

Data Center Connectivity Guide

WHAT APPLICATIONS WILL YOU BE RUNNING?

- 10/25/50GBASE-SR
- 40/100GBASE-SR4
- 40/100 Gb BiDi
- 16/32/64/128GB Fibre Channel
- 40/100GBASE-LR4
- 10GBASE-LR
- 40GBASE-FR, 100GBASE-LR1, 100GBASE-FR

WHAT FIBER TYPE ARE YOU LOOKING FOR?

Multimode

- OM3 50/125µm
- OM4 50/125µm
- OM4+ 50/125µm (Signature Core™ Fiber Optic Cabling System)
- OM5+ 50/125µm (Signature Core™ Fiber Optic Cabling System)

Singlemode

- OS2 9/125µm

WHAT POLARITY METHOD WILL YOU DEPLOY?

- Method A
- Method B
- Universal

Solutions represented throughout this guide apply to the most common configurations only.

Other configurations available.

Contact Panduit Customer Service for details at: 800-777-3300.

WHAT LEVEL OF PERFORMANCE ARE YOU LOOKING FOR IN YOUR CABLE ASSEMBLIES?

Maximum Insertion Loss (per mated pair)

- Standard Singlemode MPO .75dB
- Standard Singlemode LC .35dB
- Optimized Multimode MPO .35dB
- Optimized Multimode LC .15dB
- Ultra Multimode MPO .25dB
- Ultra Multimode LC .10dB

WHAT WILL YOUR LINK/CHANNEL LOOK LIKE?

- Longest length?
- How many cassettes or FAP's?
- Will there be a cross connect? How many?
- How many patch cords will each link require?
- How long are your patch cords?

WHAT FIBER DENSITY ARE YOU LOOKING FOR?

- HD Flex™ Fiber Cabling System 144 LC Fibers Per 1 RU, available in 1 RU, 2 RU, and 4 RU
- QuickNet™ SFQ System 96 Fibers Per 1 RU
- Opticom® Fiber System 96 Fibers Per 1 RU, available in 1 RU, 2 RU (192 Fibers), and 4 RU (288 Fibers)

KEY SYSTEM FEATURES:

HD Flex™ Fiber Cabling System

- Highest port density, maximizes real estate usage

QuickNet™ SFQ System

- Accepts copper and fiber, mounts in panel without an enclosure

Opticom® Fiber System

- Traditional cassette design, most available connector spacing

Reach Table

Reach Table					
Application	Connectivity Budget (db) 1.5* Fiber Category				
	OM3	OM4	OM4+ Signature Core™	OM5	OM5+ Signature Core™
	Maximum Channel Length (Meters)				
10 Gb/s Ethernet (10GBASE-SR)	300	400	550	400	465
25 Gb/s Ethernet (25GBASE-SR)	90	125	160	125	140
50 Gb/s Ethernet (50GBASE-SR)	70	100	130	100	115
16G Fibre Channel (FC, SAN)	100	125	200	125	160
32G Fibre Channel (FC, SAN)	70	100	125	100	115
64G Fibre Channel (Duplex**) (FC, SAN)	70	100	125	100	100
128G Fibre Channel (FC, SAN)	60	85	95	85	90
Cisco® 40G BiDi	100	135	200	150	175
Cisco® 100G BiDi	70	100	150	130	150
40 Gb/s Ethernet (4x10) (40GBASE-SR4)	100	125	165	125	145
100 Gb/s Ethernet (4x25) (100GBASE-SR4)	70	100	125	100	115
40 Gb/s Ethernet (40G SWDM4)	240	350	440	440	485
100 Gb/s Ethernet (100G SWDM4)	75	100	150	150	185

* 2 Mated Connector Pairs @ .75dB/ea - 1.5dB

** For 64GB Fibre Channel parallel versions, use 16G FC reach limits
Cisco® is a registered trademark of Cisco Technology, Inc.

Fiber Standards

Panduit® Laser-Optimized OM3, OM4 multimode fibers meet domestic and international standards. Signature Core™ Fiber Optic Cabling System exceeds domestic and international standards for optical fiber. This includes TIA-492AAAB, TIA-492AAAC, TIA-492AAAD and IEC 60793-2-10 and supports a diverse set of legacy and contemporary applications including Ethernet, Fibre Channel, Infiniband, and FICON (Fiber Connection), among others.

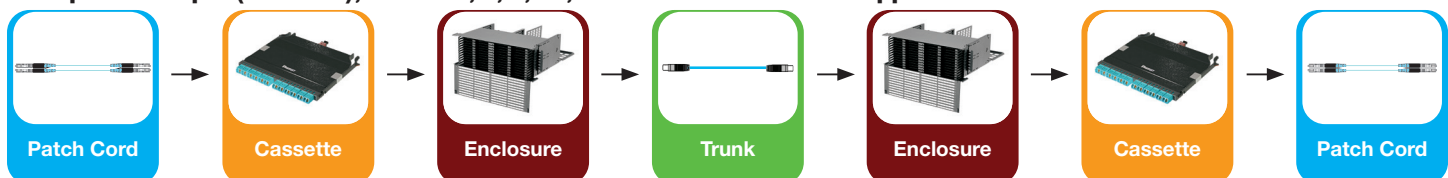
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[View the Link Loss Calculator.](#)

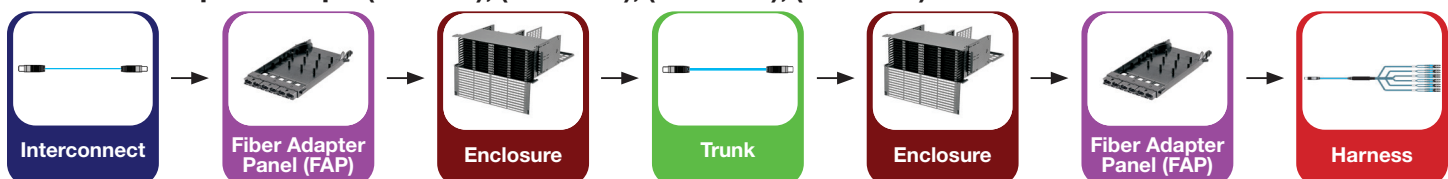
Connectivity Solution

1. Choose your connectivity application solution (A, B, or C) below.
2. Build your chosen solution from components on pages 3, 4, and 5.

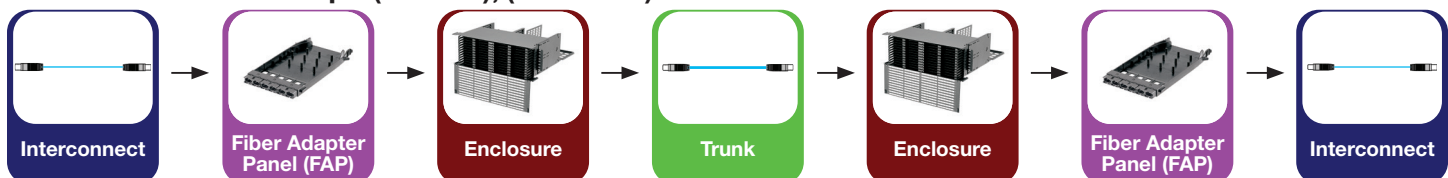
A. Duplex Example (10G-10G), 40G BiDi, 4, 8, 16, 32G Fibre Channel SAN App



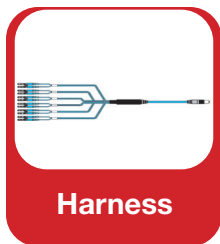
B. Parallel to Duplex Example (40G-10G), (100G-10G), (100G-40G), (128G-32G)



C. Parallel to Parallel Example (40G-40G), (100G-100G)



Harnesses/Patch Cords - Choose Your Harness & Patch Cords



Harnesses*	12 Fiber Plenum, Female PanMPO™ Connector to LC (Push-Pull or Uniboot) (24" equal breakout)
Part Number	Description
FZTRP7NQSONF010	OM4 Female PanMPO™ Connector to LC Push-Pull Optimized IL - 10'
FZTRP7NUSONF010	OM4 Female PanMPO™ Connector to LC Uniboot Optimized IL - 10'
FXTRP7NQSONF010	OM3 Female PanMPO™ Connector to LC Push-Pull Optimized IL - 10'
FXTRP7NUSONF010	OM3 Female PanMPO™ Connector to LC Uniboot Optimized IL - 10'
F9TRP5NQSSNF010	OS2 Female MPO to LC Push-Pull, Standard IL - 10'

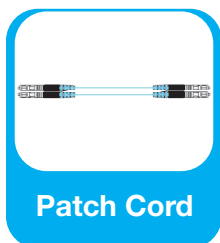
Harnesses*	8 Fiber Plenum, 4 to 1 Conversion Harnesses, Female PanMPO™ Connector to LC (Push-Pull) (24" equal breakout)
Part Number	Description
FZ8RP7NQSVNF010	OM4 Female PanMPO™ Connector to LC Push-Pull Optimized IL - 10'
FZ8RP7NUSVNF010	OM4 Female PanMPO™ Connector to LC Uniboot Optimized IL - 10'
FX8RP7NQSVNF010	OM3 Female PanMPO™ Connector to LC Push-Pull Optimized IL - 10'
FX8RP7NUSVNF010	OM3 Female PanMPO™ Connector to LC Uniboot Optimized IL - 10'
F98RP5NQSQNF010	OS2 Female MPO to LC Push-Pull, Standard IL - 10'

*For male PanMPO™ Connector, change "7" in position 6 to "8"

For male MPO, change "5" in position 6 to "6"

** To change from LC Push-Pull to Uniboot connector, change the "Q" in position 8 to a "U"

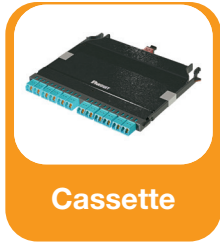
Available in lengths from 3 ft. to 30 ft.



Patch Cords	2 Fiber 1.6mm Patch Cord, Riser* LC Push-Pull to LC Push-Pull
Part Number	Description
FZ2ERQ1Q1SNM001	OM4, Optimized IL, 1 meter
FZ2ERQ1Q1SNM00*	OM4, Optimized IL, * meters
FZ2ERQ1Q1NNM001	OM4, Ultra IL, 1 meter
FX2ERQ1Q1SNM001	OM3, Optimized IL, 1 meter
FX2ERQ1Q1SNM00*	OM3, Optimized IL, * meters
F92ERQ1Q1SNM001	OS2, Standard IL, 1 meter
F92ERQ1Q1SNM00*	OS2, Standard IL, * meters

*Available from 001 to 050m, in 1m increments

Cassettes - Choose Your System Solution



Cassette

HD Flex™ Fiber Cabling System

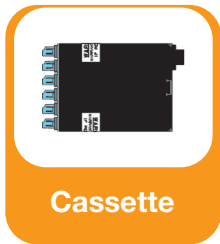
- Has the capacity to do 144 LC Fibers in 1 RU, 288 Fibers in 2 RU, and 576 in 4 RU
- Maximizes real estate usage



Cassette

QuickNet™ SFQ System

- Has the ability to do 96 Fibers in 1 RU
 - Has no enclosures in its solution
 - Has the ability to do both Fiber and copper in the same patch panel
- See copper on the back page.



Cassette

Opticom® Fiber System

- Has the ability to do 96 Fibers in 1 RU, 192 Fibers in 2 RU, and 288 Fibers in 4 RU
- Allows the user to have more space to work with

HD Flex™ Fiber Cabling System			
Part Number	Description	Part Number	Description
HD Flex™ 12 Fiber Cassette MPO to LC Duplex		HD Flex™ Cassette (2) 12F MPO to 12 LC Duplex	
FHCZO-12-10U	OM4, Universal Polarity, Optimized IL	FHCZO-24-10U	OM4, Universal Polarity, Optimized IL
FHCXO-12-10U	OM3, Universal Polarity, Optimized IL	FHCXO-24-10U	OM3, Universal Polarity, Optimized IL
FHC9N-12-10AS	OS2, Method A, Standard IL	FHC9N-24-10AS	OS2, Method A, Standard IL
FHC9N-12-10AF	OS2, Method A, pair flipped, Standard IL	FHC9N-24-10AF	OS2, Method A, pair flipped, Standard IL
HD Flex™ 4 to 1 Conversion Cassette; 1 MPO to 4 LC Duplex (parallel to duplex optics)		HD Flex™ Cassette (1) 24F MPO to 12 LC Duplex	
FHC3ZO-08-10BN	OM4, Method B, Optimized IL	FHCZO-24F-10A	OM4, Method A, Universal, Optimized IL
FHC3XO-08-10BN	OM3, Method B, Optimized IL	FHCXO-24F-10A	OM3, Method A, Universal, Optimized IL
FHC39N-08-10AN	OS2, Method A, Standard IL	FHC9N-24F-10A	OS2, Method A, Universal, Standard IL
HD Flex™ LC Splice Cassette, 6 LC Duplex, Preloaded with Fiber			
FHSZO-12-10P*	OM4, Optimized IL		
FHSXO-12-10P*	OM3, Optimized IL		
FHS9N-12-10P*	OS2, Standard IL		

*Change "P" for Pigtails to "R" for Ribbon Fiber

QuickNet™ SFQ System			
Part Number	Description	Part Number	Description
QuickNet™ SFQ 12 Fiber Cassette; MPO to LC Duplex		QuickNet™ SFQ 4 to 1 Conversion Cassette; 1 MPO to 4 LC Duplex (parallel to duplex optics)	
FQZO-12-10U	OM4, Method B, Universal, Optimized IL	FQ3ZO-08-10B	OM4, Optimized IL
FQXO-12-10U	OM3, Method B, Universal, Optimized IL	FQ3XO-08-10B	OM3, Optimized IL
FQ9N-12-10AS	OS2, Method A, Standard IL	FQ39N-08-10A	OS2, Optimized IL
FQ9N-12-10AF	OS2, Method A, pair flipped, Standard IL		

Opticom™ Fiber System			
Part Number	Description	Part Number	Description
Opticom® 12 Fiber, MPO to LC Duplex		Opticom® 24 Fiber, (2) 12F MPO to LC Duplex	
FC2ZO-12-10U	OM4, Method B, Universal Polarity, Optimized IL	FC2ZO-24-10U	OM4, Method B, Universal Polarity, Optimized IL
FC2ZO-12-10U	OM3, Method B, Universal Polarity, Optimized IL	FC2XO-24-10U	OM4, Method A, pair flipped, Optimized IL
FC29N-12-10AS	OS2, Method A, Standard IL	FC29N-24-10AS	OM3, Method A, Optimized IL
FC29N-12-10AF	OS2, Method A, pair flipped, Standard IL	FC29N-24-10AF	OM4, Method B-B2 (1-12 array), Optimized IL
Opticom® 4 to 1 Conversion Cassette; 2 MPO to 8 LC Duplex (parallel to duplex optics)			
FC3ZO-16-10B	OM4, Method B, Optimized IL		
FC3XO-16-10B	OM3, Method B, Optimized IL		

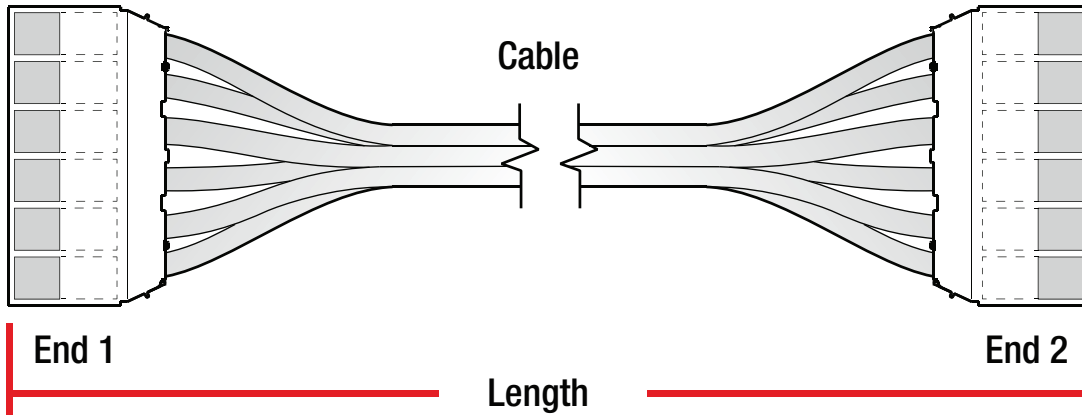
Splice Cassettes*			
Part Number	Description	Part Number	Description
Opticom® LC Splice Cassette, 6 LC Duplex, Preloaded with Fiber		Opticom® SC Splice Cassette, 6 SC Duplex, Preloaded with Fiber	
FCSZO-12-10P*	OM4, Optimized IL	FCSZO-12-03P*	OM4, Optimized IL
FCS9N-12-10P*	OS2, Standard IL	FCS9N-12-SAP*	OS2, SC/APC, Standard IL
FCS9N-12-LAP*	OS2, LC/APC, Standard IL		

*Change "P" for Pigtails to "R" for Ribbon Fiber

▶ Configure Copper QuickNet™ part numbers in our online tool

Selection Guide for QuickNet™ Cable Assembly Semi-Custom Part Numbers

Example: QCPBCCB0001F010 - QuickNet™ Cable Assembly, Category 6 Plenum, Blue Cable, UTP, Cassette to Cassette, 10'.



UTP Cassette



UTP Jack Modules



UTP Modular Plugs



Unterminated

	Part Number Series	Copper QuickNet™ Trunk Assembly Descriptions
Category 6 Riser	QCRBCCB0001F***	Category 6, UTP riser blue cable with blue cassette to blue cassette
	QCRBCJB0001F***	Category 6, UTP riser blue cable with blue cassette to blue jack
	QCRBCPB0001F***	Category 6, UTP riser blue cable with blue cassette to plug
	QCRBCUB0001F***	Category 6, UTP riser blue cable with blue cassette to unterminated
Category 6 Plenum	QCPBCCB0001F***	Category 6, UTP plenum blue cable with blue cassette to blue cassette
	QCPBCJB0001F***	Category 6, UTP plenum blue cable with blue cassette to blue jack
	QCPBCPB0001F***	Category 6, UTP plenum blue cable with blue cassette to plug
	QCPBCUB0001F***	Category 6, UTP plenum blue cable with blue cassette to unterminated
Category 6A Riser	QZRBCCB0001F***	Category 6A, UTP Vari-MaTriX riser blue cable with blue cassette to blue cassette
	QZRBCJB0001F***	Category 6A, UTP Vari-MaTriX riser blue cable with blue cassette to blue jack
	QZRBCPB0001F***	Category 6A, UTP Vari-MaTriX riser blue cable with blue cassette to plug
	QZRBCUB0001F***	Category 6A, UTP Vari-MaTriX riser blue cable with blue cassette to unterminated
Category 6A Plenum	QZPBCCB0001F***	Category 6A, UTP Vari-MaTriX plenum blue cable with blue cassette to blue cassette
	QZPBCJB0001F***	Category 6A, UTP Vari-MaTriX plenum blue cable with blue cassette to blue jack
	QZPBCPB0001F***	Category 6A, UTP Vari-MaTriX plenum blue cable with blue cassette to plug
	QZPBCUB0001F***	Category 6A, UTP Vari-MaTriX plenum blue cable with blue cassette to unterminated

*** = Length in Feet from 010 to 295

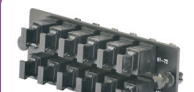
Fiber Adapter Panels (FAPs)



Fiber Adapter Panel



Fiber Adapter Panel



Fiber Adapter Panel



Fiber Adapter Panel

HD Flex™ Fiber Cabling System

Part Number	Description
HD Flex™ LC FAP with 6 LC Duplex Adapters	
FHSXN-12-10N	Multimode adapters, Aqua, zirconia sleeves (LC Pigtails not included)
FHS9N-12-10N	Singlemode adapters, Blue, zirconia sleeves (LC Pigtails not included)
HD Flex™ MPO FAP Cassettes	
FHMP-6-ABL	6 MPO adapters, Black, Method A
FHMP-6-BCG	6 MPO adapters, Charcoal Gray, Method B
FHMP-6-ARD	6 MPO adapters, Red, 24F MPO, Method A

QuickNet™ SFQ System

Part Number	Description
QuickNet™ SFQ MPO FAPs with 6 MPO Adapters	
FQMAP45BL	4 MPO adapters, Black, Method A
FQMAP65BL	6 MPO adapters, Black, Method A
FQMAP85BL	8 MPO adapters, Black, Method A
FQMAP46CG	4 MPO adapters, Charcoal Gray, Method B
FQMAP66CG	6 MPO adapters, Charcoal Gray, Method B
FQMAP86CG	8 MPO adapters, Charcoal Gray, Method B
FQMAP45RD	4 MPO adapters, Red, 24F MPO, Method A
FQMAP65RD	6 MPO adapters, Red, 24F MPO, Method A
FQMAP85RD	8 MPO adapters, Red, 24F MPO, Method A

Opticom® Fiber System

Part Number	Description
Opticom® MPO FAPs with 6 MPO Adapters	
FAPH**12BLMPO	FAP with ** MPO adapters, Black, Method A, horizontal
FAPV**12BLMPO	FAP with ** MPO adapters, Black, Method A, vertical
FAPH**12CGMPO	FAP with ** MPO adapters, Charcoal Gray, Method B
FAPH**24RDMPO	FAP with ** MPO adapters, Red, 24F MPO, Method A

**Insert 06, 12, or 18 for the number of MPOs required, ex: FAPH1212BLMPO

Part Number	Description
Opticom® LC Duplex FAPs	
FAP6WAQDLCZ	6 Multimode adapters, Aqua, zirconia split sleeves
FAP12WAQDLCZ	12 Multimode adapters, Aqua, zirconia split sleeves
FAP6WBUDLCZ	6 Singlemode adapters, Blue, zirconia split sleeves
FAP12WBUDLCZ	12 Singlemode adapters, Blue, zirconia split sleeves
FAP6WAGDLCZ	6 Singlemode LC/APC adapters, Green, zirconia split sleeves
FAP12WAGDLCZ	12 Singlemode LC/APC adapters, Green, zirconia split sleeves

Enclosures/Panels



HD Flex™ Fiber Cabling System	
Part Number	Description
Enclosures	
FLEX*U06	*1, 2, or 4 RU, 6-Port HD Flex™ Enclosure
FLEX*U12	*1, 2, or 4 RU, 12-Port HD Flex™ Enclosure



Part Number	Description
Panels	
FLEX*UPN06	*1, 2, or 4 RU, 6-Port HD Flex™ Panel
FLEX*UPN12	*1, 2, or 4 RU, 12-Port HD Flex™ Panel



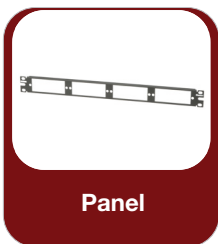
Part Number	Description
Under Floor Enclosures	
FLEX-ZRFEG	HD Flex™ Zone Raised Floor Enclosure, Gray

Part Number	Description
HD Fusion Enclosures	
FRMHSS-4RU	4 RU, HD fusion splicing enclosure
FWMHSSGS-3456**	Wall mount splice enclosure, for up to 3456 ribbon fibers (Ribbon fibers not included)
FWMHSSGS-6912**	Wall mount splice enclosure, for up to 6912 ribbon fibers (Ribbon fibers not included)

*Replace ** with 1, 2, or 4 to order the appropriate RU version (ex: FLEX1U06 is a 1 RU, 6-Port HD Flex™ Enclosure)
 **G* in HD Fusion Enclosure part number is Gray, replace G with B for Black, W for White
 (ex: FWMHSSWS-3456 is a White enclosure)

QuickNet™ SFQ System	
Part Number	Description
Enclosures	
QAPP24BL	QuickNet™ Patch Panel, angled, 24-Port, 1 RU
QAPP48HDBL	QuickNet™ Patch Panel, angled, 48-Port, 1 RU
QPP24BL	QuickNet™ Patch Panel, flat, 24-Port, 1 RU

Opticom® Fiber System	
Part Number	Description
Enclosures	
FCE*U	Fiber cassette enclosure, * RU
FMT1	Rack mount fiber tray, 1 RU
FMT2	Rack mount fiber tray, 2 RU
FRME1U	Rack mount fiber enclosure, 1 RU for fusion splices



Part Number	Description
Panels	
CFAPPBL1	Fiber adapter panel, 1 RU, holds 4 FAP's
CFAPPBL2	Fiber adapter panel, 2 RU, holds 8 FAP's

*Replace ** with 1, 2, or 4 to order the appropriate RU version (ex: FLEX1U06 is a 1 RU, 6-Port HD Flex™ Enclosure)
 Note: *1, 2, and 4 RU options

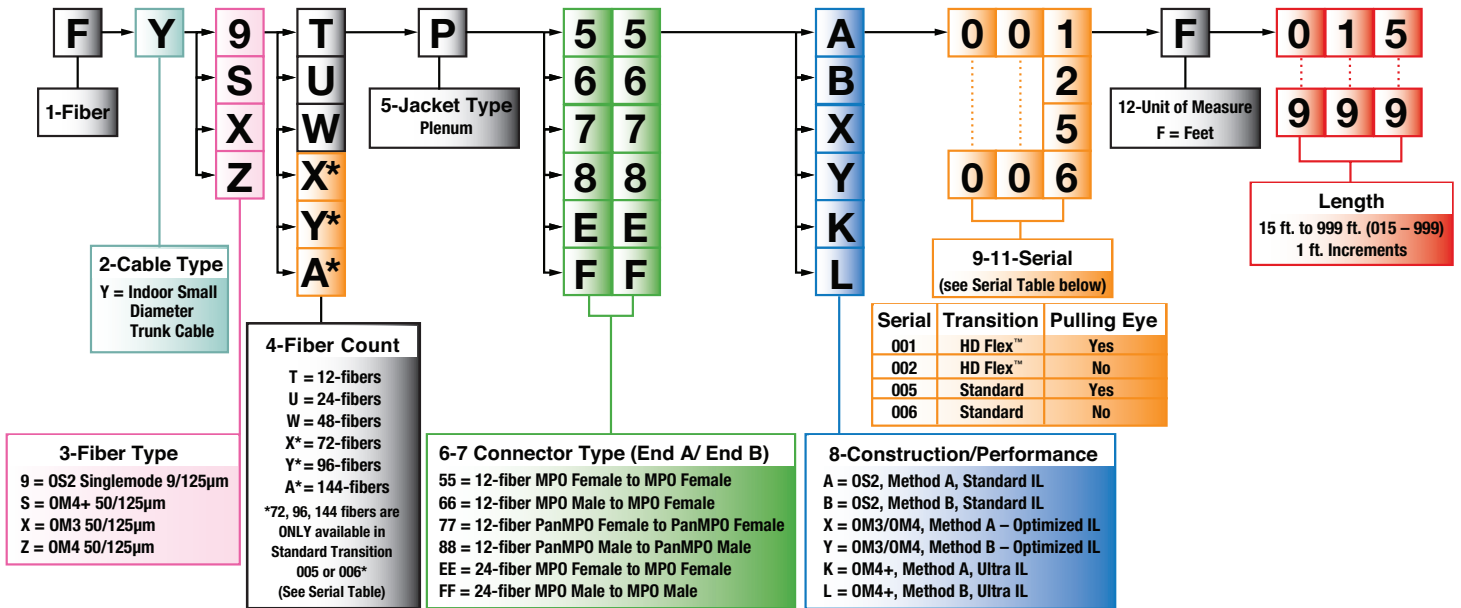
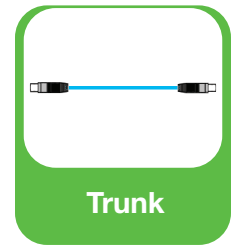


HD Flex™ Fiber Cabling System	
Part Number	Description
Fiber Management Accessories	
FLEX-PLATE*UR	HD Flex™ Enclosure Trunk Slack Plate with Rear Cover - *RU, Black
FLEX-PLATE*URW	HD Flex™ Enclosure Trunk Slack Plate with Rear Cover - *RU, White
FLEX-PLATE*UPR	HD Flex™ Patch Panel Trunk Slack Plate with Rear Cover - *RU, Black
FLEX-PLATE*UPRW	HD Flex™ Patch Panel Trunk Slack Plate with Rear Cover - *RU, White
FLEX-FCM*UA	HD Flex™ Front Cable Manager, *1, 2, or 4 RU
FLEX-0RUBR06	HD Flex™ Zero RU Bracket, 6-Port (Includes 1 FLEX-0RUUCH06)
FLEX-0RUUCH06	HD Flex™ Zero RU Bracket, 12-Port (Includes 1 FLEX-0RUUCH12)
FLEX-0RUBR12	HD Flex™ Zero RU Cassette Holder, 12-Port (For adding more cassettes to FLEX-0RUBR12)
FHSBBL06W	HD Flex™ Blanking Panel, 6-Port
FQCBRUA	QuickNet™ Zero RU Bracket, Holds 2 QuickNet™ Cassettes or Adapters
FEABRU	Opticom® Zero RU Bracket, Holds 1 Opticom® Cassette or FAP
QPPABL	QuickNet™ Patch Panel Adapter, accepts Mini-Com® Modules
QPPBBL	QuickNet™ Patch Panel Blank
FQCRCM	QuickNet™ Cassette Rear Cable Manager (2 post rack only)
FOSMF	Fiber optic splice module for FRME Rack mount enclosures
FSC24	Splice chip, 24 position
FST6	Fiber splice tray - 6" (152mm)
FSTK	Fiber splice tray - 6 mechanical or fusion splices
FST24	Fiber splice tray - 24 mechanical or fusion splices
FST48	HD Fusion splice tray kit
FST144R	Tray for ribbon fiber splicing
FOSMH1U	Fiber optic splice module handler, 1 RU
FOSMH4U	Fiber optic splice module handler, 4 RU
FSTHS	Fiber splice tray holder - used with FSTK
FMS1	Fiber management slack spool kit (2 per bag)
HLS-75R0	Hook & Loop roll, 75'L (22.9m), 0.75"W (19.1mm), Black

Replace "" with 1, 2, or 4 to order the appropriate RU version (ex: FLEX1U06 is a 1 RU, 6-Port, HD Flex™ Enclosure)

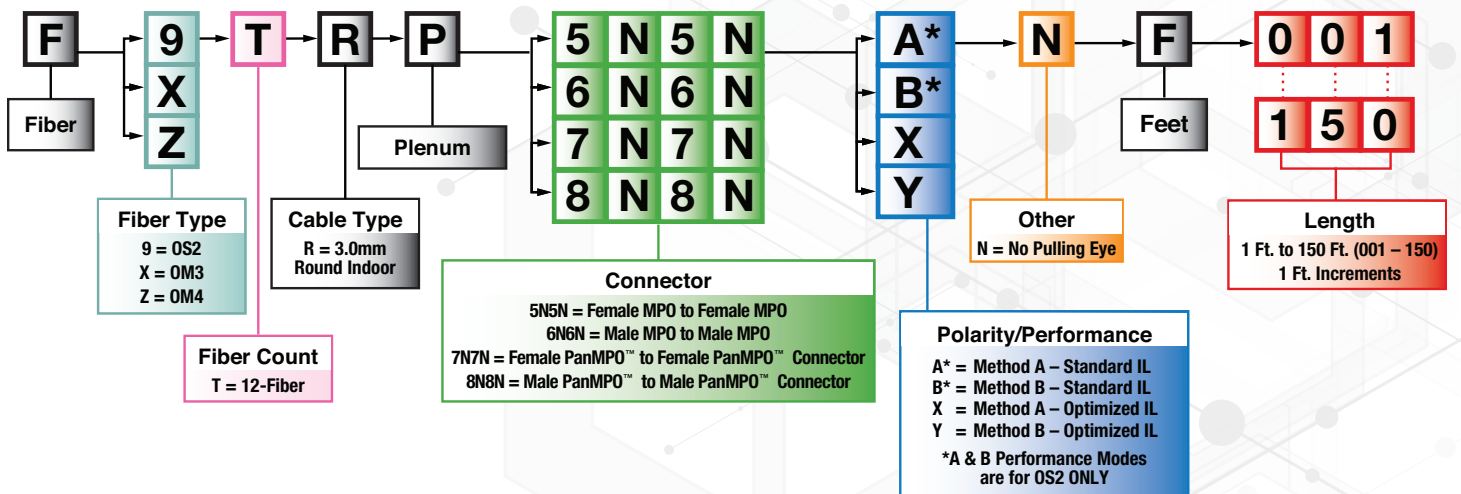
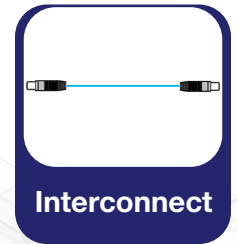
Choose Your Trunk Trunks (Build Your Part Number Below)

Configure Fiber Trunk part numbers in our online tool



Example: FYXTP77Y001F030 - OM3 12-Fiber HD Flex™ Indoor Small Diameter Trunk, Plenum, 1 x 12F PanMPO™ Female with 1m breakout to 1 x 12F PanMPO™ Female with 1m breakout, Polarity B, Optimized IL, Pulling Eye End A - 30 Foot

Choose Your Interconnect Interconnects (Build Your Part Number Below)



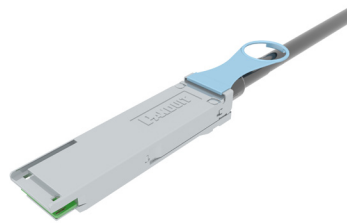
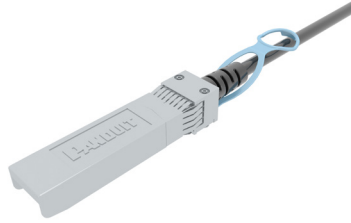
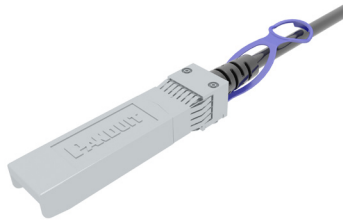
Example: FXTRP7N7NXNF001 - OM3 12-Fiber Interconnect Plenum, Female PanMPO™ Connector to Female PanMPO™ Connector, Method A, Optimized IL, No Pulling Eye - 1 Foot

Direct Attach Copper (DAC) Cable Assemblies

10 GbE SFP+, 25 GbE SFP28, and 100 GbE QSFP28 copper cable assemblies

Used at Access or Leaf layers, primarily Top of Rack architectures

100% production tested to exceed industry requirements



Passive SFP+

PSF1PXA1MBL
PSF1PXA2MBL
PSF1PXA3MBL
PSF1PXD4MBL
PSF1PXD5MBL

Passive SFP28

PSF2PZA1MBL
PSF2PZA2MBL
PSF2PZA3MBL
PSF2PZC4MBL
PSF2PZC5MBL

Passive QSFP28

PQSF2PXA1MBL
PQSF2PXA2MBL
PQSF2PXA3MBL
PQSF2PXC4MBL
PQSF2PXC5MBL

QSFP28 to (4) SFP28 Breakout Assemblies

PHQ4SFP2A1MBL
PHQ4SFP2A2MBL
PHQ4SFP2A3MBL
PHQ4SFP2C4MBL
PHQ4SFP2C5MBL

- High speed solution, most cost-effective interconnect for Data Centers
- 10 GbE SFP+, 25 Gb SFP28, and 100 Gb QSFP28 copper cable assemblies
- Used at Access or Leaf layers, primarily Top of Rack architectures
- 100% production tested to exceed industry requirements

Note: Wire Gauge Guide: 'A' in part number = 30 AWG, 'C' = 26 AWG

Note: BL (Black), BU (Blue), RD (Red), WH (White)

PANDUIT®

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