CORNING

Network Monitoring with Corning Tap Modules

What is network monitoring?

Network monitoring is the use of a system that constantly monitors a network for performance, usage, failing components, and outside threats; and notifies in case of trouble.

What benefits are there to network monitoring your system?

While most people assume network monitoring is only for system security, there are also many other benefits as well. Network monitoring can help identify performance issues and bottlenecks, view network usage, and troubleshoot your system.

Why network monitoring?

Network monitoring is essential to ensuring the success of a company. Ideally, systems utilizing network monitoring can automatically detect and respond to threats and performance issues.

What is port tapping?

Port tapping is a method of extracting data out of a live data link to enable network monitoring.

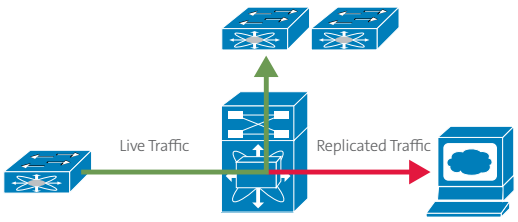
What does "tap" stand for?

In the telecommunications industry, "tap" is not an official acronym, but some vendors have created an acronym "test/traffic access port" for the "tap" term. The phrase "tapping" was originally used due to the surveillance nature of connecting into and monitoring communications.

What different data extraction methods are there?

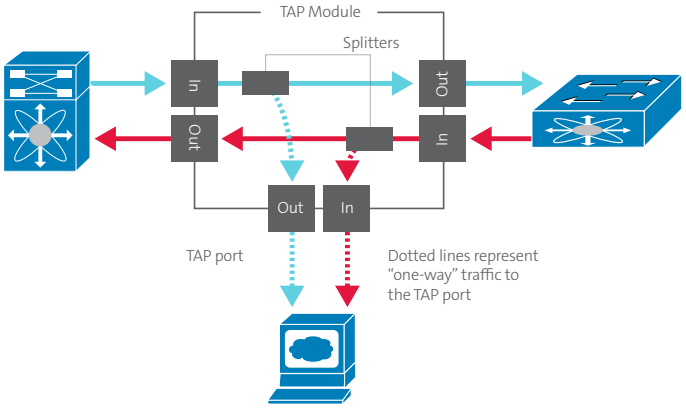
Data extraction can be done by two methods: SPAN port (active) and port tapping (passive).

SPAN Technology



Active data extraction, typically called switch port analysis (SPAN) or port mirroring, uses an electronic device (usually a switch) to replicate, or mirror, the link's data and send it to a monitoring device.

TAP Technology



Port tapping, which is completely passive, extracts the data via a device that can split signals from both directions between its intended recipients as well as a monitoring device.

While passive and active data extraction use different methods, in both instances, the monitoring device filters the data and sends it to various software tools for analysis and then on to application-layer software for use by network administrators.

What are the advantages of port tapping over SPAN ports (port mirroring)?

There are five primary advantages of port tapping has – whether via Corning EDGE™ and EDGE8® Solutions or other passive devices – versus SPAN ports:

- Port tapping is completely passive and does not require power, switch configurations, or switch programming. This allows you to avoid network issues such as bridging loops that could occur with SPAN ports during a network refresh.
- Port tapping splits the signal in real time without burdening your live network while SPAN ports replicating your signal can change the timing of frame/packet interactions and create an extra burden on the production network.
- Port tapping components are low cost and highly reliable. You can use passive components with multiple generations of optics while SPAN ports can increase in price with every data rate protocol upgrade.
- Port tapping does not require an oversubscription ratio as it is part of your structured cabling while SPAN ports require two ports (one for your live network and one for the monitoring device) for full duplex port monitoring.
- Port tapping passes on all traffic in the live link to the monitoring device. SPAN ports do not receive all network data, such as corrupt data or improperly sized packets, so it may not give the full picture of how your system is performing.

Corning uses passive port tapping through our extensive line of EDGE and EDGE8 tap modules.

Corning's EDGE™ and EDGE8® Tap Module Offerings

What is a tap module?

Corning's EDGE and EDGE8 tap modules are a module with fiber optic coupler (splitter) inside that divide the optical signal into two outputs, one for live link traffic and one for monitoring link. The live traffic continues through the system link while the monitored traffic is sent to an active monitoring device.

What is a coupler?

A coupler, also called a splitter, is a passive device that takes a single input of optical light and divides it into two or more outputs. (It can also take two or more inputs of light and combine them into a single output.)

What configurations are offered for Corning tap modules?

Corning offers three tap module configurations:

Configuration A is a Nonintegrated LC tap module with all LC ports at the front of the module. Configuration A tap modules need a separate housing from your structured cabling system.

Configuration B is an integrated MTP to LC tap module. Configuration B tap modules can be used for duplex and BiDi (EDGE system only) transmission and fit seamlessly into your structured cabling system.

Configuration C is an integrated MTP to MTP tap module. Configuration C tap modules can be used for duplex or parallel transmissions and fit seamlessly into your structured cabling solution.

All TAP module configurations are available in multiple split ratios, depending on the transmission protocol, fiber type, and maximum desired reach of the live and monitoring links.

What are split ratios?

A split ratio refers to the percentage of output power going to the live traffic receiver versus the output power going to the monitoring device. In example, if you have a 70/30 split ratio on your tap module, 70 percent of your power is going to the live receiver while 30 percent is going to the monitoring device.

What split ratios does Corning offer?

The most common split ratio configurations are 50/50 and 70/30, though Corning also offers 80/20 and 90/10 split ratios as well. These different split ratios allow for flexibility in cable lengths and data rates, as well as accounting for varying receiver sensitivity. Corning's Application Engineering Note 162, "Distance Capabilities for Corning's EDGE8®, EDGE™, and Plug & Play Preterminated Connectivity Solutions" provides maximum distances for different protocol data rates utilizing TAP modules.

What fiber types are available for Corning tap modules?

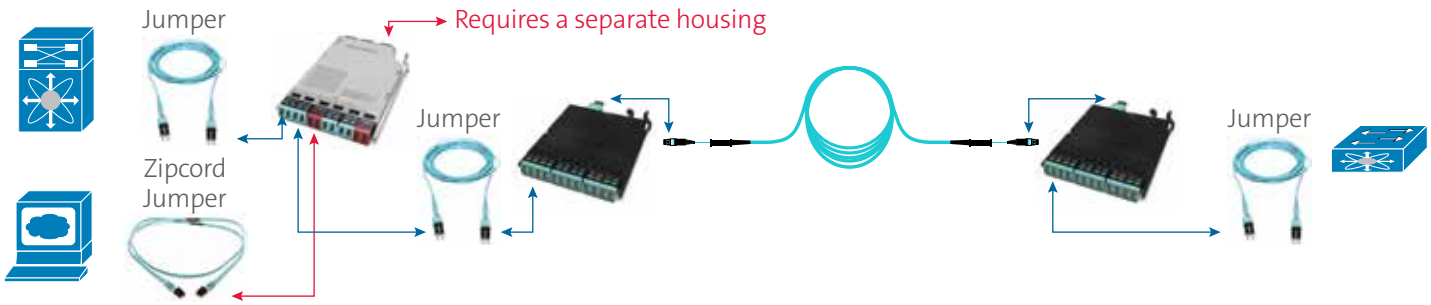
Corning EDGE™ and EDGE8® tap modules are offered in single-mode and OM4 fiber types.

What is the advantage of integrating port tapping into your structured cabling system?

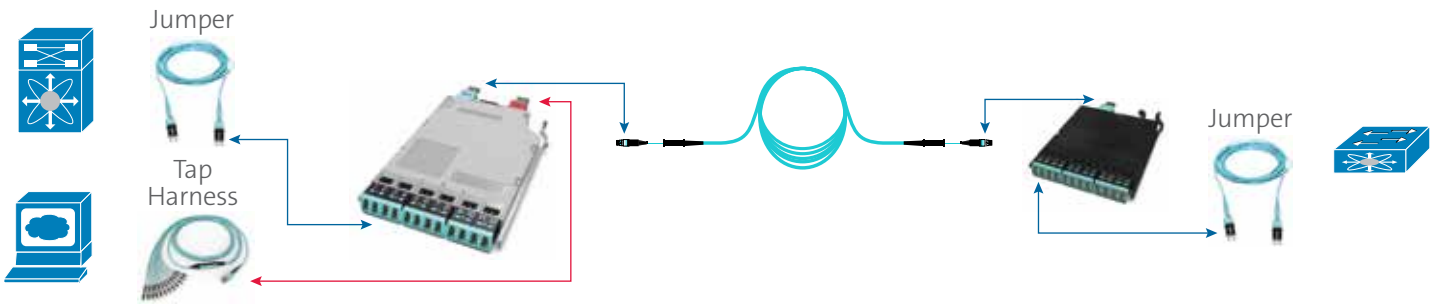
There are five main advantages of using an integrated port tapping solution with your structured cabling system are listed below.

Feature	Benefit	Value
Integrated With Rear TAP Ports	No extra rack space needed	Better utilization of rack space results in higher revenue generation per RU

Nonintegrated Solution



Integrated Solution

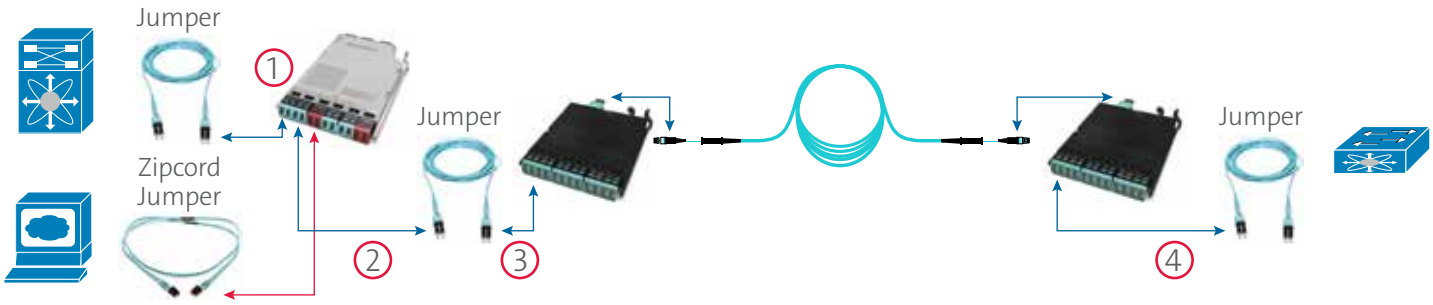


Feature	Benefit	Value
High-Performance Multimode Splitters	Reduced thin film splitter loss allows for extended reach	Reduced risk of working outside standard guidance of Fibre Channel and Ethernet

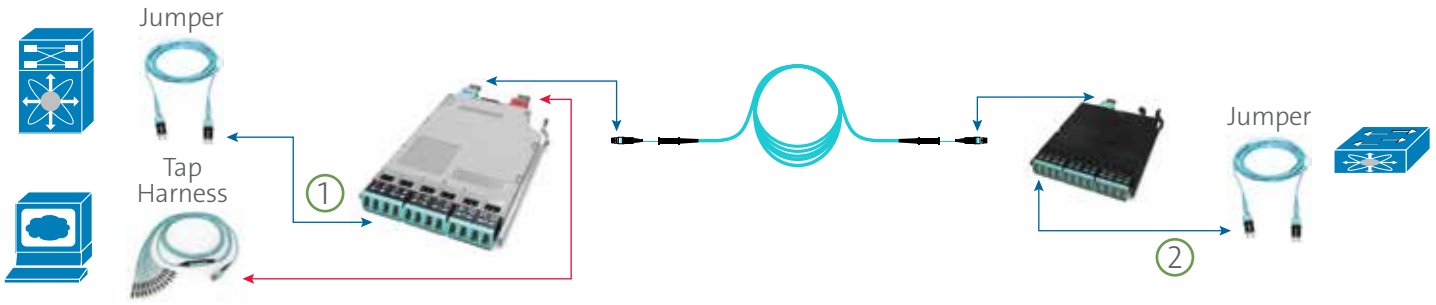
Data Rate	Link	Insertion Loss (coupler)	Fiber Type	Link Distance
16G FC	70% LIVE	2.2 dB (FBT)	OM4/OM3	-/- m
16G FC	70% LIVE	1.8 dB (Corning- Thin Film)	OM4/OM3	70/50 m

Feature	Benefit	Value
Integrated TAP Module	Removes two LC connections from the LIVE network link	Removes the additional LC jumper (cost savings) and reduces attenuation of links (results in extended distances)

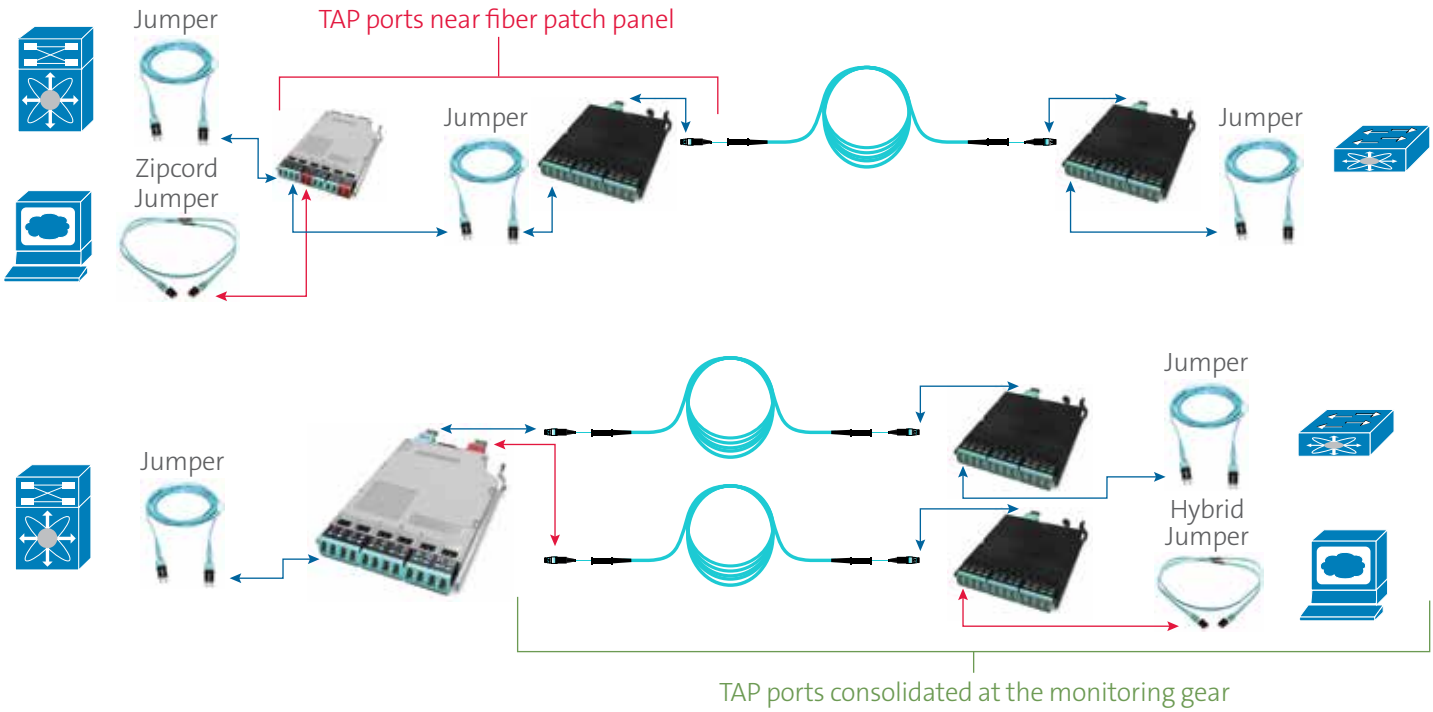
Nonintegrated Solution



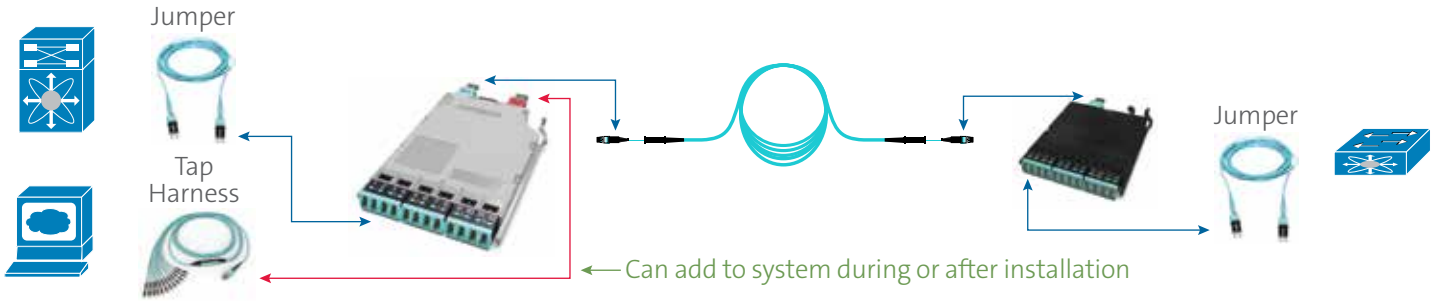
Integrated Solution



Feature	Benefit	Value
MTP®-Based Tap Port	Allows separation of LIVE and TAP ports into different cabinet locations if desired	Cost savings from consolidation of active monitoring gear (utilization); reduce risk of patching errors



Feature	Benefit	Value
Integrated TAP Module	Ability to add and remove tapped ports without disrupting the LIVE network	Reduces risk by eliminating downtime associated with temporarily breaking a link in order to “install” a tap



Does using Corning tap modules change the polarity of my system?

No; both EDGE™ and EDGE8® tap modules allow for seamless integration into universal polarity managed structured cabling systems. They eliminate the frustration of needing to flip connector pairs to correct polarity when plugging into equipment.

Does using Corning tap modules add additional loss to my system?

The inclusion of the splitter inside the tap modules inserts additional loss to the link, which in turn decreases the loss margin and channel distance. Corning Optical tap modules use a thin-film splitter technology for multimode applications offering better loss performance values. Integrating the optical splitter in the module component of the cabling infrastructure will further reduce loss compared to a nonintegrated solution. Corning’s Application Engineering Note 162, “Distance Capabilities for Corning’s EDGE8®, EDGE™, and Plug & Play™ Preterminated Connectivity Solutions” provides maximum distances for different protocol data rates utilizing TAP modules.

What data rates can you run with Corning tap modules?

There are multiple dares for both Ethernet (i.e.: 10GBase-SR, 40GBase-BiDI and 100GBase-SR4) and Fibre Channel (i.e.: 1600-M5F-SN-I and 12800-M5F-SN-I) that are compatible with Corning’s tap modules. Corning’s Application Engineering Note 162, “Distance Capabilities for Corning’s EDGE8, EDGE, and Plug & Play Preterminated Connectivity Solutions” provides maximum distances for different protocol data rates utilizing tap modules.

What are the differences between an EDGE tap module and an EDGE8 tap module?

The EDGE tap module and EDGE8 tap module perform the same data extraction on your system, but some come with different features.

One of the biggest differences between these product lines is the pinning of the Configuration B and Configuration C tap modules. The EDGE product line uses non-pinned MTP trunks, so all MTPs (LIVE and TAP) on EDGE tap modules are pinned. However, the EDGE8 product line uses pinned MTP trunks so all rear-of-module MTPs (LIVE AND TAP) are non-pinned to allow proper mating with EDGE8 trunks, while front-of-module MTPs (LIVE and TAP) are pinned. The pinned front MTPs in the EDGE8 tap module allows for the continued use of standard non-pinned to non-pinned MTP jumpers for ease of system installation.

Another difference between EDGE and EDGE8 tap modules is their footprint. EDGE tap modules are made specifically for EDGE housings, while EDGE8 tap modules are made specifically for EDGE8 housings.

Where can I find Corning’s tap module part numbers?

Tap modules are part of Corning’s preterminated EDGE and EDGE8 product lines. Part numbers are readily available on our EDGE and EDGE8 family spec sheets as well as on our Corning bill-of-materials (BOM) tool.

EDGE™ Family Spec Sheet

EDGE8® Family Spec Sheet

Bill-of-Materials Tool

What is the port density of EDGE™ and EDGE8® tap modules?

The port density will be based on the combination of the tap module footprint, configuration, and housing chosen for your network. Below is the tap module port density for the EDGE™ and EDGE8® product lines based on housing size.

Maximum EDGE TAP Port Density	Configuration A (2 Duplex Links)	Configuration A (BiDi) (1 Duplex Link)	Configuration B (6 Duplex Links)	Configuration B (BiDi) (6 Duplex Links)	Configuration C (Front TAP) (1 MTP® Link)	Configuration C (Rear TAP) (1 MTP Link)
EDGE-01U	16	8	48	48	8	8
EDGE-01U-SP	24	12	72	72	12	12
EDGE-02U	48	24	144	144	24	24
EDGE-04U	96	48	288	288	48	48

Maximum EDGE8 TAP Port Density	Configuration A (1 Duplex Link)	Configuration A (BiDi) (1 Duplex Link)	Configuration B (4 Duplex Links)	Configuration C (Front TAP) (1 MTP Link)	Configuration C (Rear TAP) (1 MTP Link)
EDGE8-01U	12	12	48	12	12
EDGE8-01U-SP	18	18	72	18	18
EDGE8-02U	36	36	144	36	36
EDGE8-04U	72	72	288	72	72

System Design:

How do I factor the monitor link distance into determining my total channel link length/optical budget for the link?

There are three separate paths through a tap module that need to be accounted for in your channel link loss budget.

- The live network link connecting your network end equipment
- The “near” tap link, which is the path from the electronics closest to the tap module to the monitoring electronics
- The “far” tap link, which is the path from the electronics farthest from the tap module to the monitoring electronics.

Each path has its own loss budget and length and therefore, its own distance limitations.

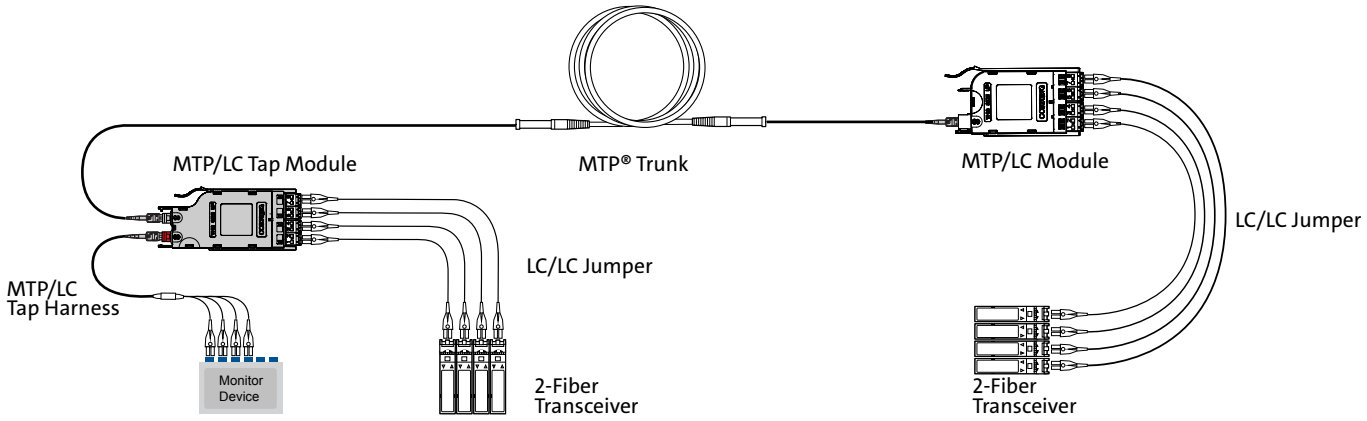
What is the maximum distance from the TAP port to the monitoring device?

The supportable monitor link lengths are addressed on a case-by-case basis for the different protocol data rates due to the limitation of the monitor link length for unequal split taps and varying monitor equipment receiver sensitivity. For multimode Fibre Channel applications, the maximum distance of the monitor link shall not exceed 20 meters direct monitor equipment interconnection for all multimode applications.

What are my link design options with the EDGE and EDGE8 tap modules?

Consistent with the flexibility that EDGE and EDGE8 Solutions offers, the EDGE/EDGE8 tap module offers a variety of design options, based on your network’s unique needs. A few examples follow.

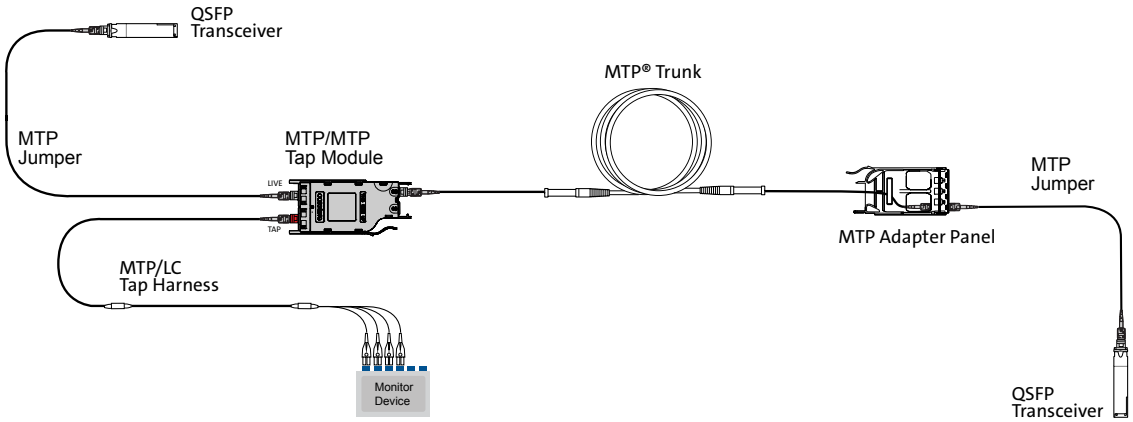
Integrated Configuration B EDGE™ Tap Module Design



In the above scenario, the configuration B EDGE tap module is deployed as an integrated part of the structured cabling system to support serial duplex transmission. Within the system, the tap module functions like a normal Universal-wired module, while also sending the split signal to the MTP TAP port. This deployment eliminates the use of extra rack space and maximizes the channel reach by reducing the number of loss components in the system.

The near-end network 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.

Integrated Configuration C EDGE8® Tap Module Design



When migrating from duplex transmission to higher data rate via parallel transmission such as 40G, MTP equipment connectivity is required. The above scenario depicts the use of an EDGE8 Configuration C tap module for a parallel transmission system. 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 can receive a parallel input, a MTP/MTP tap harness is used to interconnect to the monitor device.

These are only two possible scenarios in which you could utilize integrated tap modules in your structured cabling design. For more deployment options, please refer to AEN164, "Optical Tap Module Connectivity Solutions for Network Monitoring."

Why do I need to use a tap module harness for the tap port of the tap module?

Port monitoring electronics use simplex LC connectivity because all monitoring ports are receive ports instead of the standard transmit/receive duplex ports used for typical network electronics. Standard EDGE and EDGE8 harnesses and jumpers use our exclusive uniboot duplex LC design that allows for easy polarity management without having to separate the LCs. However, this does not allow for separation of the two fibers to plug into simplex ports. Therefore, Corning has designed a Tap module harness which uses a simplex LC design to be used with monitoring electronics. You would continue to use a standard EDGE/EDGE8 trunk or harness for the live traffic MTP connector port on the tap module.

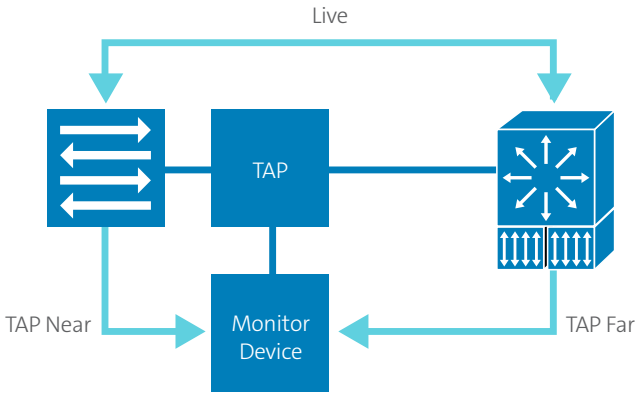
Testing and Troubleshooting

How do I test an EDGE™/EDGE8® tap module?

Optical splitter devices are often bidirectional (they can manage transmit/receive signals from both directions), but each fiber within the device – whether fused-together cores or reflective devices in/near the core – is optimized to manage this traffic in one direction, typically the transmit direction. When you send light down the optimized transmission path and the light splits to the expected paths, the expected loss results. When you send the light upstream against its optimized downstream path, an unacceptably high loss results.

You are also sending light to two different types of electronics (transceivers and monitoring devices).

- You must test directionally – sending light down the tap module's even-numbered ports, whose fibers are optimized to carry transmitting traffic, and measuring light from the tap module's odd-numbered ports, whose fibers are optimized to carry receiving traffic
- There are three simultaneous aspects of the link to test – the two ends of the live link as well as the monitor link end. If the tap module is in another location, there will be three discrete locations to test.
- You will need to determine your allowable loss budgets for the total link, which includes
  - The live link
  - The monitoring link from the closest transceiver (tap near)
  - The monitoring link from the farthest transceiver (tap far)



Corning has Standard Recommended Procedures (SRPs) for testing EDGE and EDGE8 tap module configuration available on the Corning website and listed below:

SRP 003-127
"EDGE™ LC-LC Tap Module Installation"

SRP 003-126-AEN
"EDGE™ LC-MTP® Tap Module Installation and Testing"

SRP 003-128
"EDGE™ MTP® TAP Module Installation and Testing"

SRP 003-138-AEN
"EDGE8® LC-LC Tap Module Installation"

SRP 003-137-AEN
"EDGE8® LC-MTP® Tap Module Installation and Testing"

SRP 003-139-AEN
"EDGE8® MTP® Tap Module Installation and Testing"

CORNING

Corning Optical Communications LLC • PO Box 489 • Hickory, NC 28603-0489 USA
800-743-2675 • FAX: 828-325-5060 • International: +1-828-901-5000 • www.corning.com/opcomm