Panduit® Fiber Tap Modules

Purpose

Networks comprised of switches, servers, and storage elements must work in unison to transport important information in the form of data traffic. Networks need to be properly designed and maintained to prevent transport delays and failures especially when burdened with very large amounts of data traffic. The need for real-time network visibility of data traffic becomes vital for effective performance monitoring, robust security and functional business success.

FCT-7ZC

The method used to obtain real-time network visibility must not disturb a network's operations while providing precise, highly detailed dimensional data statistics. The deployment of optical Traffic Analysis Points (TAPs) within mission critical networks is an effective technique for obtaining real-time network visibility.

What is a Traffic Analysis Point (TAP)?

A passive optical Traffic Analysis Point (TAP) is an access point installed in networks that provides real-time monitoring of ports. It is minimally invasive and does not disrupt the network signal.

TAPs are positioned in the network link between two network devices. The TAP provides two distinct paths of the same network signal by splitting the optical signal that is carrying the network link; the network path (live port) and the monitoring path (TAP port). Depending on the ratio of light diverted, TAPs introduce additional loss into the network. With these additional losses, the overall fiber budget needs to be considered and carefully assessed.

Solution

Panduit has developed a family of TAP cassettes with a split ratio of 70/30 (70% of the light is diverted through to the live port while 30% of the light is diverted to the TAP port). This TAP cassette offering consists of the following four types:

- FCT-7ZA: Front live 6-port duplex LC, front TAP 6-port duplex LC, and rear live 6-port duplex LC
- FCT-7ZB: Front live 6-port duplex LC, front TAP 6-port duplex LC, and rear live 12-fiber MTP
- FCT-7ZC: Front live 4-port duplex LC, front TAP 4-port duplex LC, and front live 4-port duplex LC
- FCT-7ZD: Front live 12-port duplex LC, two rear TAP 12-fiber MTPs, and two rear live 12-fiber MTPs

The TAPs consist of different connector combinations for the live and TAP ports to account for different cabling topologies and to enable ease of deployment within those different cabling topologies.

The 70/30 TAPs introduce additional insertion loss of 1.8dB to the live path and 5.8dB to the TAP path. These additional losses drastically reduce the total channel lengths for all applications and careful consideration must be taken when designing channels to be tapped. Reach charts and designs provided on the following pages serve only as guidance. Before committing to a design, customers should ensure that transceiver sensitivity and the network losses are compatible with the specific application, and that bit errors do not exceed standards requirements.

FCT-7ZA

The FCT-7ZA TAP solution contains 6 LC duplex live ports on the rear of the cassette along with 6 duplex LC live ports and 6 duplex LC TAP ports on the front of the cassette.

A typical fiber deployment utilizing the FCT-7ZA TAP cassette is shown below in Figure 1.

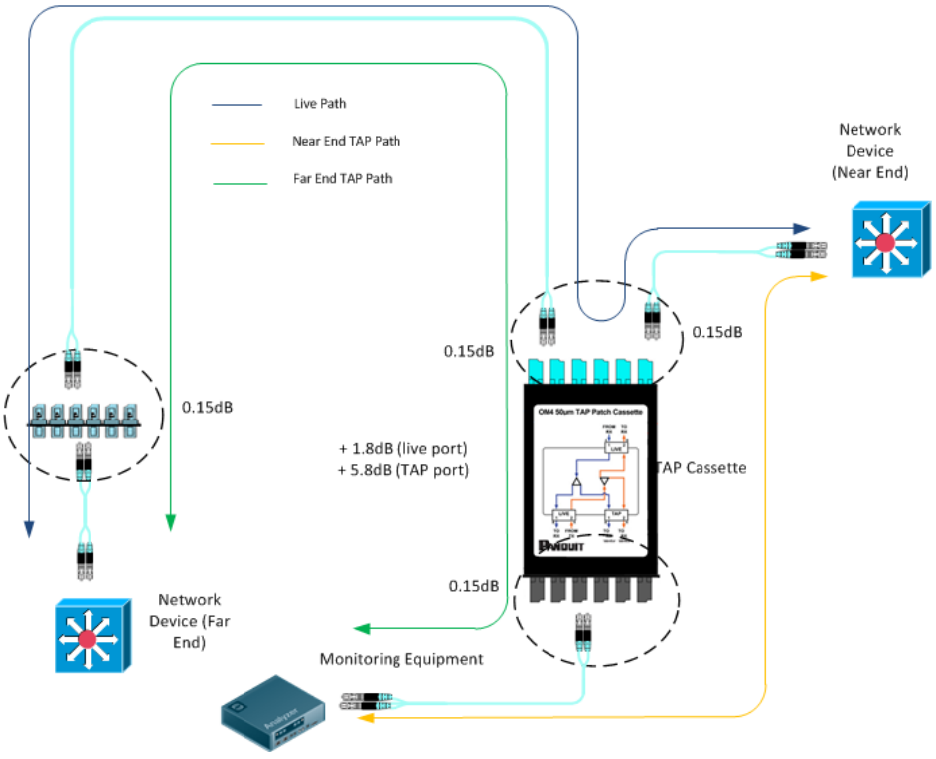
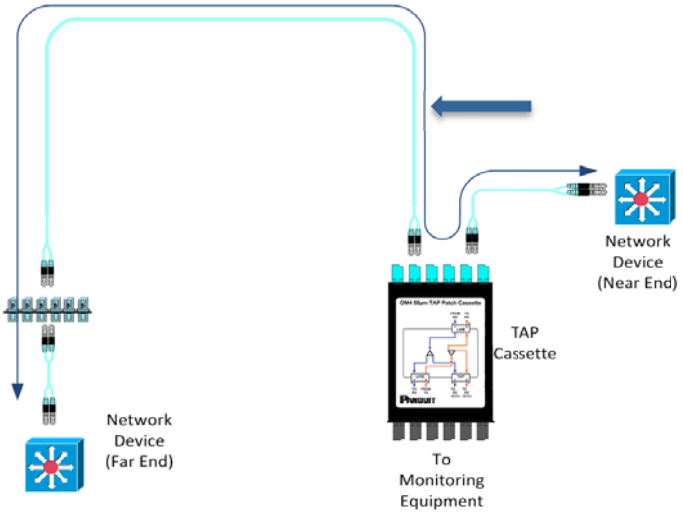


Figure 1. Typical fiber topology utilizing the FCT-7ZA TAP cassette

The colored paths in the diagram show the three paths of which the channel insertion loss needs to be calculated to ensure the designated transmission signal will effectively be transmitted.

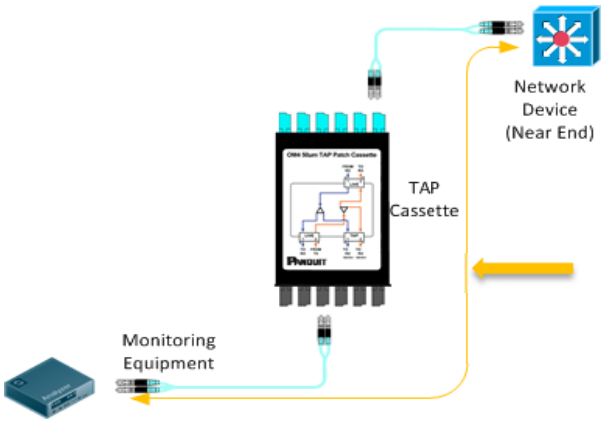
Live Path

*The live path **(blue line shown in the Figure 1)** runs from Network Device to Network Device and flows through the entire channel utilizing the live ports on the TAP.*



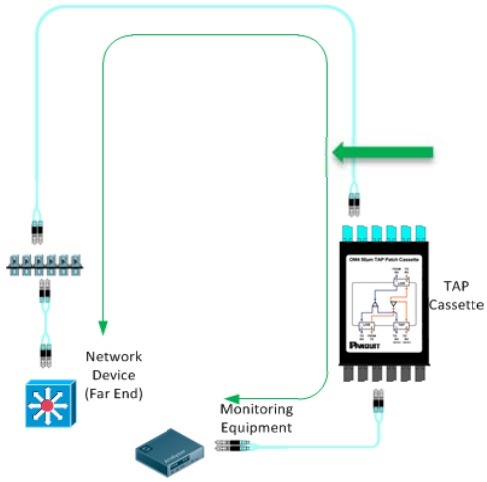
Near End TAP Path

*The near end TAP path **(orange line shown in Figure 1)** runs from the Network Device nearest to the TAP through the TAP (input is through a live port and output is through a TAP port) out to the monitoring equipment.*



Far End TAP Path

*The far end TAP path (**green line shown in Figure 1)** runs from the Network Device farthest from the TAP through the TAP (input is through a live port and output is through a TAP port) out to the monitoring equipment.*



The corresponding connector insertion loss is calculated for each path. The insertion loss is calculated by following the signal flow of each path and adding up the connector losses. These calculated insertion loss values are then used to calculate the maximum length of the channel based upon the technology being transmitted through the channel. The maximum lengths for the fiber topology in Figure 1 utilizing the FCT-7ZA TAP cassette are shown in the tables below.

Live Path Connector IL calculation
0.15dB + 1.80dB + 0.15dB + 0.15dB = 2.25dB

TAP Path (Near End) Connector IL calculation
0.15dB + 5.8dB + 0.15dB = 6.10dB

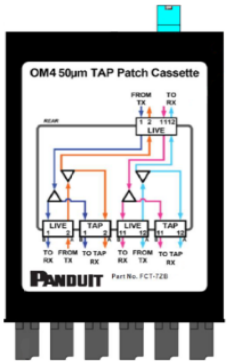
TAP Port (Far End) Connector IL calculation
0.15dB + 0.15dB + 5.8dB + 0.15dB = 6.25dB

Signal Path	Connector Insertion Loss	Technology	Maximum Reach (meters)		
			OM3	OM4	Sig Core
Live Path	2.25dB	10GBASE-SR	300	400	500
		4G FC	370	390	480
		8G FC	140	170	210
TAP Path (Near End)	6.10dB	10GBASE-SR	170	225	300
		4G FC	75	85	100
		8G FC	18	25	50
TAP Path (Far End)	6.25dB	10GBASE-SR	165	250	295
		4G FC	70	80	90
		8G FC	15	20	40

Note: These values are calculated with "extra" margin (>3dB) required for the Analyzer receiver

FCT-7ZB

The FCT-7ZB TAP solution consists of one live MPO port on the rear of the cassette and six duplex live ports and six duplex TAP ports on the front of the cassette.



A typical fiber deployment utilizing the FCT-7ZB TAP cassette is shown below in Figure 2.

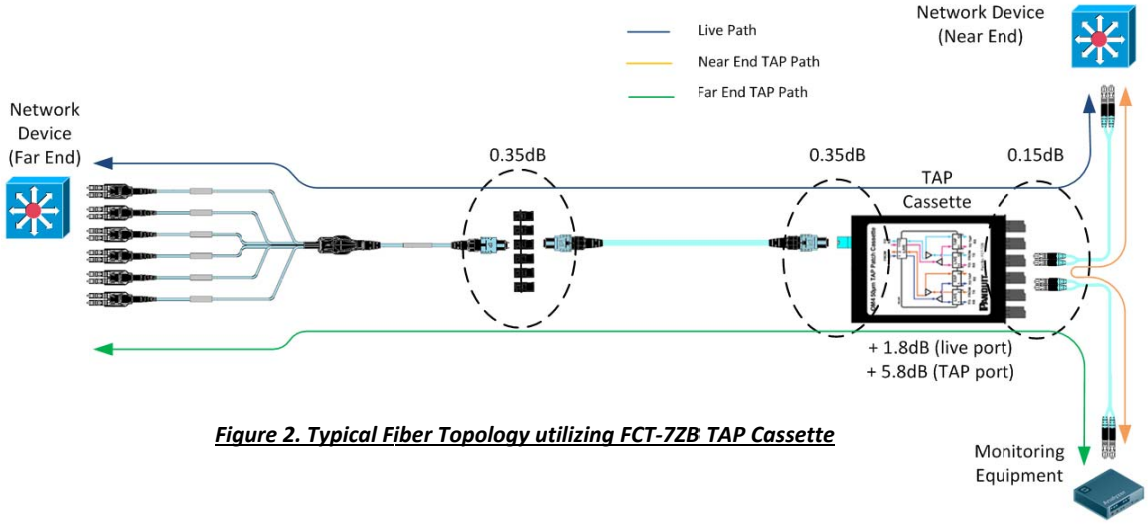
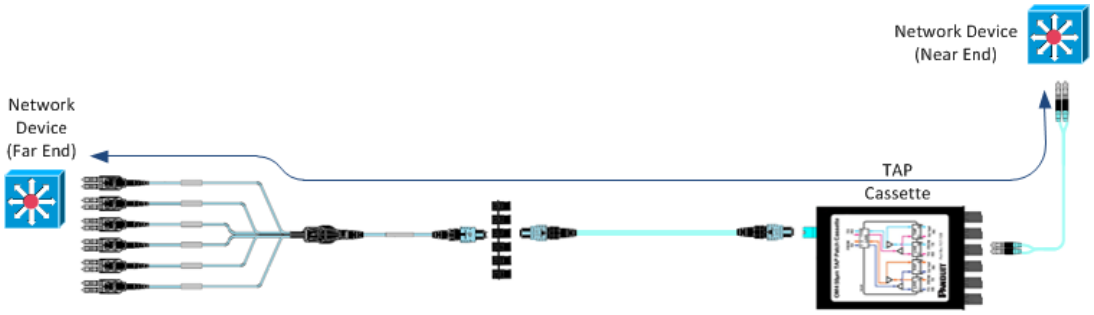
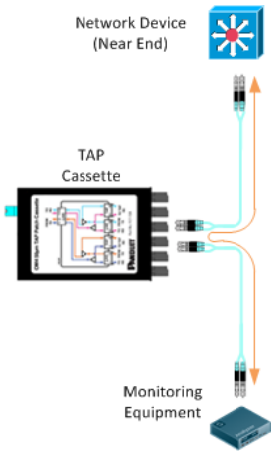


Figure 2. Typical Fiber Topology utilizing FCT-7ZB TAP Cassette

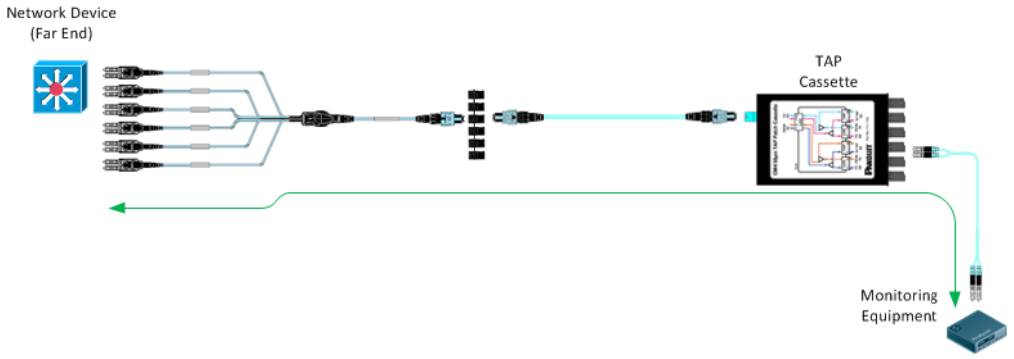
Live Path



Near End TAP Path



Far End TAP Path



The corresponding connector insertion loss is calculated for each path. The insertion loss is calculated by following the signal flow of each path and adding up the connector losses. These calculated insertion loss values are then used to calculate the maximum length of the channel based upon the technology being transmitted through the channel. The maximum lengths for the fiber topology in Figure 1 utilizing the FCT-7ZB TAP cassette are shown in the tables below.

Live Path:
0.15dB + 1.80dB + 0.35dB + 0.35dB = 2.65dB

TAP Path (Near End)
0.15dB + 5.80dB + 0.15dB = 6.10dB

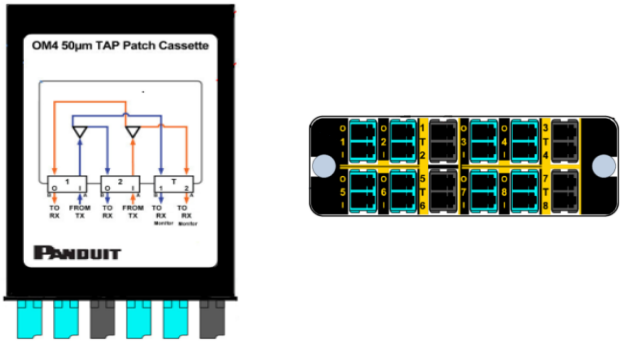
TAP Path (Far End)
0.15dB + 5.80dB + 0.35dB + 0.35dB = 6.65dB

Signal Path	Connector Insertion Loss	Technology	Maximum Reach (meters)		
			OM3	OM4	Sig Core
Live Path	2.65dB	10GBASE-SR	260	355	435
		4G FC	285	295	325
		8G FC	105	110	150
TAP Path (Near End)	6.10dB	10GBASE-SR	170	255	300
		4G FC	75	85	100
		8G FC	18	25	50
TAP Path (Far End)	6.65dB	10GBASE-SR	65	140	165
		4G FC	0	5	15
		8G FC	0	5	10

Note: These values are calculated with "extra" margin (>3dB) required for the Analyzer receiver

FCT-7ZC

The FCT-7ZC TAP solution consists of eight duplex live ports and four duplex TAP ports on the front of the cassette .



A typical fiber deployment utilizing the FCT-7ZC TAP cassette is shown below in Figure 3.

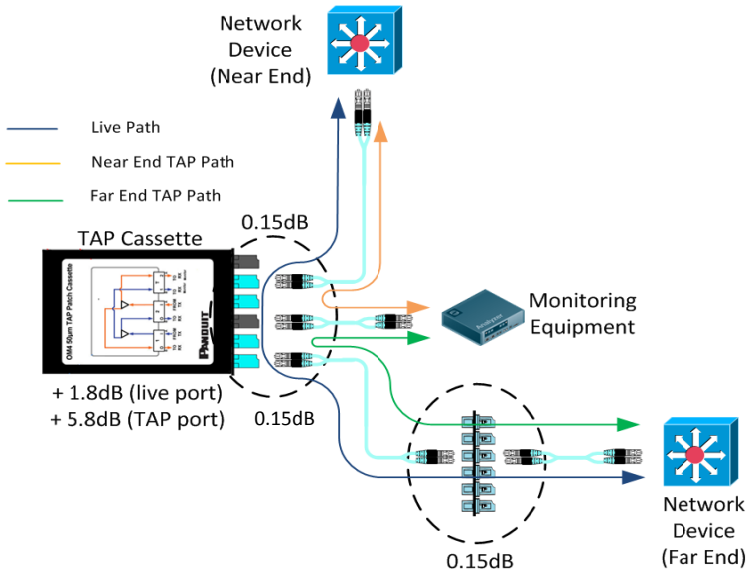
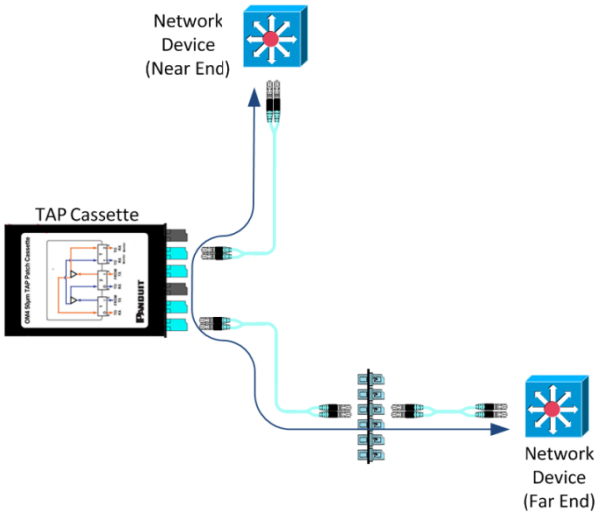
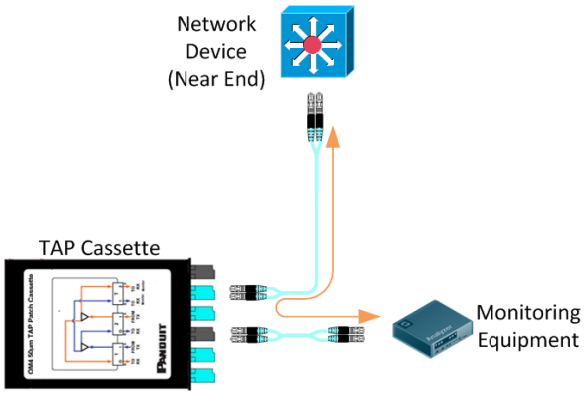


Figure 3. Typical fiber topology utilizing the FCZ-7ZC TAP

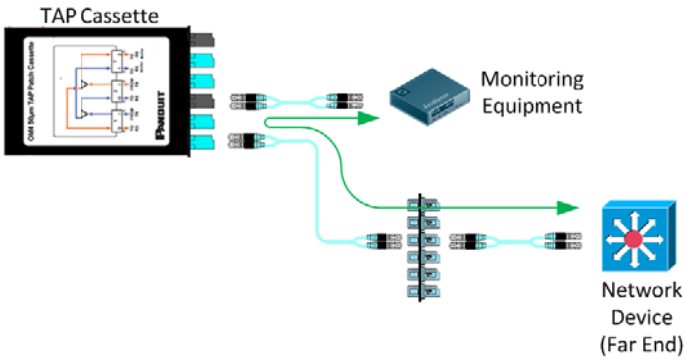
Live Path



Near End TAP Path



Far End TAP Path



The corresponding connector insertion loss is calculated for each path. The insertion loss is calculated by following the signal flow of each path and adding up the connector losses. These calculated insertion loss values are then used to calculate the maximum length of the channel based upon the technology being transmitted through the channel. The maximum lengths for the fiber topology in Figure 1 utilizing the FCT-7ZC TAP cassette are shown in the tables below.

Live Path:
0.15dB + 0.15dB + 1.80dB + 0.15dB = 2.25dB

TAP Path (Near End)
0.15dB + 5.80dB + 0.15dB = 6.10dB

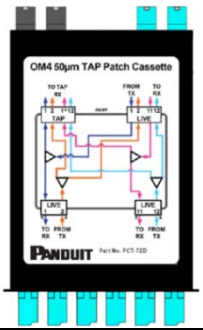
TAP Path (Far End)
0.15dB + 0.15dB + 5.80dB + 0.15dB = 6.25dB

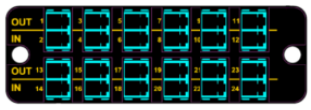
Signal Path	Connector Insertion Loss	Technology	Maximum Reach (meters)		
			OM3	OM4	Sig Core
Live Path	2.25dB	10GBASE-SR	300	400	500
		4G FC	370	390	480
		8G FC	140	170	210
TAP Path (Near End)	6.10dB	10GBASE-SR	170	225	300
		4G FC	75	85	100
		8G FC	18	25	50
TAP Path (Far End)	6.25dB	10GBASE-SR	165	250	295
		4G FC	70	80	90
		8G FC	15	20	40

Note: These values are calculated with "extra" margin (>3dB) required for the Analyzer receiver

FCT-7ZD

The FCT-7ZD TAP solution consists of two MPO live ports and two MPO TAP ports on the rear of the cassette and twelve duplex live ports on the front of the cassette.





A typical fiber deployment utilizing the FCT-7ZD TAP cassette is shown below in Figure 4.

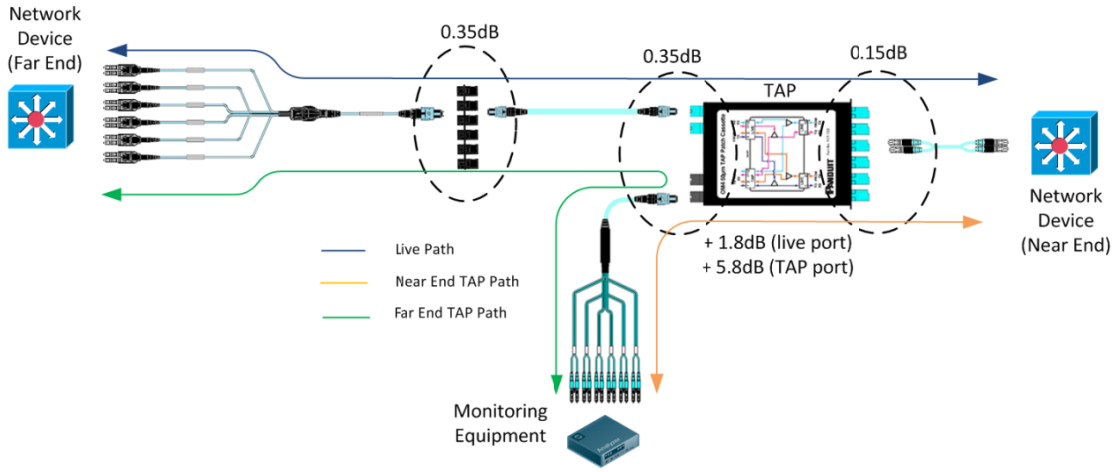
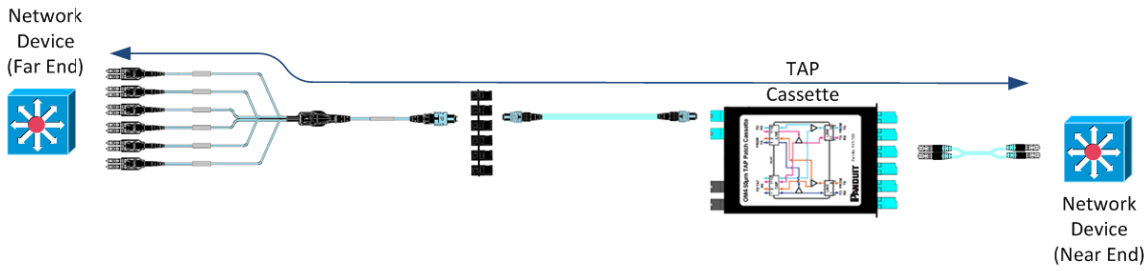
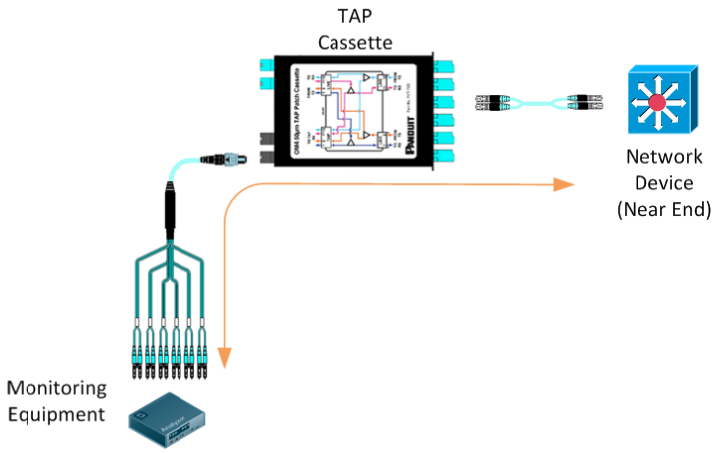


Figure 4. Typical Fiber topology utilizing the FCT-7ZD TAP Cassette

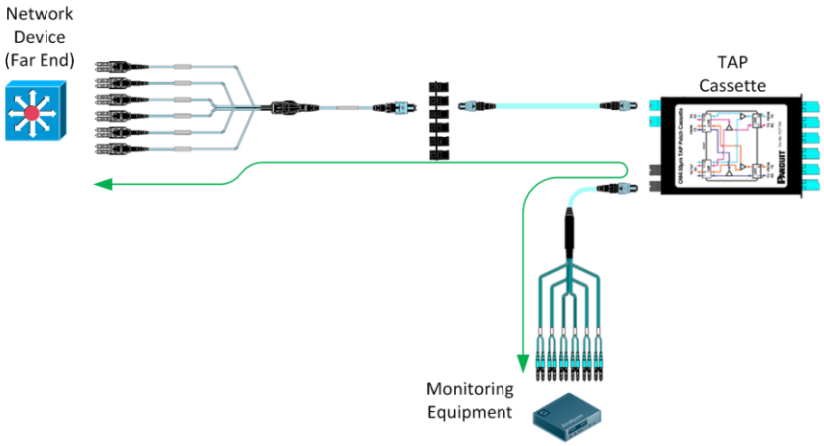
Live Path



Near End TAP Path



Far End TAP Path



The corresponding connector insertion loss is calculated for each path. The insertion loss is calculated by following the signal flow of each path and adding up the connector losses. These calculated insertion loss values are then used to calculate the maximum length of the channel based upon the technology being transmitted through the channel. The maximum lengths for the fiber topology in Figure 1 utilizing the FCT-7ZD TAP cassette are shown in the tables below.

Live Path:
0.15dB + 1.80dB + 0.35dB + 0.35dB = 2.65dB

TAP Path (Near End)
0.15dB + 5.80dB + 0.35dB = 6.30dB

TAP Path (Far End)
0.35dB +0.35dB + 5.80dB + 0.35dB = 6.85dB

Signal Path	Connector Insertion Loss	Technology	Maximum Reach (meters)		
			OM3	OM4	Sig Core
Live Path	2.65dB	10GBASE-SR	260	355	435
		4G FC	285	295	325
		8G FC	105	110	150
TAP Path (Near End)	6.30dB	10GBASE-SR	165	250	295
		4G FC	70	80	90
		8G FC	15	20	40
TAP Path (Far End)	6.85dB	10GBASE-SR	35	110	135
		4G FC	N/A	5	10
		8G FC	N/A	5	10

Note: These values are calculated with "extra" margin (>3dB) required for the Analyzer receiver

Summary

The need for real-time network visibility of data traffic becomes vital for effective performance monitoring, robust security and functional business success. Panduit offers four types of TAPs that can supply this performance monitoring port along with providing flexibility for the TAP to fit into various fiber topologies.

Appendix A

Installation and Cleaning

The TAP cassettes are installed from the front of the enclosure or fiber adapter panel. The TAP cassette is compatible with Panduit FRME, FCEU, and FMT series enclosure systems or the CFPPBL series fiber adapter panels.

For examples of how the TAP cassette will install into the enclosure systems or fiber adapter panels, see the following:

FS006 Opticom® QuickNet™ Rack Mount Fiber Cassette Enclosures Install Instructions for FCE1U, FCE1UA, FCE2U

FS012 Opticam® QuickNet™ Rack Mount Fiber Cassette Enclosures install instructions for FCE4U

CM185A Fiber Adapter Patch Panel 1 & 2 RU (CFAPPBL1, CFAPPBL1A, CFAPPBL2 or CFAPPBL2A) for use with FMT1, FMT1A, FMT2 or FMT2A type fiber trays.

Cleaning of the cassettes follows basic fiber optic connector cleaning that can be found in Panduit documents:

PN433A MTP Fiber Cleaning Tools

PN446 Visual Inspection and Cleaning of Multimode and Singlemode Structured Cabling System Interconnect Components.

Assistance with troubleshooting the links can be found in Panduit document:

TR117 Troubleshooting a Permanent Link

TAP Operation

For information on how a TAP operates refer to Panduit Technology Brief titled:

Optical Traffic Analysis Points (TAPs) and Their Effect on Fiber Link Budgets.

Appendix B

Testing the TAP Links

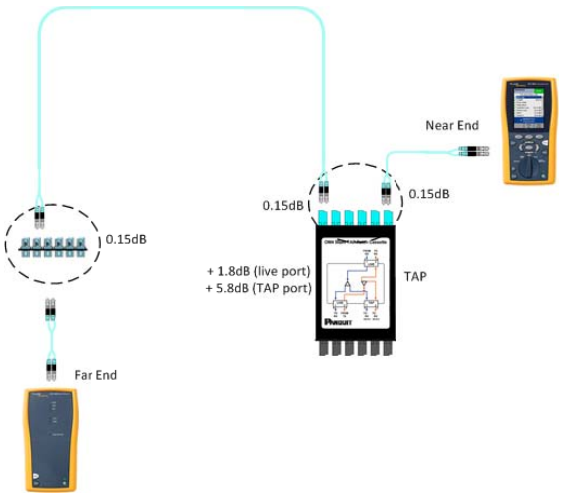
There are three separate permanent links associated with each TAP configuration and each of these need to be tested utilizing PMLS (power meter light source) testing in accordance with TIA-526-14-B Annex 'A'. The three permanent links that need to be tested are:

1. Live Link: Near End to Far End
2. Near End Tap Link: Near End to TAP
3. Far End Tap Link: Far End to TAP

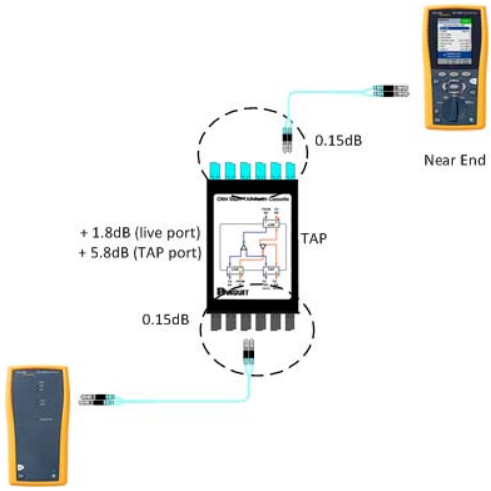
Below are examples of how the fiber links with the various TAP cassettes installed can be tested. For further testing guidance refer to Panduit document PN 445 Permanent Link Testing of Multimode and Singlemode Fiber Optic Cabling Systems.

FTC-7ZA

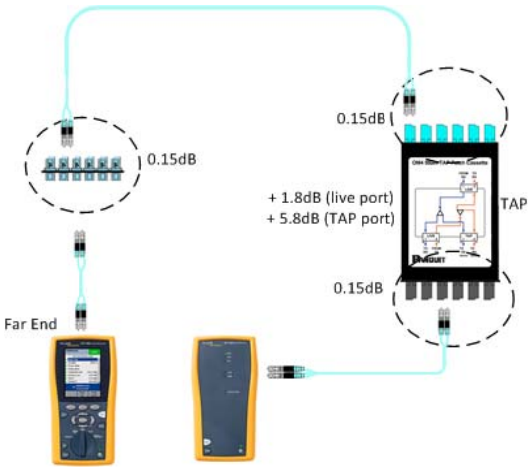
Live Link



Near End TAP



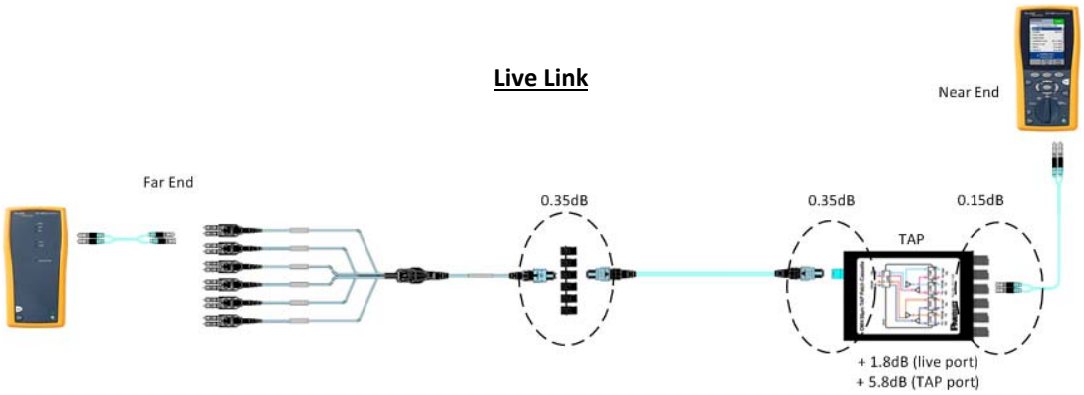
Far End TAP



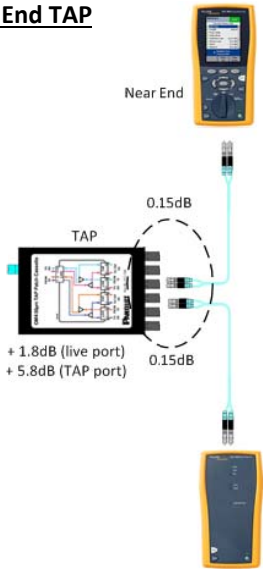
FTC-7ZB

Note that for this test, an additional LC connection is made between the Power Meter at the Far End and the fiber harness. This is for testing only; the harness is directly attached to the far end equipment during normal operation.

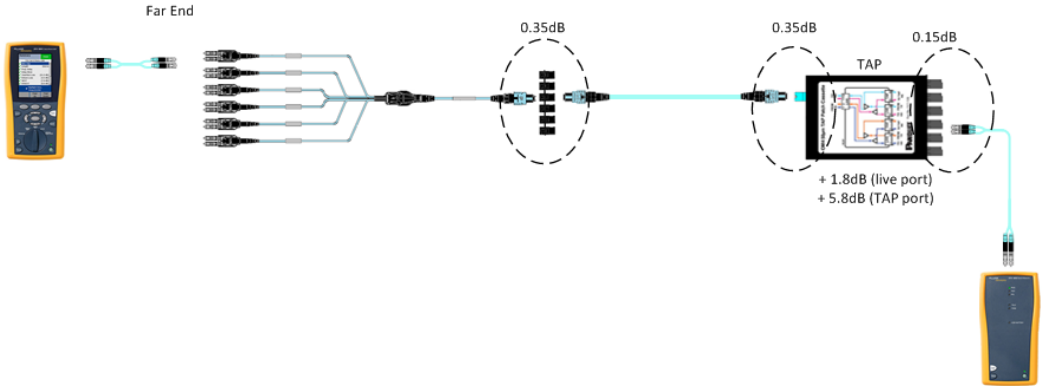
Live Link



Near End TAP

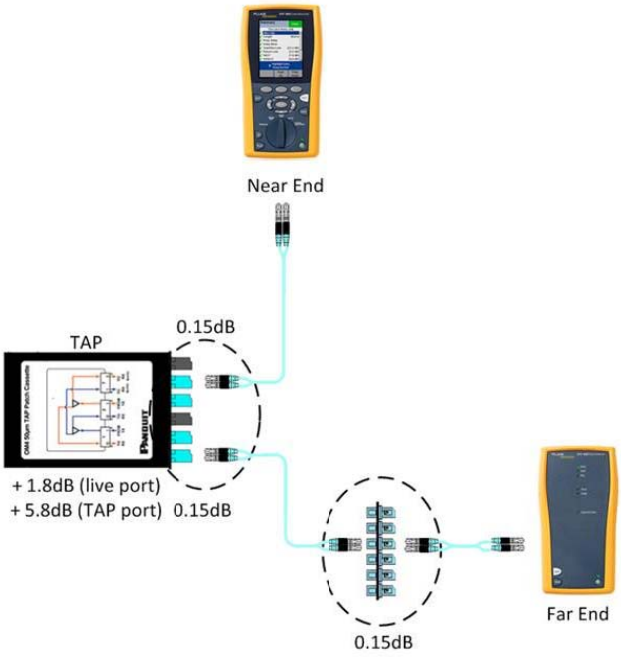


Far End TAP

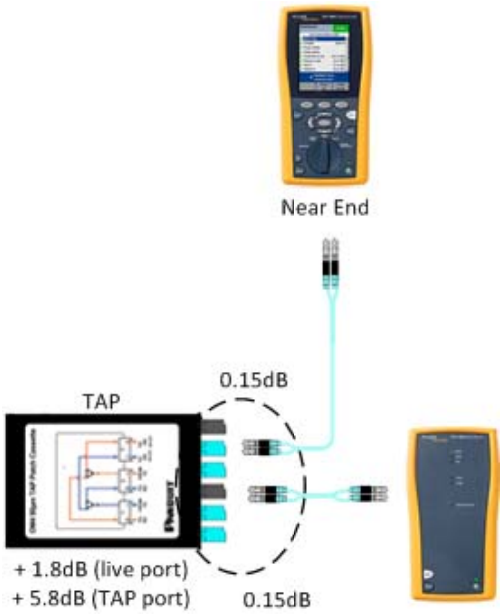


FTC-7ZC

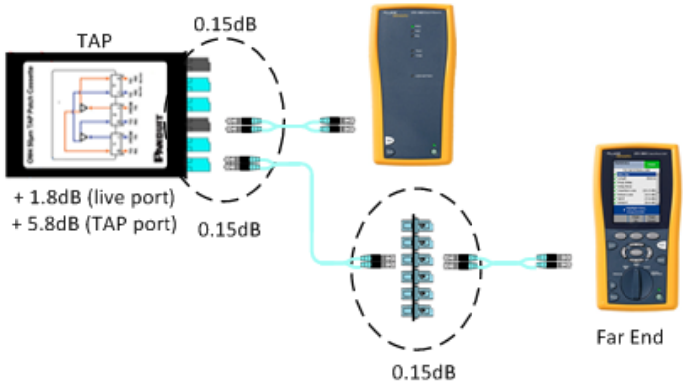
Live Link



Near End TAP



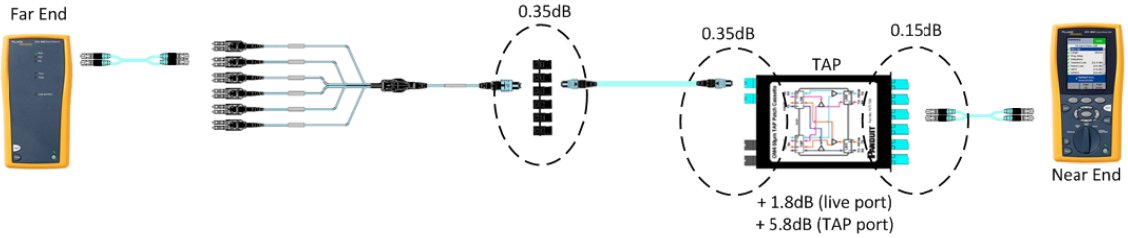
Far End TAP



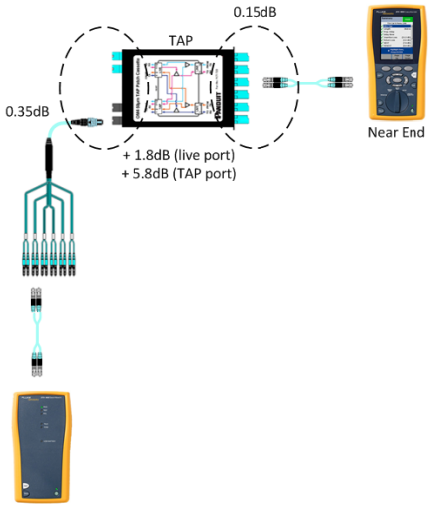
FTC-7ZD

Note that for this test, additional LC connections are made between the harness at the far end and the TAP for testing. This is for testing only; the harness is directly attached to the far end equipment and TAP during normal operation.

Live Link



Near End TAP



Far End TAP