers and the far end equipment are connected through the rear LIVE MTP port across the structured cabling infrastructure. The MTP Tap port on the rear is interconnected to the monitor device via tap MTP/LC harness with the LC breakout in a simplex style to connect to the receive ports on the monitor device. Refer to the cabling diagram shown in Figure 7.

Figure 7: Integrated MTP/MTP/LC Tap module



Bill of Materials for Figure 7 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
2	H750312QE8-KWxxxF	H900212GE8-KWxxxF	EDGE™ Tap Harness, xxx F, Non-pinned MTP® PRO to LC Simplex

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3	ETM-5B-Q	ETM-5B-G	EDGE™ Tap Module, 50/50 split ratio (live/tap), 12F, 6 LC duplex ports, one pinned MTP® adapter labeled LIVE, one pinned red MTP adapter labeled TAP, enables six monitored ports, Universal Polarity
4	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)
5	ECM-UM12-05-93Q	ECM-UM12-04-89G	EDGE 12f MTP/LC Connector Module

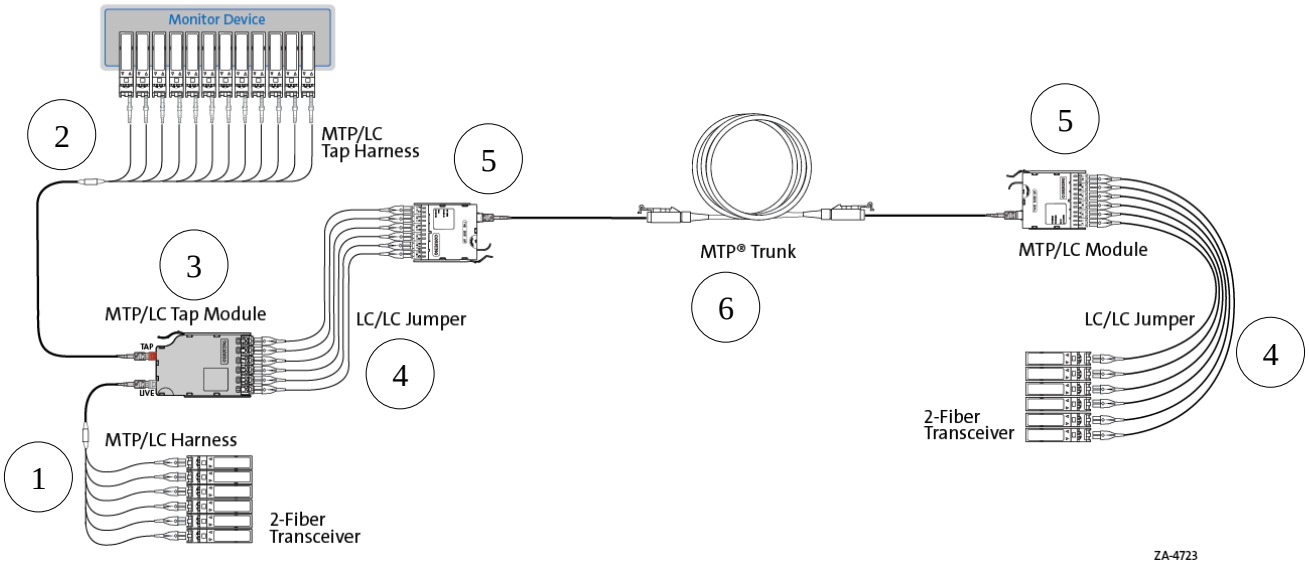
Bill of Materials for Figure 7 - EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
2	HE50308QPH-KBxxxF	HE70208GPH-KBxxxF	EDGE8® Tap Harness, xxx F, Pinned MTP® PRO to LC Simplex
3	ETM8-50B-Q	ETM8-50B-G	EDGE8® Tap Module, 50/50 split ratio (live/tap), 8F, 4 LC duplex ports, one non-pinned MTP® adapter labeled LIVE, one non-pinned red MTP adapter labeled TAP, enables four monitored ports, Universal Polarity
4	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored
5	ECM8-UM08-05-E6Q-ULL	ECM8-UM08-04-E8G-ULL	EDGE8® Solutions Module, LC Duplex to MTP (non-pinned), 8 Fiber, Universal Polarity

Published: 4/1/2023

Configuration B – Integrated MTP/MTP/LC – Port Replication

The Integrated MTP/MTP/LC tap can also be used to port replicate a serial duplex switch. This enables the integration of tapping in an existing, or disparate structured or unstructured cabling link. The interconnection of the MTP LIVE port on the tap module and the duplex ports on the transceiver via an MTP/LC duplex harness replicates the equipment ports onto the module. Connection to far end equipment is completed with the use of cross-connect jumpers across the cabling system. The TAP port on the rear of the tap module allows for the flexibility to monitor anytime without disrupting the live network. Refer to the cabling diagram shown in Figure 8.

Figure 8: Integrated MTP/MTP/LC Tap module Port Replication



Bill of Materials for Figure 8 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	H757912QPH-KBxxxF	H907812GPH-KBxxxF	EDGE™ Non-staggered Harness, 12-fiber, MTP® PRO 12F (Non-pinned) to LC Uniboot, low-loss MM, TIA-568 Type-B Polarity, 24-inch legs (+3/-0 in), xxx F
2	H750312QE8-KWxxxF	H900212GE8-KWxxxF	EDGE™ Tap Harness, xxx F, Non-pinned MTP® PRO to LC Simplex

Published: 4/1/2023

3	ETM-5B-Q	ETM-5B-G	EDGE™ Tap Module, 50/50 split ratio (live/tap), 12F, 6 LC duplex ports, one pinned MTP® adapter labeled LIVE, one pinned red MTP adapter labeled TAP, enables six monitored ports, Universal Polarity
4	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
5	ECM-UM12-05-93Q	ECM-UM12-04-89G	EDGE 12f MTP/LC Connector Module
6	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)

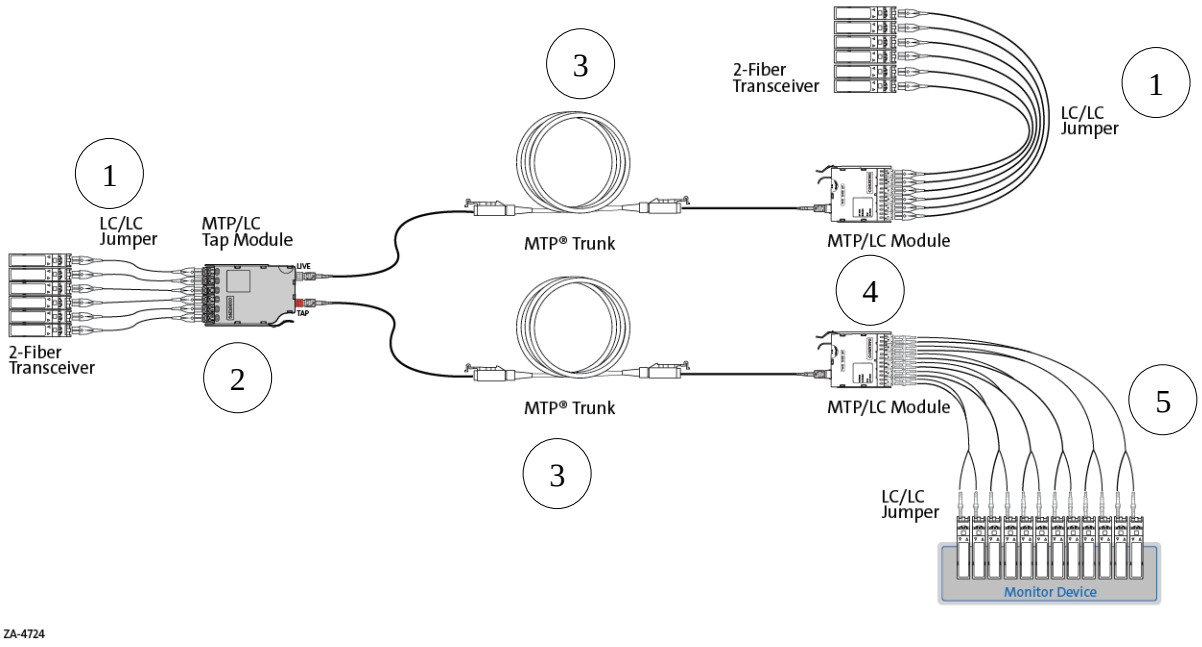
Bill of Materials for Figure 8 - EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	HE67908QPH-KBxxxF	HE87808GPH-KBxxxF	EDGE8® Non-staggered Harness,8 fiber, MTP® PRO 8F (Non-pinned) to LC Uniboot SM, TIA-568 Type-B Polarity, 24-inch legs (+3/-0 in), xxx F
2	HE50308QPH-KBxxxF	HE70208GPH-KBxxxF	EDGE8® Tap Harness, xxx F, Pinned MTP® PRO to LC Simplex
3	ETM8-50B-Q	ETM8-50B-G	EDGE8® Tap Module, 50/50 split ratio (live/tap), 8F, 4 LC duplex ports, one non-pinned MTP® adapter labeled LIVE, one non-pinned red MTP adapter labeled TAP, enables four monitored ports, Universal Polarity
4	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
5	ECM8-UM08-05-E6Q-ULL	ECM8-UM08-04-E8G-ULL	EDGE8® Solutions Module, LC Duplex to MTP (non-pinned), 8 Fiber, Universal Polarity
6	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored

Published: 4/1/2023

Configuration B – Integrated MTP/MTP/LC – Remote Monitoring

This configuration is like the above Configuration B deployment, however the TAP port on the tap module is extended via structure cabling to a different location where the monitoring equipment resides. This can be deplored for security, compliance, access control or as part of a design requirement. At the monitor equipment location, the structured cabling is terminated onto an MTP/LC module which is then interconnected to the monitor port via duplex jumper with the monitor port in simplex connector style. This configuration can only be deployed for Ethernet protocols. Fiber Channel protocols are limited by the amount of connector loss introduced by the structured cabling component. Refer to the cabling diagram shown in Figure 9

Figure 9: Integrated MTP/MTP/LC – Remote Monitoring



Bill of Materials for Figure 9 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
2	ETM-5B-Q	ETM-5B-G	EDGE™ Tap Module, 50/50 split ratio (live/tap), 12F, 6 LC duplex ports, one pinned MTP® adapter labeled LIVE, one pinned red MTP adapter labeled TAP, enables six monitored ports, Universal Polarity

Published: 4/1/2023

3	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)
4	ECM-UM12-05-93Q	ECM-UM12-04-89G	EDGE 12F MTP/LC Connector Module
5	030502Q5120xxxF	020402G5120xxxF	Fiber Optic Patch Cord, 2 Fibers, LC Simplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, xxx feet

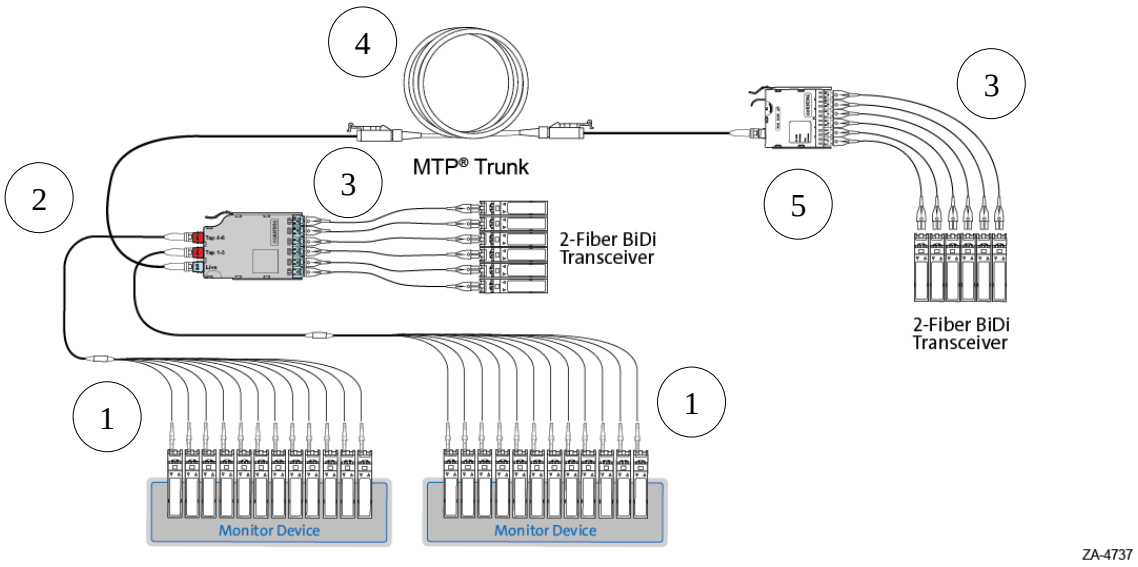
Bill of Materials for Figure 9 - EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
2	ETM8-50B-Q	ETM8-50B-G	EDGE8® Tap Module, 50/50 split ratio (live/tap), 8F LC duplex ports, one non-pinned MTP® adapter labeled LIVE, one non-pinned red MTP adapter labeled TAP, enables four monitored ports, Universal Polarity
3	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored
4	ECM8-UM08-05-E6Q-ULL	ECM8-UM08-04-E8G-ULL	EDGE8® Solutions Module, LC Duplex to MTP (non-pinned), 8 Fiber, Universal Polarity
5	030502Q5120xxxF	020402G5120xxxF	Fiber Optic Patch Cord, 2 Fibers, LC Simplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, xxx feet

Published: 4/1/2023

Configuration B – Integrated MTP/MTP/LC – BiDi

Unlike the regular integrated tap module, BiDi Integrated tap module has two MTP TAP ports. The Bi-Directional channels at the different wavelengths from each Live MTP link is filtered out and routed to the two MTP Tap ports. Within the cabling infrastructure, the integrated BiDi tap module operates as a regular Corning Universal module with the addition of the two TAP MTP ports for monitoring. This allows for the flexibility to monitor anytime without disrupting the live network. As illustrated in the diagram in Figure 10, near-end equipment is connected to the module LIVE LC port via duplex jumpers, and the far end equipment is connected through the rear LIVE MTP port across the structured cabling infrastructure. The two MTP TAP ports on the rear is interconnected to the monitor device via two tap MTP/LC harnesses with the LC breakout in a simplex configuration, to connect to the receive ports on the monitor device.

Figure 10: Integrated MTP/MTP/LC – BiDi Tap Module



Bill of Materials for Figure 10 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	H750312QE8-KWxxxF	NA	EDGE™ Tap Harness, xxx F, Non-pinned MTP® PRO to LCUPC Simplex

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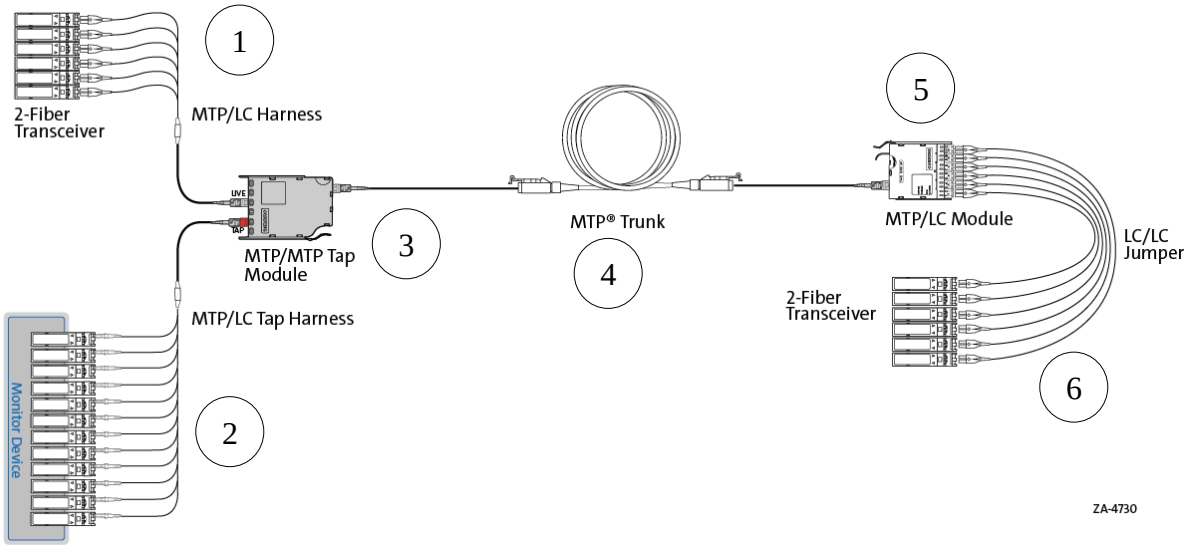
2	ETM-5B-Q-BD	NA	EDGE™ Bidirectional Tap Module, 50 µm MM (OM4), 50/50 split ratio (live/tap), 12F, 6 LC duplex ports, one pinned MTP® adapter labeled LIVE, one pinned red MTP adapter labeled TAP, enables six monitored ports, Universal Polarity, supports Cisco's Bi-directional
3	797902QD120xxxF	NA	2F LC Uniboot Jumper; xxx feet
4	G757548QPNDDUxxxF	NA	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)
5	ECM-UM12-05-93Q	NA	EDGE 12F MTP/LC Connector Module

Configuration C – Integrated MTP/MTP/MTP - Duplex Links

In this scenario, the MTP/MTP/MTP tap module is deployed as a component of the structured cabling in support of serial duplex transmission protocol. It can also, be used to future proof the infrastructure for easy migration to higher parallel transmission data rate without the need to swap out MTP/LC modules in the infrastructure. This deployment eliminates the use of extra rack space and maximizes the channel reach by reducing the number of loss components in the system. For duplex transmission, near-end equipment is connected to the LIVE MTP port in front of the module via MTP/LC harness and the far end equipment is connected through the rear LIVE MTP port across the structured cabling infrastructure. The MTP Tap port is interconnected to the monitor device via tap MTP/LC harness with the LC breakout in a simplex configuration, to connect to the receive ports on the monitor device. Refer to the cabling diagram shown in Figure 11.

Figure 11: Integrated MTP/MTP/MTP - Duplex Links



Bill of Materials for Figure 11 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	H757912QPH-KBxxxF	H907812GPH-KBxxxF	EDGE™ Non-staggered Harness, 12-fiber, MTP® PRO 12F (Non-pinned) to LC Uniboot, low-loss MM, TIA-568 Type-B Polarity, 24-inch legs (+3/-0 in), xxx F
2	H750312QE8-KWxxxF	H900212GE8-KWxxxF	EDGE™ Tap Harness, xxx F, Non-pinned MTP® PRO to LC Simplex
3	ETM-5C-Q	ETM-5C-G	EDGE™ Tap Module, 50/50 split ratio (live/tap), one front-mounted pinned red MTP® adapter labeled TAP, two pinned MTP adapters labeled LIVE, enables six monitored ports
4	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)
5	ECM-UM12-05-93Q	ECM-UM12-04-89G	EDGE 12F MTP/LC Connector Module
6	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet

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Bill of Materials for Figure 11 - EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	HE67908QPH-KBxxxF	HE87808GPH-KBxxxF	EDGE8® Non-staggered Harness,8 fiber, MTP® PRO 8F (Non-pinned) to LC Uniboot SM, TIA-568 Type-B Polarity, 24-inch legs (+3/-0 in), xxx F
2	HE50308QPH-KBxxxF	HE70208GPH-KBxxxF	EDGE8® Tap Harness, xxxF, Pinned MTP® PRO to LC Simplex
3	ETM8-50C-Q	ETM8-50C-G	EDGE8® Tap Module, 50/50 split ratio (live/tap), non-pinned Tap (red) and pinned Live MTP adapters on the front, non-pinned Live MTP adapter on the rear
4	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored
5	ECM8-UM08-05-E6Q-ULL	ECM8-UM08-04-E8G-ULL	EDGE8® Solutions Module, LC Duplex to MTP (non-pinned), 8 Fiber, Universal Polarity
6	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet

Configuration C – Integrated MTP/MTP/MTP – Duplex Links with Remote Monitoring

The next configuration represents a network where the monitor device in a different location than the (MDA) location. The MTP TAP port on the rear of the Tap module is extended via structured cabling to the monitor location. At the remote location, the structured cabling is terminated onto a MTP/LC module, and the monitor devices inter-connected via duplex jumpers with the monitor connector end in a simplex configuration. Refer to the cabling diagram shown in Figure 12.

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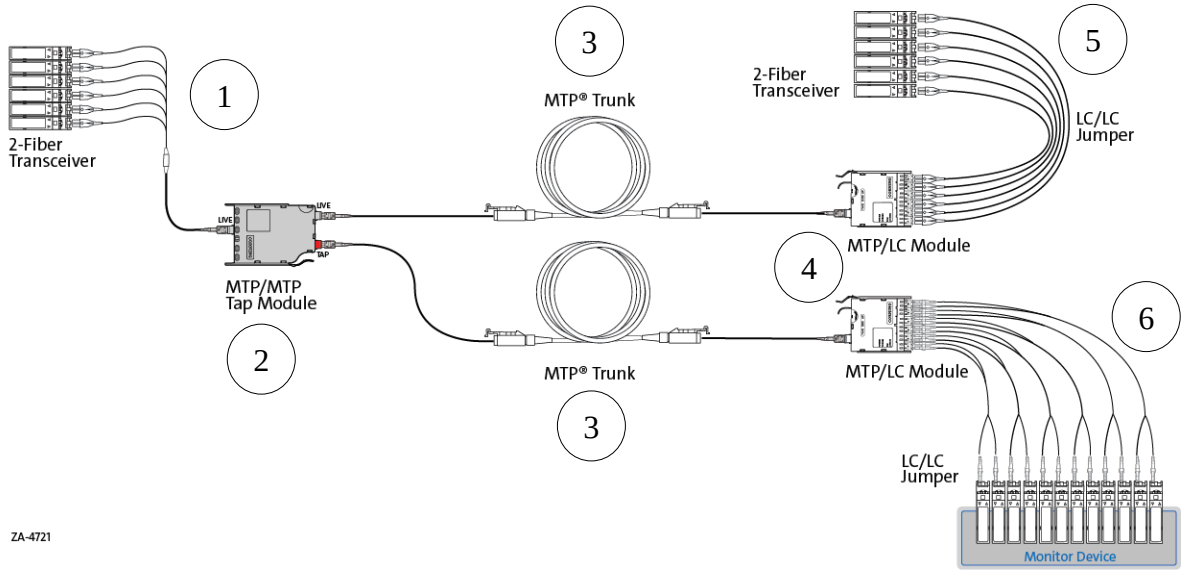
Figure 12: Integrated MTP/MTP/MTP – Duplex Links with Remote Monitoring



Bill of Materials for Figure 12 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	H757912QPH-KBxxxF	H907812GPH-KBxxxF	EDGE™ Non-staggered Harness, 12-fiber, MTP® PRO 12F (Non-pinned) to LC Uniboot, low-loss MM, TIA-568 Type-B Polarity, 24-inch legs (+3/-0 in), xxx F
2	ETM-5C-Q-R	ETM-5C-G-R	EDGE™ Tap Module, 50/50 split ratio (live/tap), one rear-mounted pinned red MTP® adapter labeled TAP, two pinned MTP adapters labeled LIVE, enables six monitored ports
3	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)
4	ECM-UM12-05-93Q	ECM-UM12-04-89G	EDGE 12F MTP/LC Connector Module
5	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet

Published: 4/1/2023

6	030502Q5120xxxF	020402G5120xxxF	Fiber Optic Patch Cord, 2 Fibers, LC Simplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, xxx feet

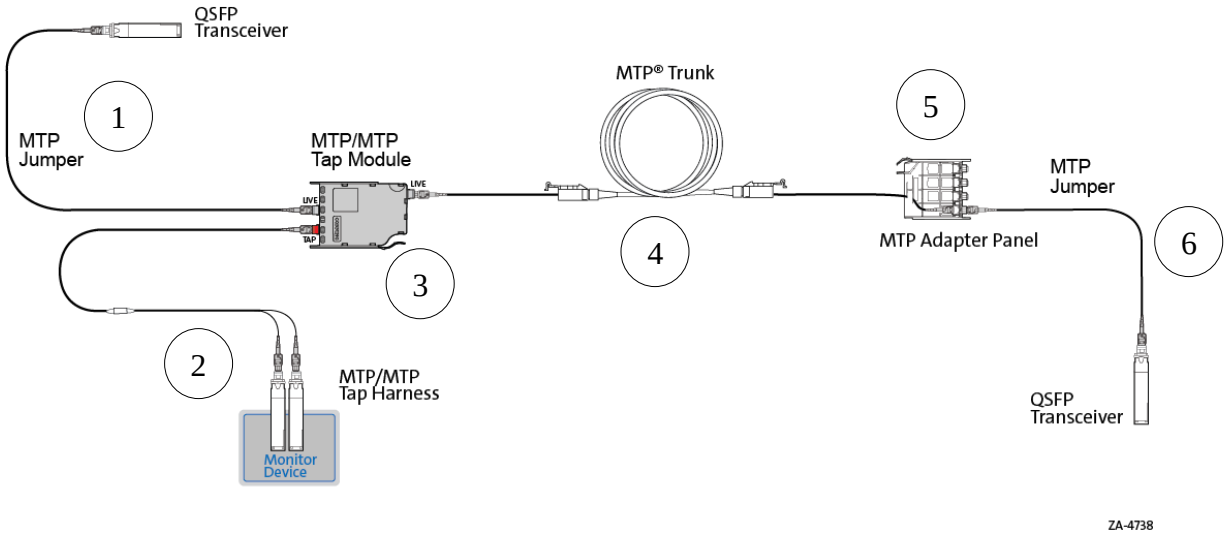
Bill of Materials for Figure 12 - EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	HE67908QPH-KBxxxF	HE87808GPH-KBxxxF	EDGE8® Non-staggered Harness,8 fiber, MTP® PRO 8F (Non-pinned) to LC Uniboot SM, TIA-568 Type-B Polarity, 24-inch legs (+3/-0 in), xxx F
2	ETM8-50C-Q-R	ETM8-50C-G-R	EDGE8® Tap Module, 50/50 split ratio (live/tap), pinned Live MTP adapter on the front of the module and non-pinned Live and Tap (red) MTP adapters on the rear
3	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored
4	ECM8-UM08-05-E6Q-ULL	ECM8-UM08-04-E8G-ULL	EDGE8® Solutions Module, LC Duplex to MTP (non-pinned), 8 Fiber, Universal Polarity
5	797902QD120xxxF	787802GD120xxxF	2F LC Uniboot Jumper; xxx feet
6	030502Q5120xxxF	020402G5120xxxF	Fiber Optic Patch Cord, 2 Fibers, LC Simplex to LC Duplex, Zipcord Tight-Buffered Cable, Riser, with 2.0 mm legs, xxx feet

Configuration C – Integrated MTP/MTP/MTP Tap Module – Parallel Links

When migrating from duplex transmission to higher data rate via parallel transmission such as 40G, MTP equipment connectivity is required. A MTP jumper is used to interconnect the MTP parallel link equipment port to the MTP LIVE port in front of the tap module. When the monitoring equipment is capable of receiving a parallel input, the front facing TAP port module is used to interconnect the monitor via MTP/MTP tap harness as shown in Figure 13.

Published: 4/1/2023

Figure 13: Integrated MTP/MTP/MTP – Parallel Links with Parallel Tapping



Bill of Materials for Figure 13 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	J757512QE8-NBxxxF	J909012GE8-NBxxxF	12-fiber MTP® Jumper, MTP® PRO (non-pinned) to MTP® PRO (non-pinned), TIA-568 Type-B polarity, no pulling grip, xxx F
2	HE6E608QPH-KBxxxF	HE8E808GPH-KBxxxF	EDGE8® Tap MTP® to MTP® Harness, xxx Feet, one 8-fiber non-pinned MTP to two 4 fiber non-pinned MTPs
3	ETM-5C-Q	ETM-5C-G	EDGE™ Tap Module, 50/50 split ratio (live/tap), one front-mounted pinned red MTP® adapter labeled TAP, two pinned MTP adapters labeled LIVE
4	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)
5	EDGE-CP48-E3	EDGE-CP48-90	EDGE™ 48-fiber MTP Connector Panel

Published: 4/1/2023

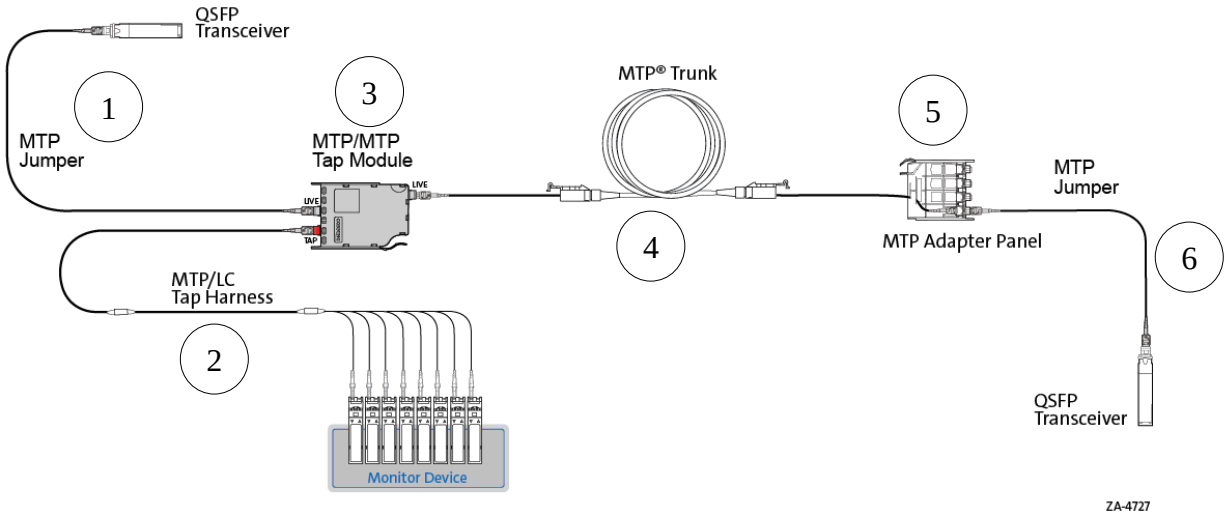
6	J759312QE8-NAxxxF	J899012GE8-NAxxxF	12-fiber MTP® Jumper, MTP® PRO (pinned) to MTP® PRO (non-pinned), TIA-568 Type-A polarity, no pulling grip, xxx F

Bill of Materials for Figure 13 - EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	JE6E608QE8-NBxxxF	JE8E808GE8-NBxxxF	8-fiber MTP® PRO Jumper, MTP® PRO 8F (non-pinned) to MTP® PRO 8F (non-pinned), TIA-568 Type-B Polarity, no pulling grip, xxx F
2	HE5E608QPH-KBxxxF	HE7E808GPH-KBxxxF	EDGE8® Tap MTP® PRO to MTP® PRO Harness, xxx Feet, one 8-fiber pinned MTP to two 4-fiber non-pinned MTPs
3	ETM8-50C-Q	ETM8-50C-G	EDGE8® Tap Module, 50/50 split ratio (live/tap), non-pinned Tap (red) and pinned Live MTP adapters on the front, non-pinned Live MTP adapter on the rear
4	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored
5	EDGE8-CP32-V3	EDGE8-CP32-V1	EDGE8® 32-fiber MTP Connector Panel
6	JE6E608QE8-NAxxxF	JE8E808GE8-NAxxxF	8-fiber MTP® PRO Jumper, MTP® PRO 8F (non-pinned) to MTP® PRO 8F (non-pinned), TIA-568 Type-A Polarity, no pulling grip, xxx F

For situations where the monitoring equipment does not have parallel monitoring capability, a MTP/LC harness is utilized for the TAP connection. Refer to the cabling diagram shown in Figure 14.

Published: 4/1/2023

Figure 14: Integrated MTP/MTP/MTP Tap Module – Parallel Links



Bill of Materials for Figure 14 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	J757512QE8-NBxxxF	J909012GE8-NBxxxF	12-fiber MTP® Jumper, MTP® PRO (non-pinned) to MTP® PRO (non-pinned), TIA-568 Type-B polarity, no pulling grip, xxx F
2	HE60308QPH-KBxxxF	HE80208GPH-KBxxxF	EDGE8® Tap Harness, xxxF, Non-Pinned MTP PRO to LC Simplex
3	ETM-5C-Q	ETM-5C-G	EDGE™ Tap Module, 50/50 split ratio (live/tap), one front-mounted pinned red MTP® adapter labeled TAP, two pinned MTP adapters labeled LIVE, enables six monitored ports
4	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)
5	EDGE-CP48-E3	EDGE-CP48-90	EDGE™ 48-fiber MTP Connector Panel

Published: 4/1/2023

6	J759312QE8-NAxxxF	J899012GE8-NAxxxF	12-fiber MTP® Jumper, MTP® PRO (pinned) to MTP® PRO (non-pinned), TIA-568 Type-A polarity, no pulling grip, xxx F

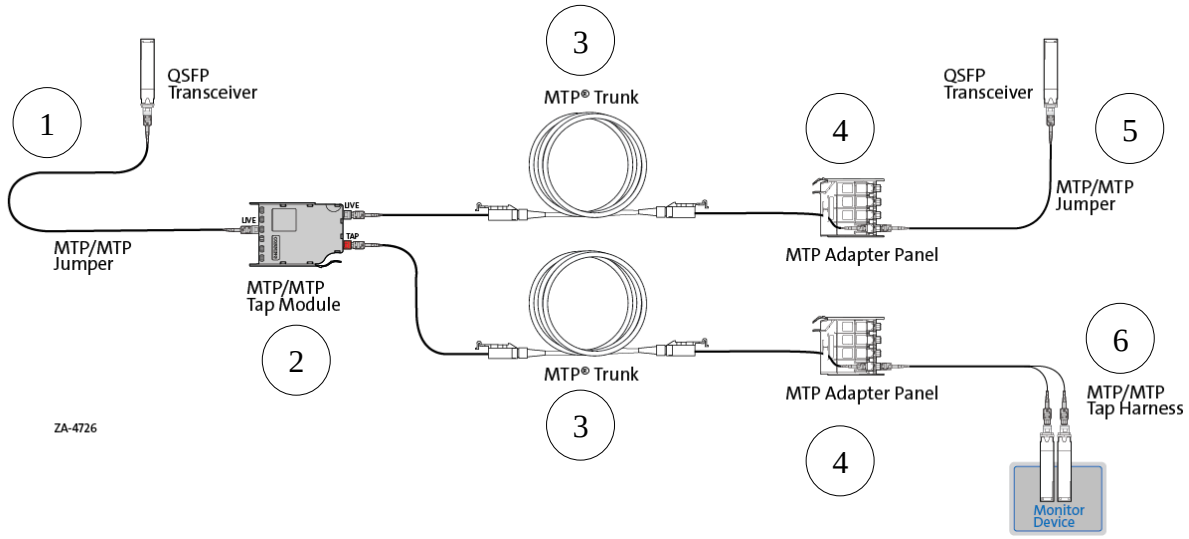
Bill of Materials for Figure 14 - EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	JE6E608QE8-NBxxxF	JE8E808GE8-NBxxxF	8-fiber MTP® PRO Jumper, MTP PRO 8F (non-pinned) to MTP PRO 8F (non-pinned), TIA-568 Type-B Polarity, no pulling grip, xxx F
2	HE50308QPH-KBxxxF	HE70208GPH-KBxxxF	EDGE8® Tap Harness, xxxF, Pinned MTP PRO to LC Simplex
3	ETM8-50C-Q	ETM8-50C-G	EDGE8 Tap Module, 50/50 split ratio (live/tap), non-pinned Tap (red) and pinned Live MTP adapters on the front, non-pinned Live MTP adapter on the rear
4	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8 MTP Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored
5	EDGE8-CP32-V3	EDGE8-CP32-V1	EDGE8 32-fiber MTP Connector Panel
6	JE6E608QE8-NAxxxF	JE8E808GE8-NAxxxF	8-fiber MTP PRO Jumper, MTP PRO 8F (non-pinned) to MTP PRO 8F (non-pinned), TIA-568 Type-A Polarity, no pulling grip, xxx F

Configuration C.3 – Integrated MTP/MTP/MTP – Parallel links with Remote Monitoring

In a situation where the monitoring device is in a different location from the main distribution location (MDA), a rear-facing MTP TAP port tap module can be extended via structured cabling to the monitor location. At the monitor location, when the monitoring equipment is capable of receiving a parallel input, the monitor ports are interconnected to the structured cable via MTP/MTP Tap harness as shown in figure 15.

Published: 4/1/2023

Figure 15: Integrated MTP/MTP/MTP – Parallel Links with Remote MTP port Monitor Device



Bill of Materials for Figure 15 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	J757512QE8-NBxxxF	J909012GE8-NBxxxF	12-fiber MTP® Jumper, MTP® PRO (non-pinned) to MTP® PRO (non-pinned), TIA-568 Type-B polarity, no pulling grip, xxx F
2	ETM-5C-Q-R	ETM-5C-G-R	EDGE™ Tap Module, 50/50 split ratio (live/tap), one rear-mounted pinned red MTP® adapter labeled TAP, two pinned MTP adapters labeled LIVE
3	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)
4	EDGE-CP48-E3	EDGE-CP48-90	EDGE™ 48-fiber MTP Connector Panel
5	J759312QE8-NAxxxF	J899012GE8-NAxxxF	12-fiber MTP® Jumper, MTP® PRO (pinned) to MTP® PRO (non-pinned), TIA-568 Type-A polarity, no pulling grip, xxx F

Published: 4/1/2023

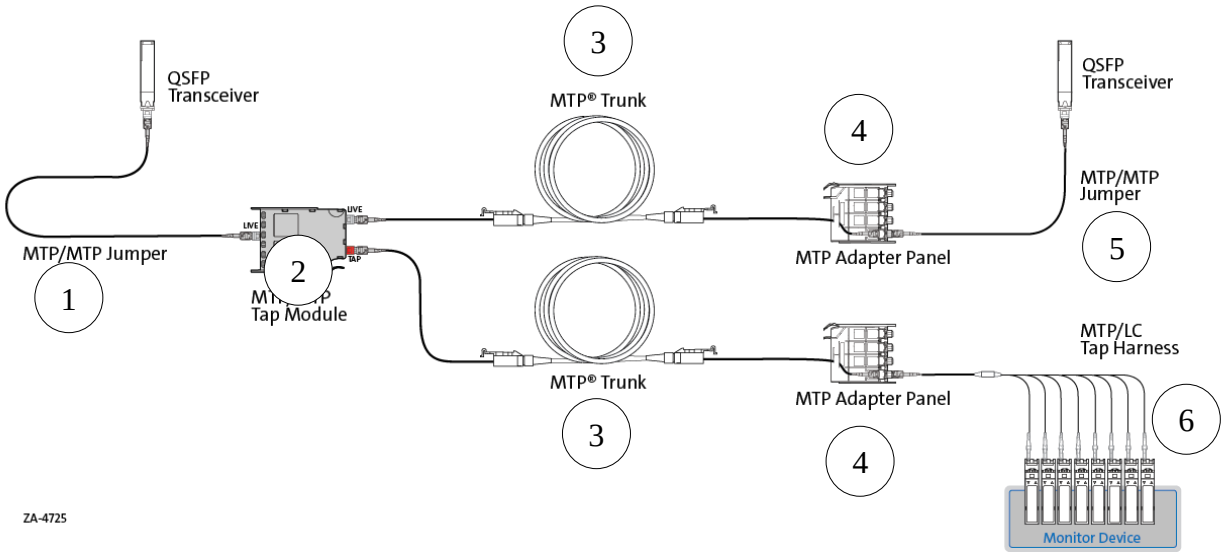
6	HE5E608QPH-KBxxxF	HE7E808GPH-KBxxxF	EDGE8® Tap MTP® to MTP® Harness, xxx Feet, one 8-fiber pinned MTP to two 4 fiber non-pinned MTPs

Bill of Materials for Figure 15 - EDGE8 (Base 8)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	JE6E608QE8-NBxxxF	JE8E808GE8-NBxxxF	8-fiber MTP® PRO Jumper, MTP® PRO 8F (non-pinned) to MTP® PRO 8F (non-pinned), TIA-568 Type-B Polarity, no pulling grip, xxx F
2	ETM8-50C-Q-R	ETM8-50C-G-R	EDGE8® Tap Module, 50/50 split ratio (live/tap), pinned Live MTP adapter on the front of the module and non-pinned Live and Tap (red) MTP adapters on the rear
3	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored
4	EDGE8-CP32-V3	EDGE8-CP32-V1	EDGE8® 32-fiber MTP Connector Panel
5	JE6E608QE8-NAxxxF	JE8E808GE8-NAxxxF	8-fiber MTP® PRO Jumper, MTP® PRO 8F (non-pinned) to MTP® PRO 8F (non-pinned), TIA-568 Type-A Polarity, no pulling grip, xxx F
6	HE5E608QPH-KBxxxF	HE7E808GPH-KBxxxF	EDGE8® Tap MTP® PRO to MTP® PRO Harness, xxx Feet, one 8 fiber pinned MTP to two 4 fiber non-pinned MTPs

For situations where the monitoring equipment does not have parallel optic receiver monitoring capability, a tap MTP/ LC breakout is used to interconnect the structured cable to the monitor port as shown in Figure 16.

Published: 4/1/2023

Figure 16: Integrated MTP/MTP/MTP – Parallel Links with Remote LC port Monitor Device



Bill of Materials for Figure 16 – EDGE (Base 12)			
Item	**OM4 Part Number**	**OS2 Part Number**	**Description**
1	J757512QE8-NBxxxF	J909012GE8-NBxxxF	12-fiber MTP® Jumper, MTP® PRO (non-pinned) to MTP® PRO (non-pinned), TIA-568 Type-B polarity, no pulling grip, xxx F
2	ETM-5C-Q-R	ETM-5C-G-R	EDGE™ Tap Module, 50/50 split ratio (live/tap), one rear-mounted pinned red MTP® adapter labeled TAP, two pinned MTP adapters labeled LIVE, enables six monitored ports
3	G757548QPNDDUxxxF	G909048GPNDDUxxxF	48-fiber MTP (non-pinned) to MTP (non-pinned) Trunk; xxx feet (Note: Trunks available in fiber counts up to 576F)
4	EDGE-CP48-E3	EDGE-CP48-90	EDGE™ 48-fiber MTP Connector Panel

Published: 4/1/2023

5	J759312QE8-NAxxxF	J899012GE8-NAxxxF	12-fiber MTP® Jumper, MTP® PRO (pinned) to MTP® PRO (non-pinned), TIA-568 Type-A polarity, no pulling grip, xxx F
6	HE50308QPH-KBxxxF	HE70208GPH-KBxxxF	EDGE8® Tap Harness, xxxF, Pinned MTP PRO to LC Simplex

Bill of Materials for Figure 16 - EDGE8 (Base 8)

Item	OM4 Part Number	OS2 Part Number	Description
1	JE6E608QE8-NBxxxF	JE8E808GE8-NBxxxF	8-fiber MTP® PRO Jumper, MTP® PRO 8F (non-pinned) to MTP® PRO 8F (non-pinned), TIA-568 Type-B Polarity, no pulling grip, xxx F
2	ETM8-50C-Q-R	ETM8-50C-G-R	EDGE8® Tap Module, 50/50 split ratio (live/tap), pinned Live MTP adapter on the front of the module and non-pinned Live and Tap (red) MTP adapters on the rear
3	GE5E548QPNDDUxxxF	GE7E748GPNDDUxxxF	EDGE8® MTP® Trunk, 48 Fibers, MTP 8F (Pinned) to MTP 8F(Pinned), TIA-568 Standard Universal Type-B Polarity, Pulling grip on first end only, xxx F, Non-Armored
4	EDGE8-CP32-V3	EDGE8-CP32-V1	EDGE8® 32-fiber MTP Connector Panel
5	JE6E608QE8-NAxxxF	JE8E808GE8-NAxxxF	8-fiber MTP® PRO Jumper, MTP® PRO 8F (non-pinned) to MTP® PRO 8F (non-pinned), TIA-568 Type-A Polarity, no pulling grip, xxx F
6	HE60308QPH-KBxxxF	HE80208GPH-KBxxxF	EDGE8® Tap Harness, xxx F, Non-Pinned MTP® PRO to LC Simplex

Conclusion

The best tap application deployment to monitor a network will depend on many factors such as design, equipment port and location; migration path, distance, cost, pathway availability, etc. For additional questions, contact Corning Optical Communications' Technical Support Line at 800-743-2671 or dutyeng@corning.com.

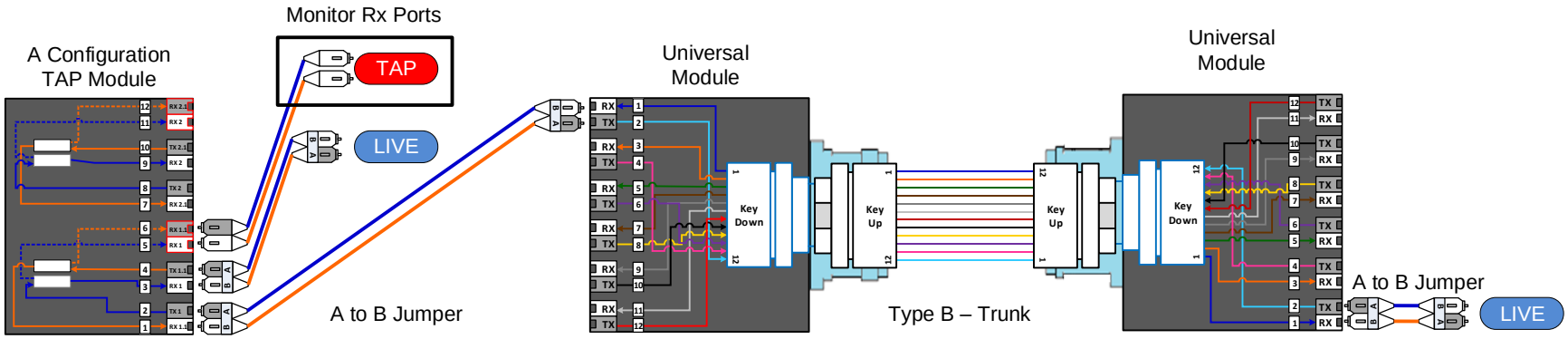
Published: 4/1/2023

References

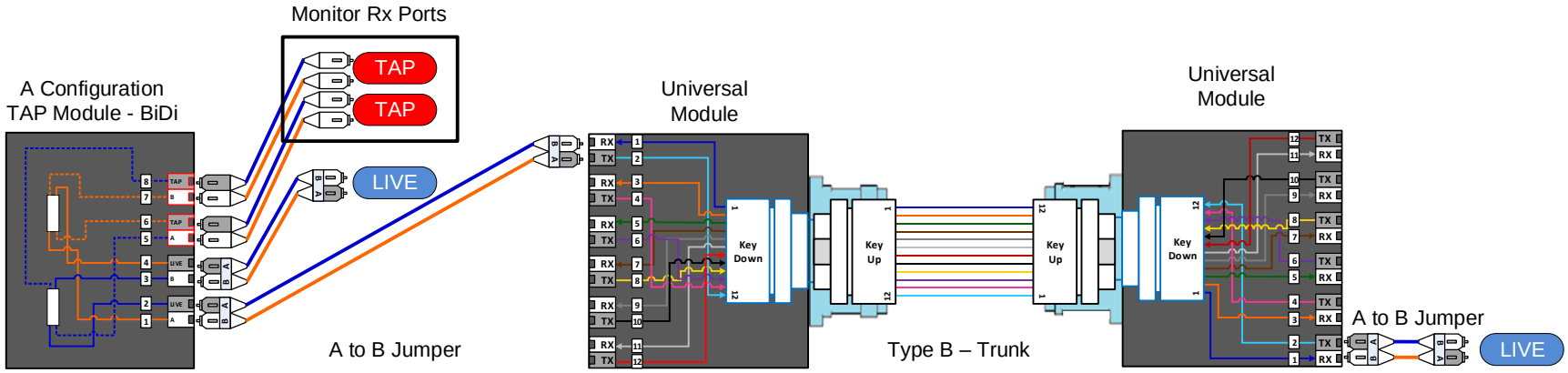
Published: 4/1/2023

Appendix A:

Polarity of Figure 4

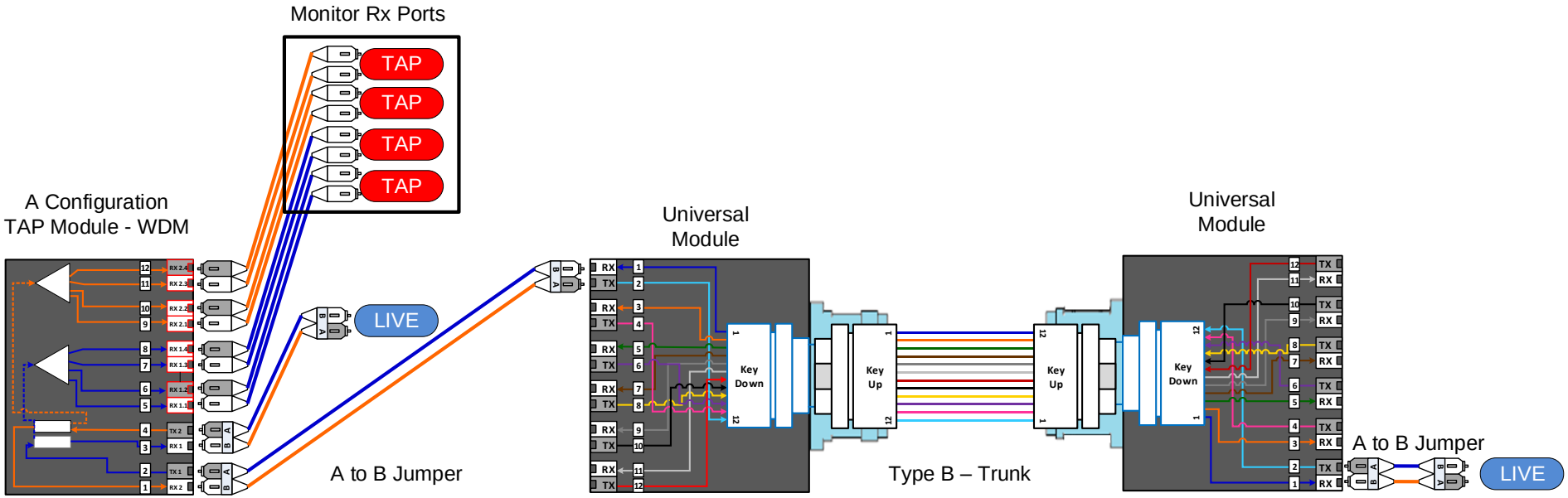


Polarity of Figure 5



Published: 4/1/2023

Polarity of Figure 6



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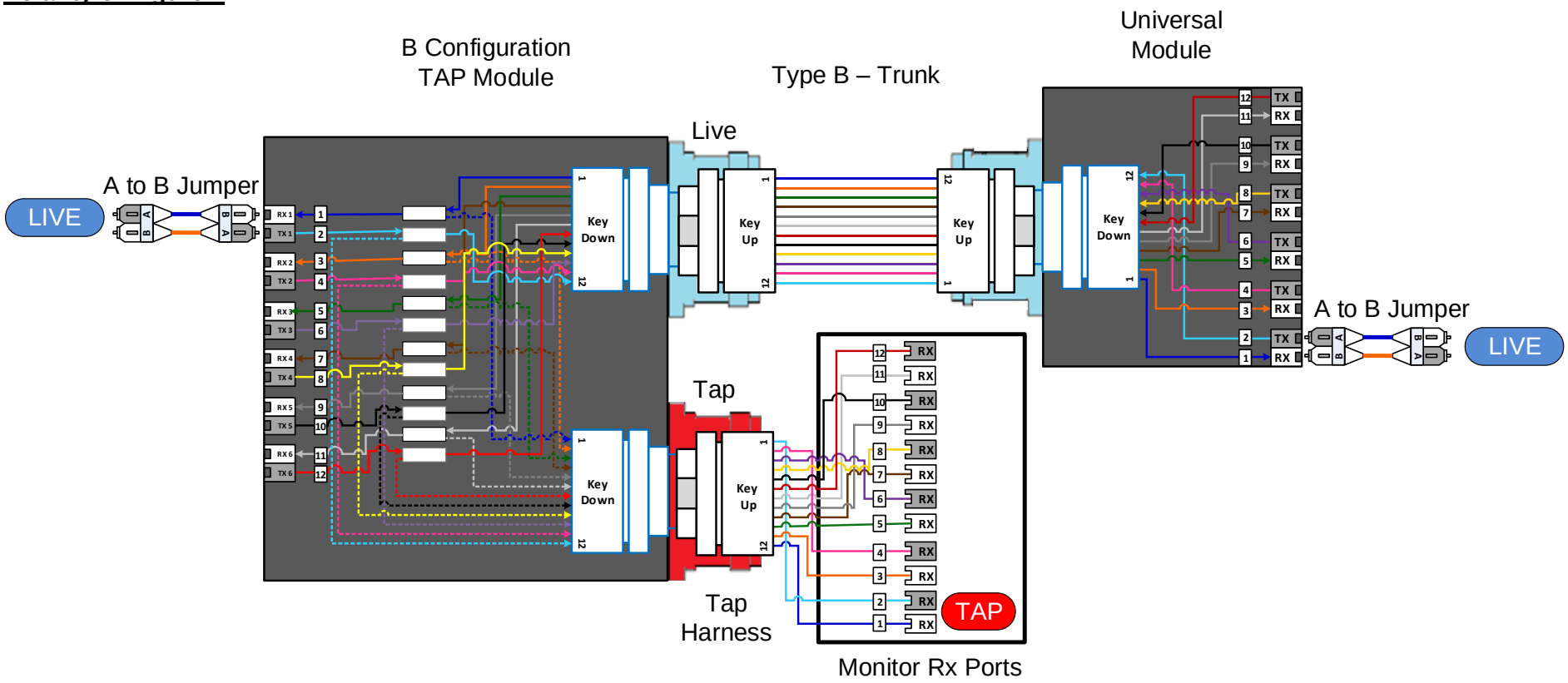
Polarity of Figure 7



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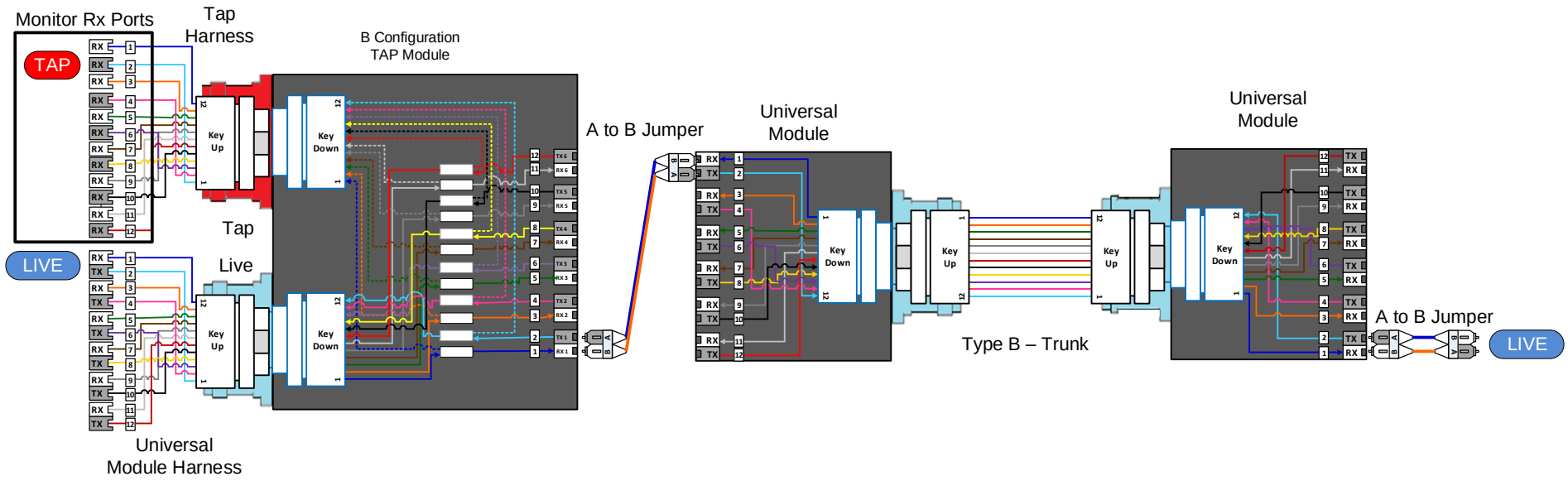
Polarity of Figure 8



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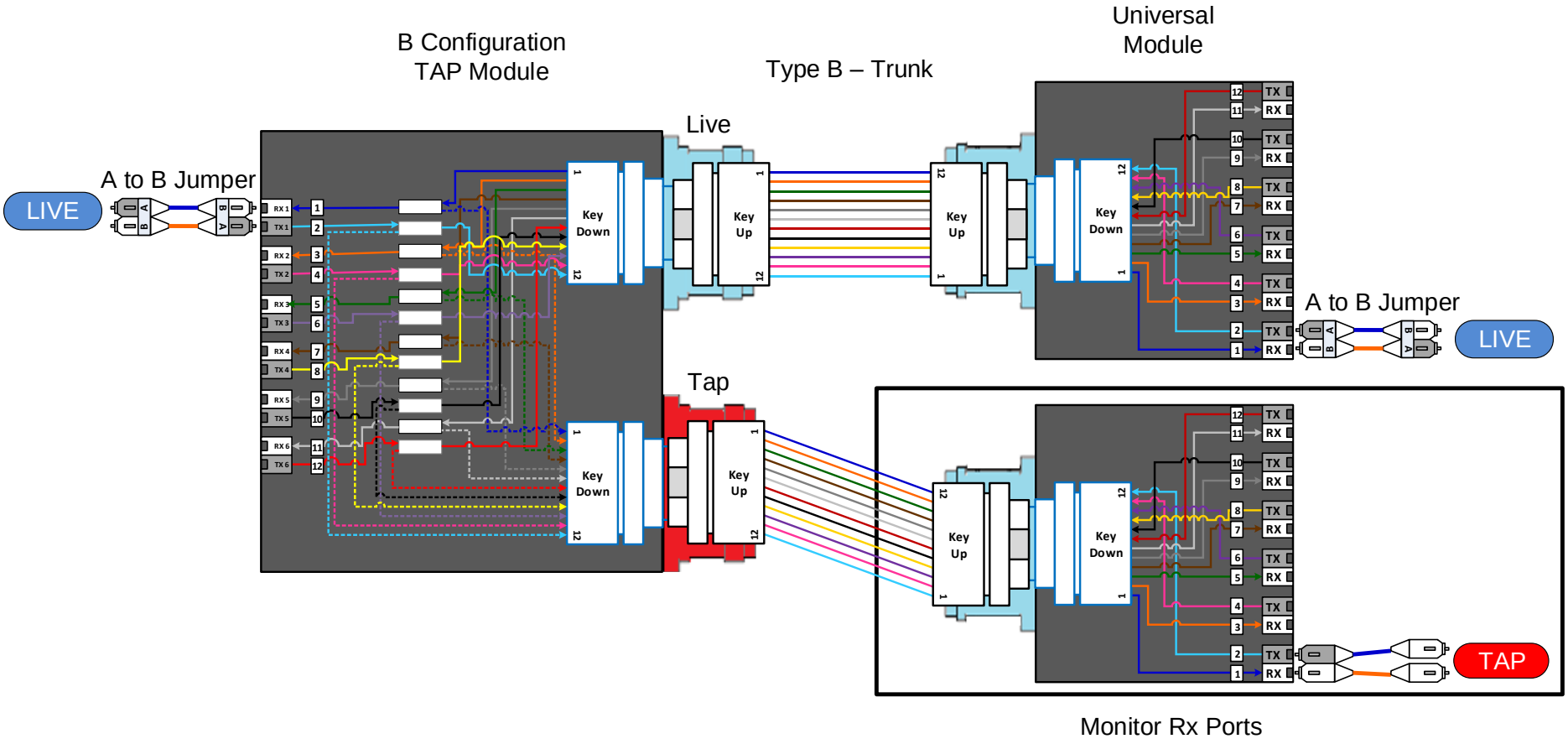
Polarity of Figure 9



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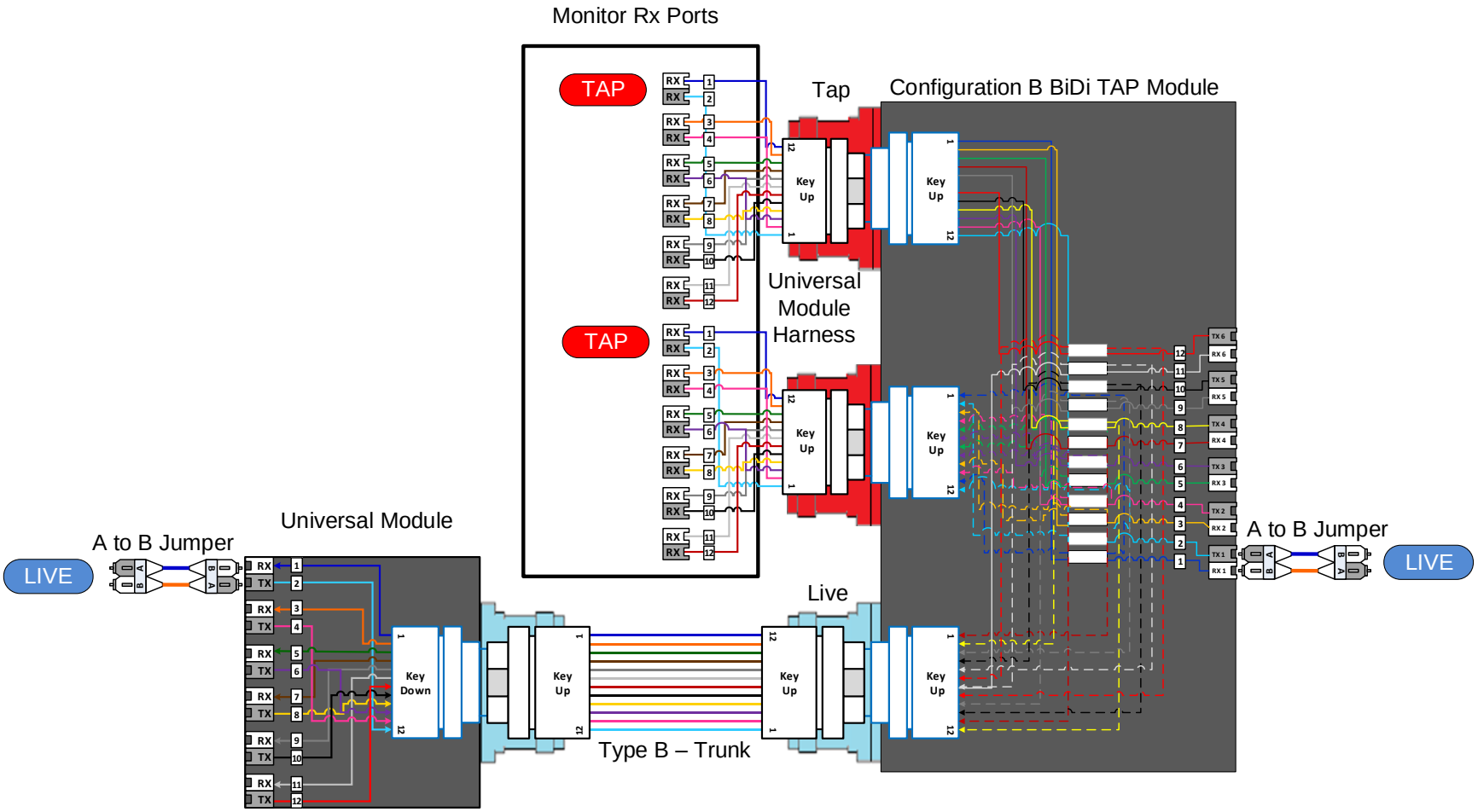
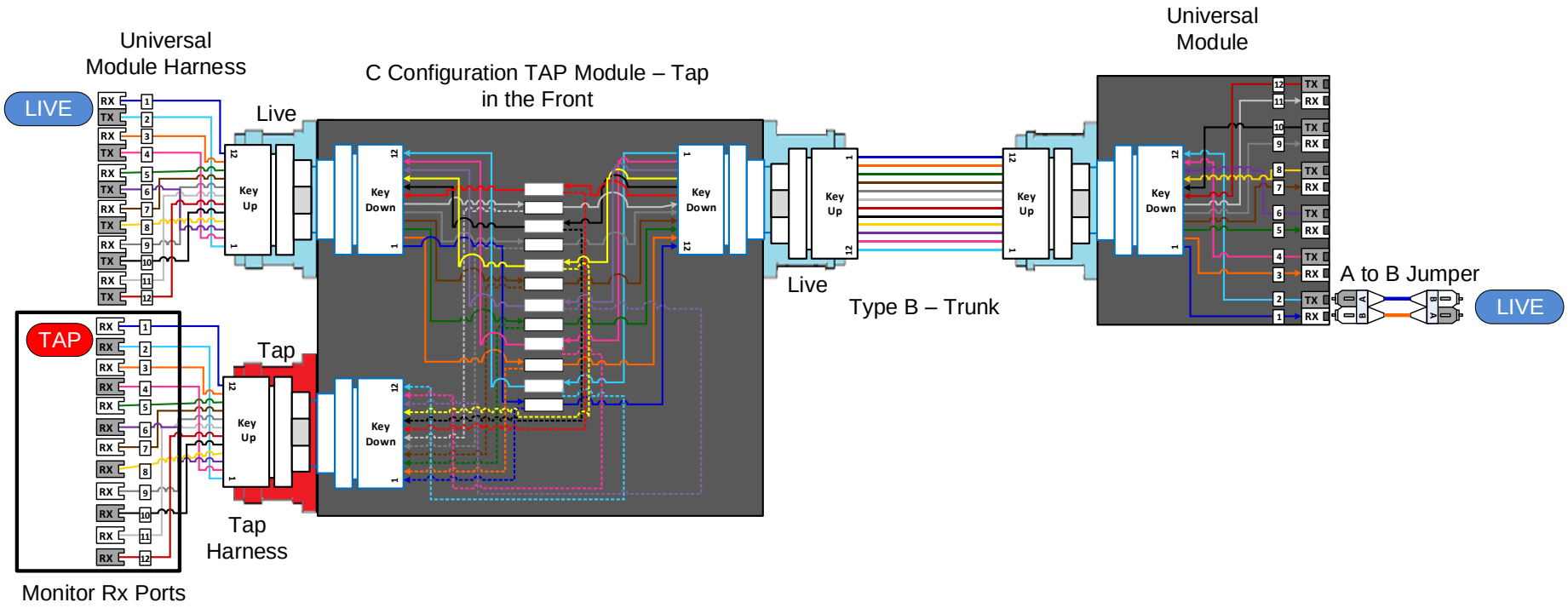
Polarity of Figure 10



Published: 4/1/2023

Polarity of Figure 11



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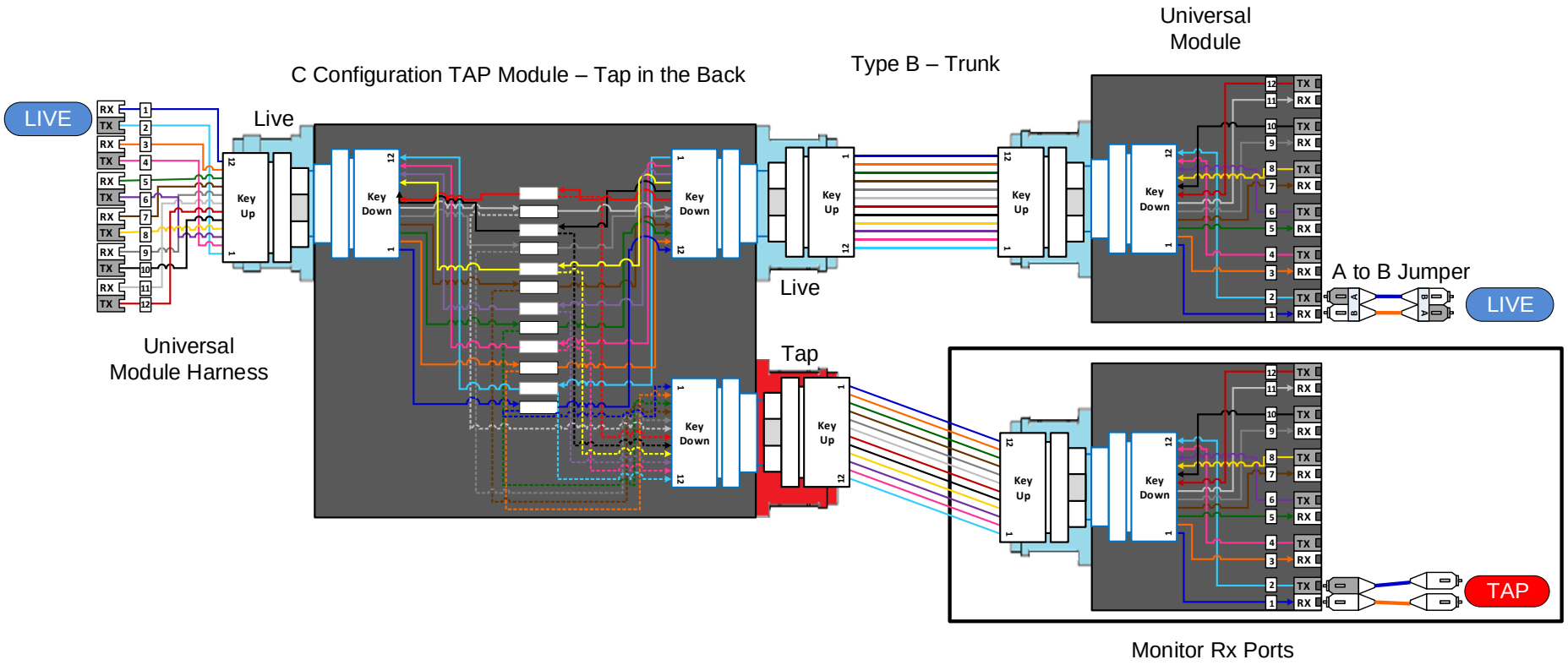
Polarity of Figure 12



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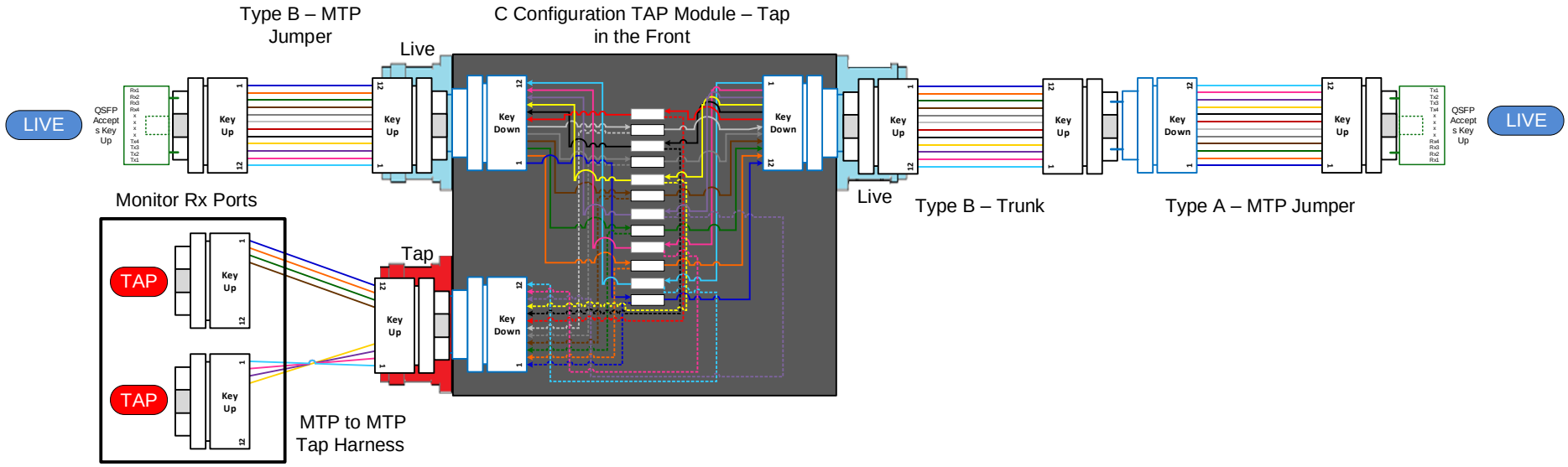
Polarity of Figure 13



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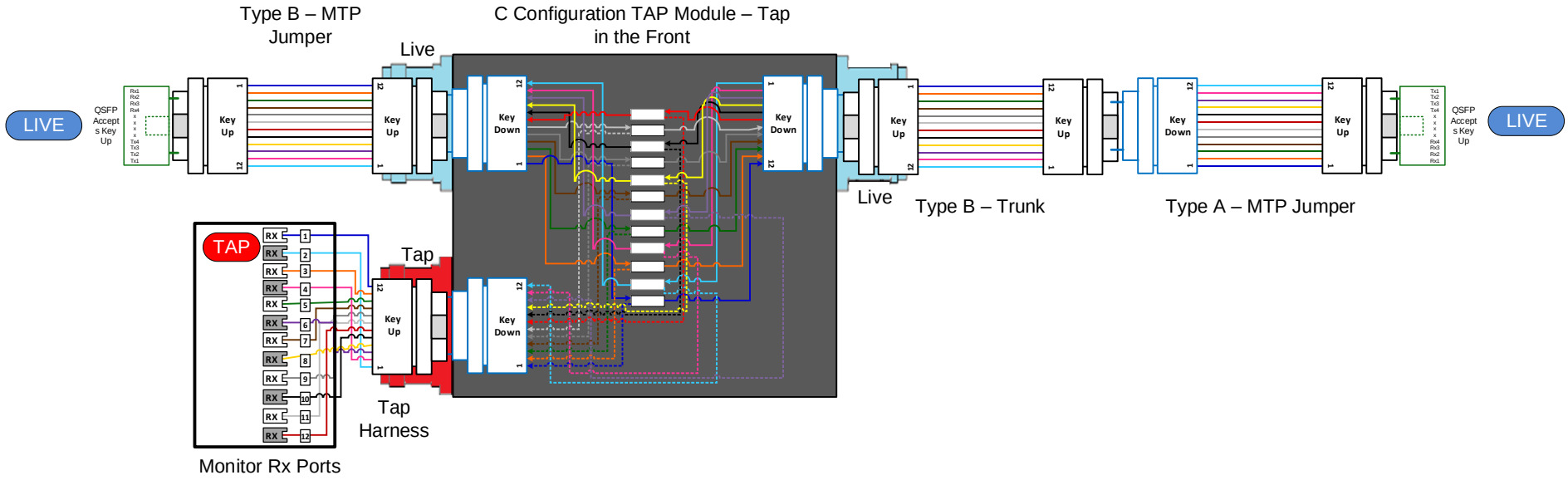
Polarity of Figure 14



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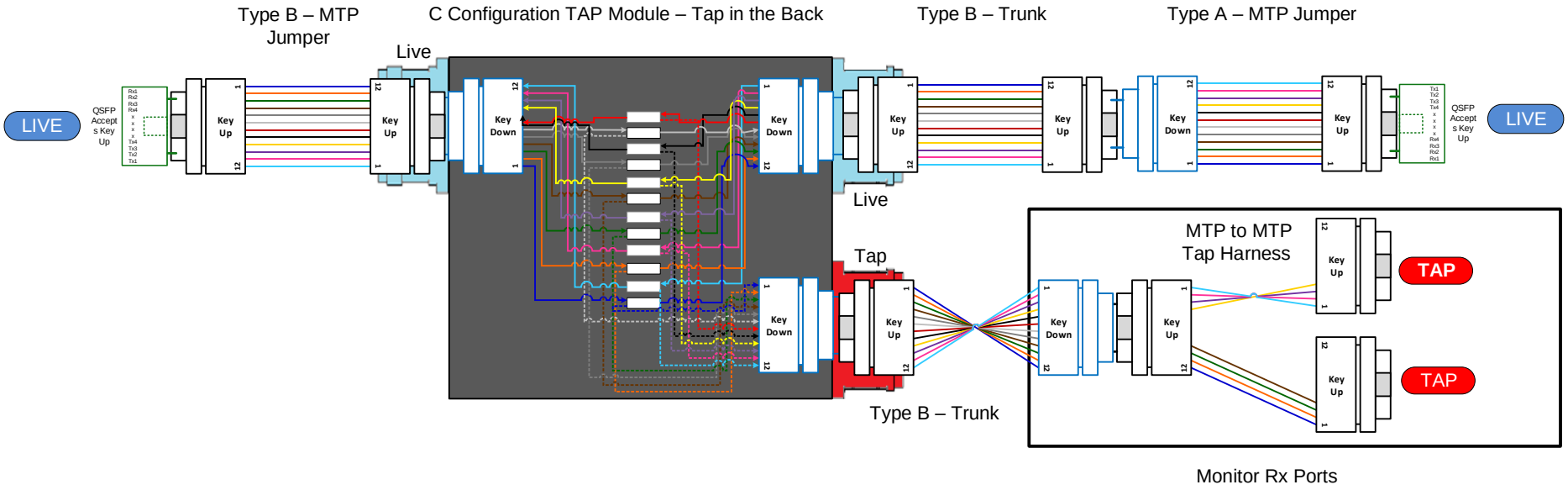
Polarity of Figure 15



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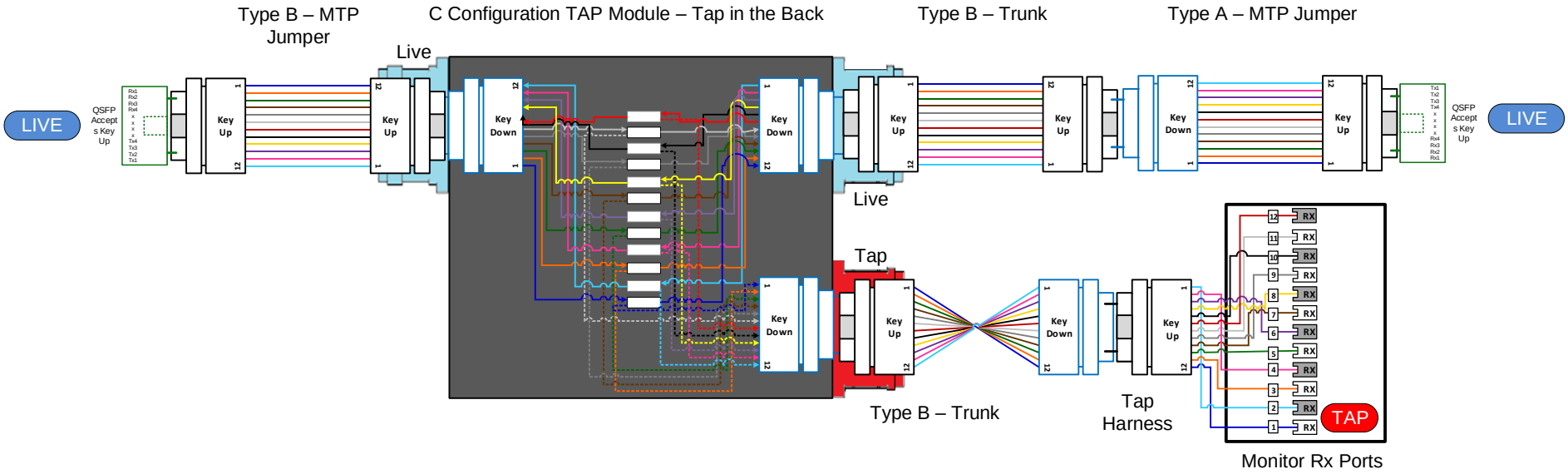
Polarity of Figure 16



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