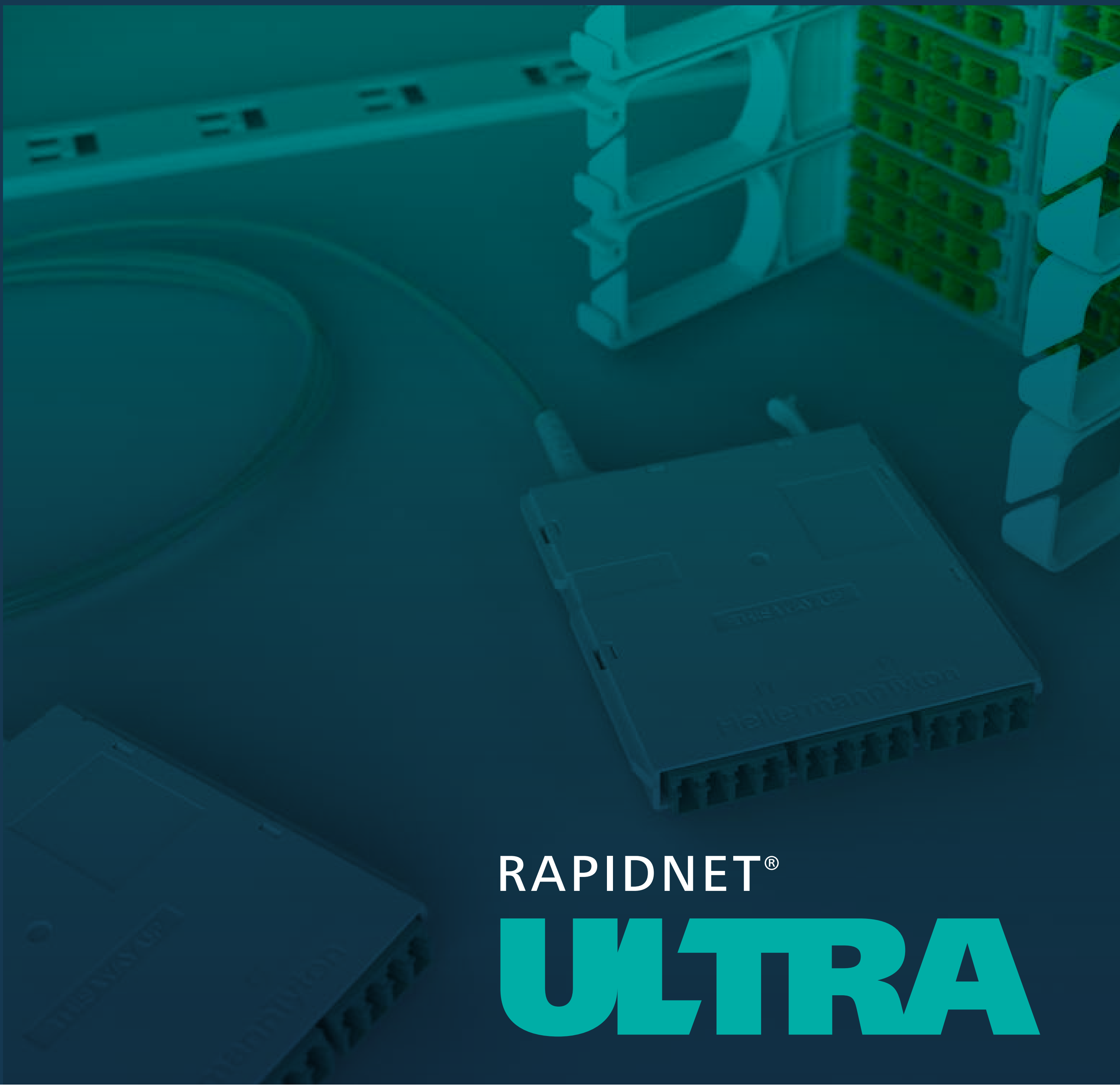
Cabling Guide

The Data Centre Solution

MADE TO CONNECT



RAPIDNET®

ULTRA

HellermannTyton

Your RapidNet ULTRA Cabling Guide

We understand that your data centre's infrastructure is the foundation of your business.

Our cabling guide provides several RapidNet ULTRA solution examples based upon typical data centre applications.

HellermannTyton design, produce and deliver the most diverse, flexible, ultra low-loss, capex friendly solutions in the industry.

CABLING GUIDE

RAPIDNET®
ULTRA

There is no one size fits all

The data centre industry is diverse and the RapidNet ULTRA system embodies this belief.
A 'one solution fits all' won't suffice.

This cabling guide has been developed with you in mind, whether you are a network designer, data centre manager, engineer, or end user, this guide will highlight considerations for your choice of cabling configurations to support your needs.

Assess Your Data Centre's Needs
The following are simplified points of consideration for your data centre needs. All of these points will affect the choices you make for your cabling solution. These are not exhaustive and if you require assistance with understanding more about making the right choice for your cabling then please contact our application engineering team to discuss further.

Today's bandwidth needs

This will determine the specification of the optical transceivers being used and will directly affect a number of factors, such as; connector form factor i.e. LC or MTP – and help to establish which base fibre system to use i.e. Base-8 or Base-12

Tomorrow's bandwidth and potential migration requirements

Future plans for increased bandwidth and potential migration from one transceiver type to another e.g. 400Gb to 50Gb may present the need to use assemblies that offer flexibility for moves, adds & changes i.e. MTP Pro connectors to help change polarity and gender. Consideration of tomorrows demands will influence the link configurations of today and create a more sustainable approach to your system.

Distance

Consider the cabling distance. Are you only concerned with short runs within a data centre or do you need to consider longer distances within a large building or campus environment. Do you need to build in redundancy? This is one factor that will help choose the correct fibre specification such as OM4 or OS2.

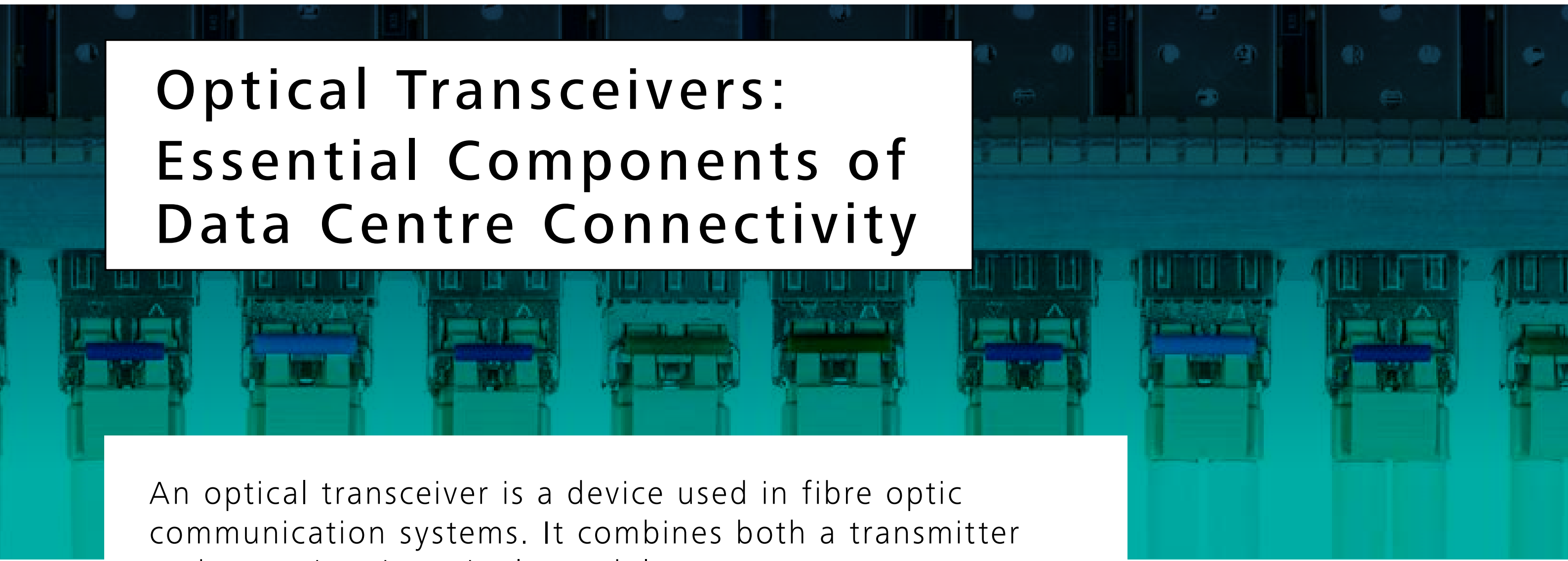
Loss budgets

Consider the complexity of your infrastructure, are you restricted by loss budget? HellermannTyton is renowned in the industry for offering best in class low loss pre-terminated links with direct termination to connectors, helping you to reduce your overall loss.

Topology

Most data centres utilise industry standard architectures and cabling topologies. In turn this affects cable routing pathways, alongside any additional runs to build in redundancy.

The answers to these questions ultimately determine the most suitable cabling and link configurations. For example, are you cabling point to point with little to no obstruction in the pathway making this scenario suitable to deploy a cassette to cassette terminated link? If this link is over a long distance within the data centre you may also wish to use a double jacket (ruggedised) cable for increased mechanical protection.



Optical Transceivers: Essential Components of Data Centre Connectivity

An optical transceiver is a device used in fibre optic communication systems. It combines both a transmitter and a receiver in a single module.

Transceivers facilitate high-speed and high-bandwidth data transmission over long distances required for efficient data centre operations.

They ensure reliable connections and support the scalability of data centre networks by allowing for upgrades and expansions without significant infrastructure changes.

By using light for data transmission, optical transceivers significantly reduce latency compared to traditional copper cables, enhancing the performance of data-intensive applications.

KEY FEATURES

Function

It converts electrical signals into optical signals for transmission over fibre optic cables, and vice versa.

Form Factors

Common types include SFP, SFP+, QSFP+, QSFP28 and QSFP-DD

Data Rates

Range from 1 Gbps to 400 Gbps and beyond, depending on the model.

Applications

Used in telecommunications, data centres, enterprise networks, and other high-speed data transmission environments.

Wavelengths

Common wavelengths include 850nm, 1310nm and 1550nm.

Optical Performance

Depending on the type of fibre optic cable they're designed to work with they are run over multimode or singlemode fibre.

Influencing Fibre Connectivity

The optical transceiver market paves the way for optical fibre connectivity.

BENEFITS

- **High bandwidth**
- **Low signal loss over long distances**
- **Immune to electromagnetic interference**

TYPICAL USAGE

Server to Switch Connectivity

Connecting servers to network switches, enabling fast data exchange within the data centre.

Switch to Switch Connectivity

Linking network switches, both within the same data centre and across different locations, to maintain robust network architecture.

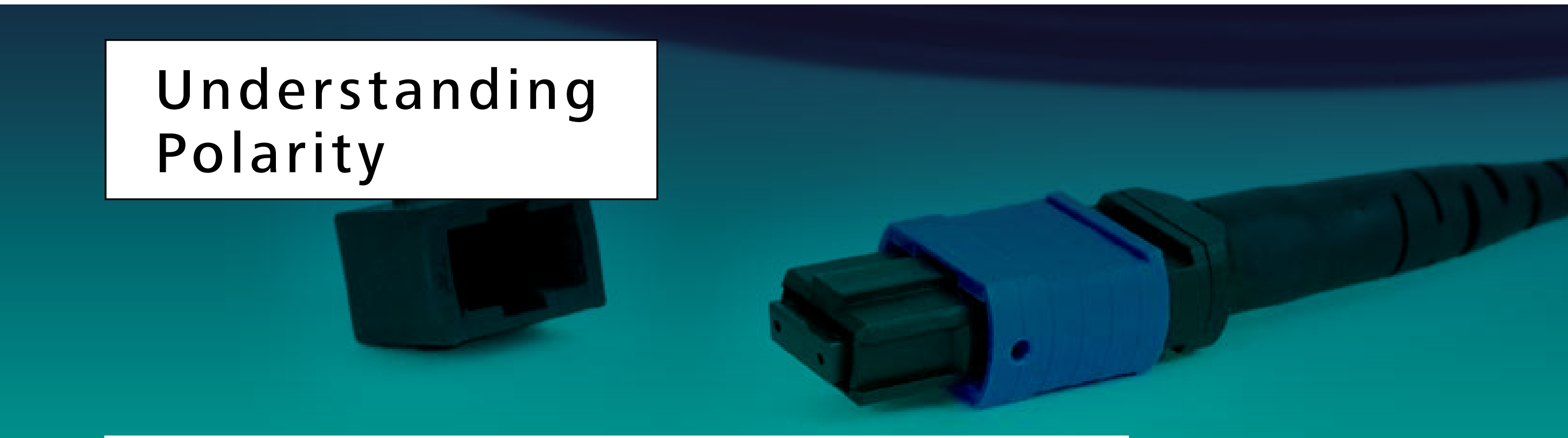
Storage Area Networks (SANs)

Facilitating the high-speed connection between storage systems and servers, ensuring quick data access and backup.

This table illustrates some of the basic specifications associated with the more common transceiver models.

APPLICATION	GBps	Fibre Type	Max. Distance	Max. Channel Loss	Pluggable Form Factor	Connector	Wavelength
10GBase-SR	10	Multimode	400m	2.9dB	SFP+	LC	850nm
10GBase-LR	10	Singlemode	10km	6.2dB	SFP+	LC	1310nm
25GBase-SR	25	Multimode	100m	1.9db	SFP+	LC	850nm
25GBase-LR	25	Singlemode	10km	6.3dB	SFP+	LC	1310nm
40GBase-SR4	40	Multimode	150m	1.5db	QSFP	MTP	850nm
40GBase-LR4	40	Singlemode	10km	6.7dB	QSFP	LC	1310nm
50GBase-SR	50	Multimode	100m	1.9dB	SFP56	LC	850nm
50GBase-LR	50	Singlemode	10km	6.3dB	QSFP28	LC	1310nm
100GBase-SR10	100	Multimode	150m	1.5db	QSFP28	MTP	850nm
100GBase-LR1	100	Singlemode	10km	6.3dB	QSFP28/SFPDD	LC	1310nm
200GBase-SR4	200	Multimode	100m	1.9dB	QSFP-56	MTP	850nm
200GBase-LR4	200	Singlemode	10km	6.3dB	QSFP-56	LC	1310nm
400GBase-SR16	400	Multimode	100m	1.9dB	QSFP-DD	MTP	850nm
400GBase-LR8	400	Singlemode	10km	6.3dB	QSFP-DD	LC	1310nm

Understanding Polarity



Fibre optic networks are integral to modern communication infrastructure, offering high-speed data transmission over long distances with minimal loss.

A critical aspect of ensuring the efficiency and reliability of these networks is maintaining correct fibre polarity. This document provides a detailed technical overview of fibre polarity, from basic two-fibre systems to more complex multi-fibre systems such as base-8 and base-12 fibres using MTP connectivity.

What is Fibre Optic Polarity?

Fibre optic polarity refers to the correct alignment and connection of the transmit (Tx) and receive (Rx) paths in a fibre optic system.

Polarity ensures that signals sent from the transmitter on one end are correctly received by the receiver on the other end. In essence, it maintains the directional flow of data, crucial for effective communication.

Why Fibre Polarity is Important

Understanding and maintaining fibre polarity is essential because incorrect polarity can lead to signal loss, increased error rates, and network downtime.

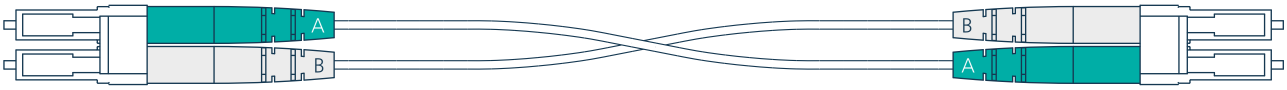
Proper polarity ensures that data transmitted from one device reaches the correct destination without any interruption, thus maintaining the integrity and performance of the network.

Two Fibre Polarity (Base-2)

In two-fibre systems, one fibre is used for transmitting data (Tx) and the other for receiving data (Rx). This setup is common in most fibre optic communication systems, including point-to-point links and duplex communication systems.

For duplex transmission, things are relatively straightforward. An A-B duplex patch cord connects the receiving (B) and transmitting (A) connectors. This physical connection ensures that data flows bidirectionally, maintaining fibre polarity.

There is also the A-A duplex patch cord, which is physically crossed but maintains the existing polarity. It's used when the fibre polarity crossover has already occurred and needs to be preserved.



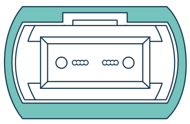
Multi-fibre Systems

Multi-fibre systems use connectors such as an MTP (branded MPO) to manage multiple fibres in a single connection. This approach simplifies the cabling and increases the efficiency of high-density network environments.

Eight Fibre (Base-8)

Base-8 fibre systems use eight fibres per connector, typically in a 4Tx and 4Rx configuration. Optical channels are based on multiples of eight such as 8, 16, 24, 48, 72 and so on. This setup is common in 40G and 100G Ethernet applications.

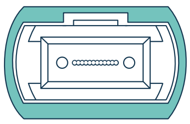
MTP 8



Twelve Fibre (Base-12)

Whilst no transceiver utilises all 12 fibres in a row, a Base-12 fibre system is used to manage multiple duplex fibre channels which is suitable for deploying 10G links. This is still todays most common method. Base-12 links can also be upgraded tomorrow to support 40G/100G links using MTP conversion cables or cassettes.

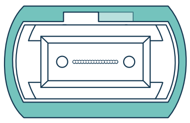
MTP 12



Sixteen Fibre (Base-16)

Sixteen fibre solutions are the latest advancement which uses eight fibres to transmit and eight fibres to receive. This cabling technology has been developed to support multimode 400G SR8 and serves to augment fibre density.

MTP 16



MTP CONNECTORS

The MTP connector is a high-performance version of the generic MPO connector, designed by US Conec.

MTP stands for Multi-fibre Termination Push-on. The MTP connector includes several patented features that improve its performance and reliability over the standard MPO connector. They are fully compliant with MPO standards (IEC 61754-7-1:2014, TIA-604-5) and can mate with generic MPO connectors, offering enhanced performance where needed.

Today, an MTP connector is commonly used to deploy 12 or 24 fibres, however they can house up to 72 fibres in a single connector, making it ideal for high-density cabling solutions. This high-density capability significantly reduces the space required for cabling, which is crucial in data centres and high-performance computing environments.

For more detailed information on the MTP connector please read our guide: "Understanding the Differences Between MTP and MPO connectivity"

Polarity Methods

Fibre polarity becomes a little more complex when working with multi-fibre MTP type cables and connectors. Industry standards list three different polarity methods for MTP; A, B and C.

References to fibre polarity can be found in the following industry standards;

- ISO/IEC 11801
- TIA-568.3-D
- ANSI/TIA-942

With the 3 different polarity types, the potential for mistakes in deployment are higher so it is important that the correct cables are used.

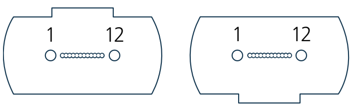
The two types of adaptors, key up - key up and key up - key down also have a role to play in determining the end-to-end channel polarity, whether MTP's are used throughout or fan outs are deployed in the final connections.

i For more detailed information on Fibre Polarity read our guide: **Understanding Fibre Polarity**

Polarity A

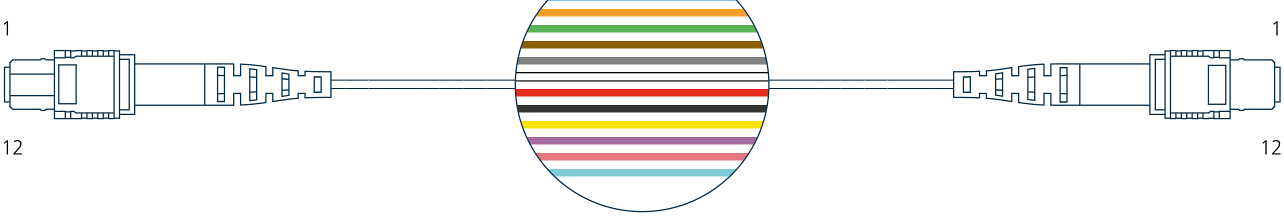
A straight-through MTP trunk cable with a key up connector on one end and a key down connector on the other end so that the fibre located in Position 1 arrives at Position 1 at the other end.

Key up **Key down**



A			B
BLUE	**1**	**1**	BLUE
ORANGE	**2**	**2**	ORANGE
GREEN	**3**	**3**	GREEN
BROWN	**4**	**4**	BROWN
GREY	**5**	**5**	GREY
WHITE	**6**	**6**	WHITE
RED	**7**	**7**	RED
BLACK	**8**	**8**	BLACK
YELLOW	**9**	**9**	YELLOW
PURPLE	**10**	**10**	PURPLE
PINK	**11**	**11**	PINK
AQUA	**12**	**12**	AQUA

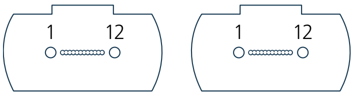
Key up **Key down**

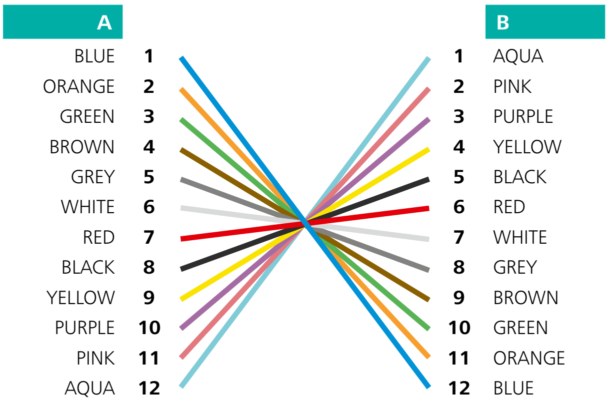


Polarity B

Uses key up connectors on both ends to achieve a cross-over or reversed polarity meaning the fibre located in Position 1 arrives at Position 12 at the opposite end, the fibre located in Position 2 arrives at Position 11 at the opposite end and so on.

Key up **Key up**

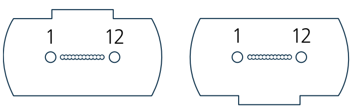


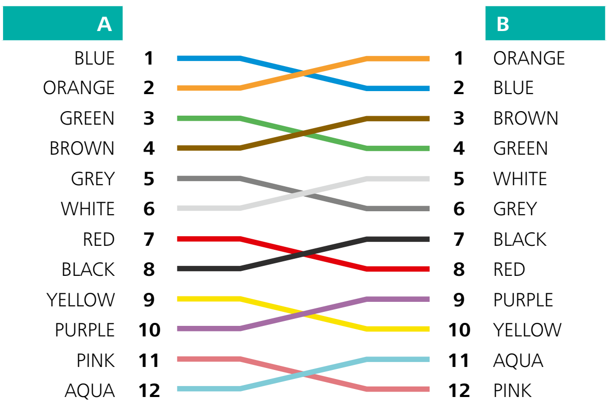


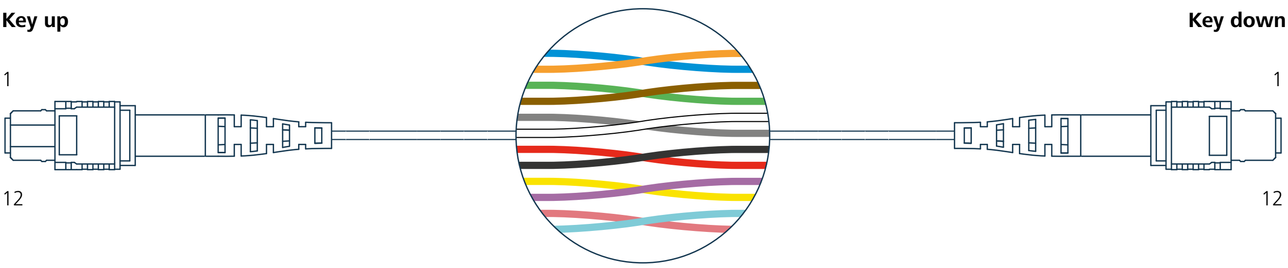
Polarity C

Polarity C uses a key up connector on one end and a key down on the other end like the Polarity A method, but the flip happens within the cable itself where each pair of fibres are flipped so that the fibre in Position 1 arrives at Position 2 at the opposite end and the fibre in Position 2 arrives at Position 1.

Key up **Key down**







Data Centre Topology

1 Centralised Topology

Centralised topology involves the concentration of all core networking equipment in a single, central location within the data centre.

This centralised point is typically a main distribution area (MDA), where core switches, routers, and other critical network infrastructure are housed.

This set up offers several advantages, including simplified management and maintenance, as well as enhanced security since all critical devices are in one secured area.

BENEFITS

Simplified Management

Having all core equipment in one location makes it easier to manage and troubleshoot network issues.

Cost-Efficiency

Centralised architecture can reduce the need for redundant equipment and cabling, lowering overall costs.

Scalability

Adding new devices or expanding the network can be more straightforward since the central point acts as a hub for all connections.

CONSIDER

Potential for Bottlenecks

With all traffic passing through a central point, there is a risk of congestion and potential bottlenecks.

Single Point of Failure

If the central hub experiences a failure, it can impact the entire network.

Implementation

Utilises high-capacity core switches and often employs high-bandwidth fibre optic cabling to connect various areas of the data centre to the MDA.

2 Zoned Topology

A zoned data centre topology refers to an architectural design where the data centre is divided into distinct zones or areas, each containing a specific set of network and server resources.

In this approach, switching and networking equipment are distributed across different physical zones within the data centre rather than being centralised in a single location.

Each zone typically serves a group of server racks or cabinets and includes local switching equipment that connects servers within that zone. This helps to optimise network performance by reducing latency, minimising cabling costs, and improving scalability.

Zoned topologies are often implemented in configurations like End-of-Row (EoR), Middle-of-Row (MoR), and Top-of-Rack (ToR) switching, where network switches are placed either at the end of a row, middle of a row, or on top of each rack respectively.

BENEFITS

Reduced Latency

By localising network traffic within zones, latency can be minimised, improving performance.

Enhanced Flexibility

Each zone can be managed independently, allowing for easier upgrades and modifications.

Fault Isolation

Problems can be contained within a zone, reducing the impact on the entire data centre.

CONSIDER

Complexity

Managing multiple zones can increase the complexity of the network.

Higher Costs

More networking equipment is required for each zone, potentially increasing costs.

Implementation

Typically involves structured cabling systems with fibre optics for inter-zone connections and copper cabling within zones for shorter runs.

3 End of Row (EoR) Topology

In the End of Row topology, network switches are placed at the end of each row of server racks.

This configuration allows for shorter cable runs between the servers and the switches, which can simplify cable management and reduce latency.

BENEFITS

Simplified Cabling

Shorter cable runs reduce the complexity and cost of cabling.

Improved Performance

Reduced latency due to shorter distances between servers and switches.

Easier Maintenance

Switches at the end of each row are easier to access for maintenance and upgrades.

CONSIDER

Potential for Higher Costs

Each row requires its own switches, which can increase the initial investment.

Space Requirements

Switches at the end of each row may require additional space, potentially reducing the amount of space available for servers.

Implementation

Utilises a mix of copper and fibre optic cabling, with high-capacity switches installed at the end of each row.

Data Centre Topology

4 Middle of Row (MoR) Topology

Middle of Row topology places network switches in the middle of each row of server racks.

This set up aims to balance the benefits of End of Row and Top of Rack topologies, providing a centralised point within each row for network connections.

BENEFITS

Balanced Cabling

Centralised placement within the row helps balance cable lengths and manageability.

Improved Access

Switches are more accessible for maintenance compared to Top of Rack configurations.

Cost Efficiency

Fewer switches may be needed compared to Top of Rack, reducing costs.

CONSIDER

Space Utilisation

Requires rack space for switches, potentially reducing the number of servers that can be installed.

Complexity

Cabling and network design can be more complex compared to simpler topologies.

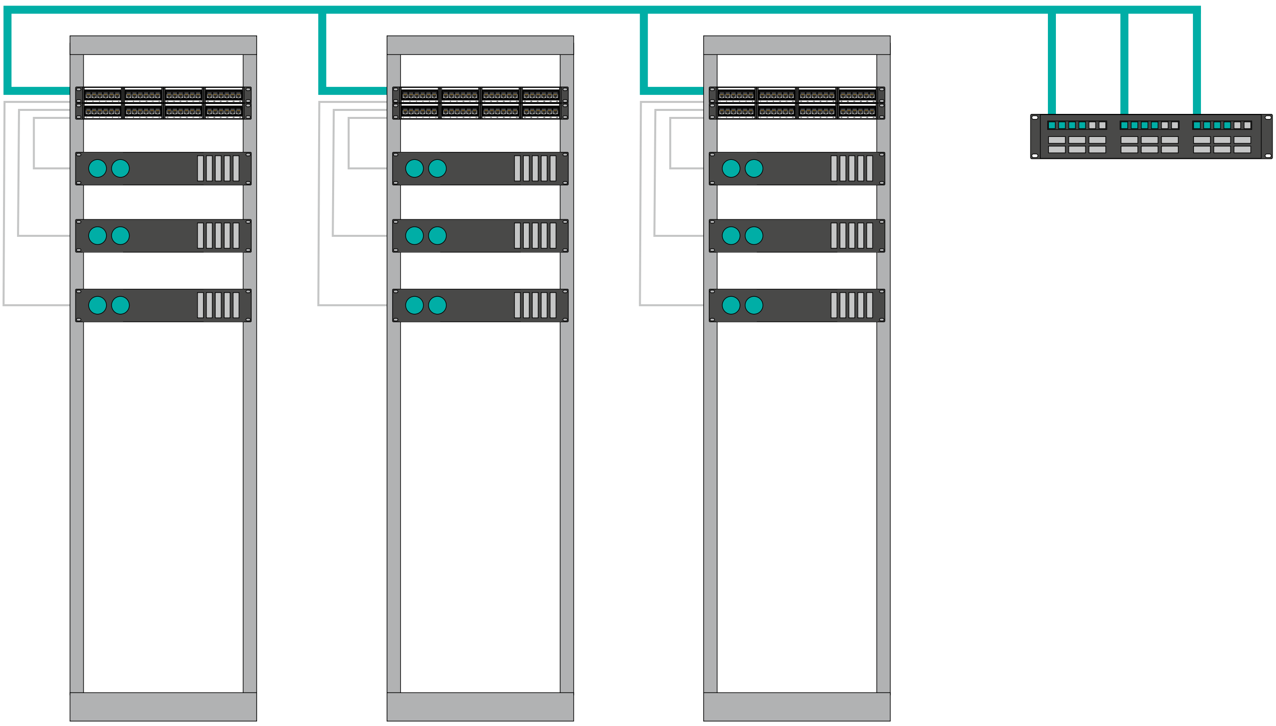
Implementation

Typically involves a combination of copper and fibre optic cabling, with mid-row switches serving as aggregation points for the row's network traffic.

5 Top of Rack (ToR) Topology

Top of Rack topology places network switches at the top of each server rack.

This set up minimises the distance between servers and switches, which can simplify cabling and improve network performance.



BENEFITS

Reduced Latency

Extremely short cable runs between servers and switches minimise latency.

Simplified Cabling

Easier cable management due to short, direct connections.

Scalability

Each rack operates independently, making it easier to add or remove racks without disrupting the entire network.

CONSIDER

Higher Costs

Each rack requires its own switch, which can increase the initial capital expenditure.

Power Consumption

More switches mean higher overall power consumption.

Implementation

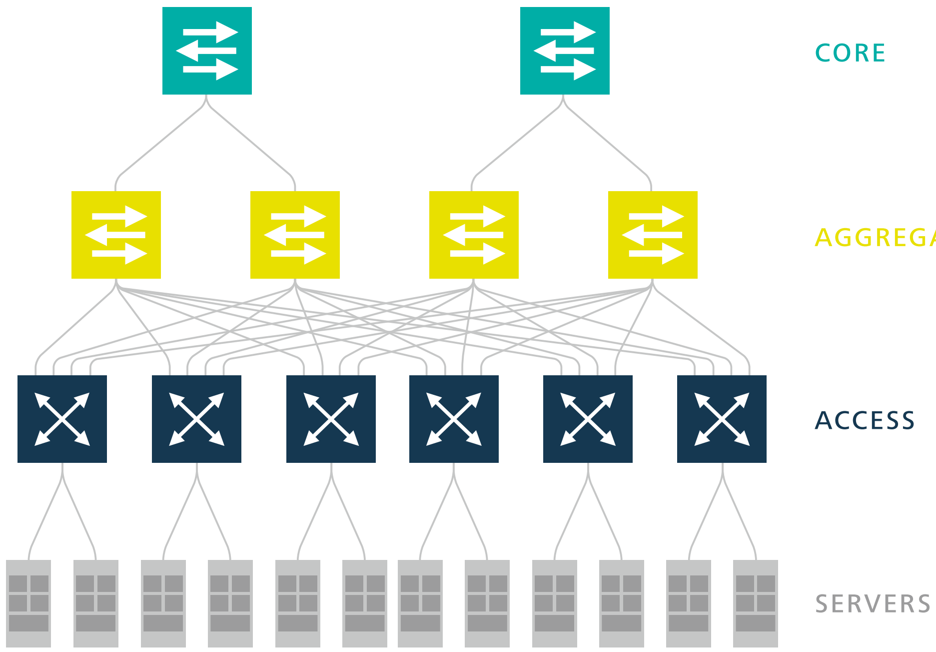
Uses short copper cables for connections within the rack and fibre optics for connections between racks and the core network.

Data Centre Architecture

Multi-tier Model

The Multi-tier model, also known as the 'hierarchical model', is a traditional and widely-used data centre architecture that organises the network infrastructure into distinct layers or tiers.

Each tier has specific roles and responsibilities, ensuring efficient data traffic management, redundancy, and scalability. Inherently a multi-tier model may have slower east-west traffic due to traversing network layers.



Architecture Overview

CORE LAYER

Role: The core layer is the backbone of the data centre network, providing high-speed and reliable connectivity between different parts of the data centre and external networks.

Components: High-capacity switches and routers.

Features: High availability, redundancy, low latency, and high bandwidth.

AGGREGATION/ DISTRIBUTION LAYER

Role: This layer aggregates traffic from multiple access layer switches before sending it to the core layer. It also implements policy-based routing, load balancing, and security functions.

Components: Layer 3 switches with routing capabilities.

Features: Scalability, load balancing, redundancy, and efficient traffic management.

ACCESS LAYER

Role: The access layer connects servers and end devices to the data centre network. It ensures that end devices can communicate with the aggregation layer and beyond.

Components: Layer 2 switches, Top-of-Rack (ToR) switches.

Features: High port density, VLAN segmentation, and close proximity to servers.

Key Benefits

Scalability

The multi-tier model supports the addition of new devices and network segments without significant changes to the overall architecture.

Redundancy & Reliability

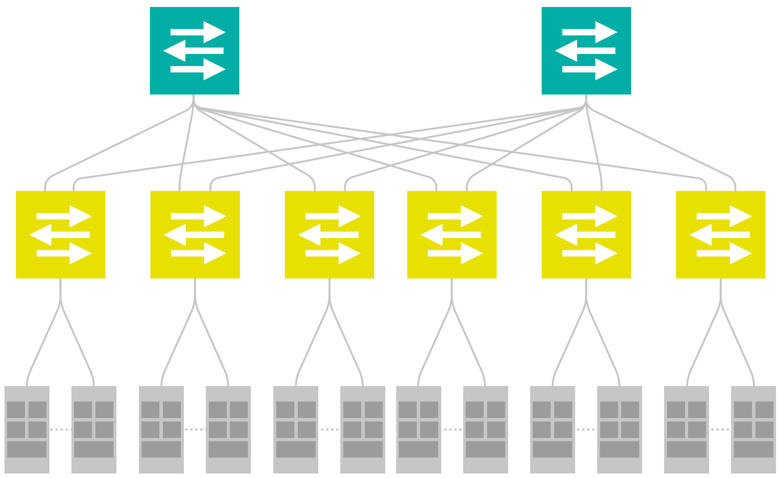
Multiple paths and redundant components ensure high availability and fault tolerance.

Efficient Traffic Management

Traffic is managed efficiently through hierarchical layers, reducing congestion and improving performance but may result in slower east-west traffic.

Spine & Leaf / Mesh Model

The Spine-and-Leaf model, also known as the 'mesh model', is a modern data centre architecture designed to address the limitations of the multi-tier model by providing high-speed, low-latency, and scalable connectivity.



Architecture Overview

SPINE LAYER

Function: Spine switches act as the backbone of the network, interconnecting all leaf switches. Every leaf switch connects to every spine switch, creating a non-blocking architecture.

Characteristics: High-capacity, high-throughput switches designed to handle massive amounts of data traffic with minimal latency.

Implementation: Utilises high-speed fibre optic cabling to ensure fast and reliable connections. Spine switches are often high-performance devices capable of supporting large data volumes.

LEAF LAYER

Function: Leaf switches are connected directly to servers and storage devices, providing the first point of network connectivity.

Characteristics: Each leaf switch is connected to every spine switch, ensuring multiple paths for data traffic and reducing bottlenecks.

Implementation: Typically involves high-density, low-latency switches with extensive port capacity. Uses both copper and fibre optic cabling depending on the required speed and distance.

Key Benefits

Scalability

Predictable and linear scalability, non-blocking architecture, creating multiple paths for traffic. Consistent latency as you add more leaf switches, the number of nodes between any two endpoints remains constant.

You can add new leaf switches to accommodate more servers without reconfiguring the entire network. Performance consistency, bandwidth and latency remain predictable as the network grows.

Redundancy & Reliability

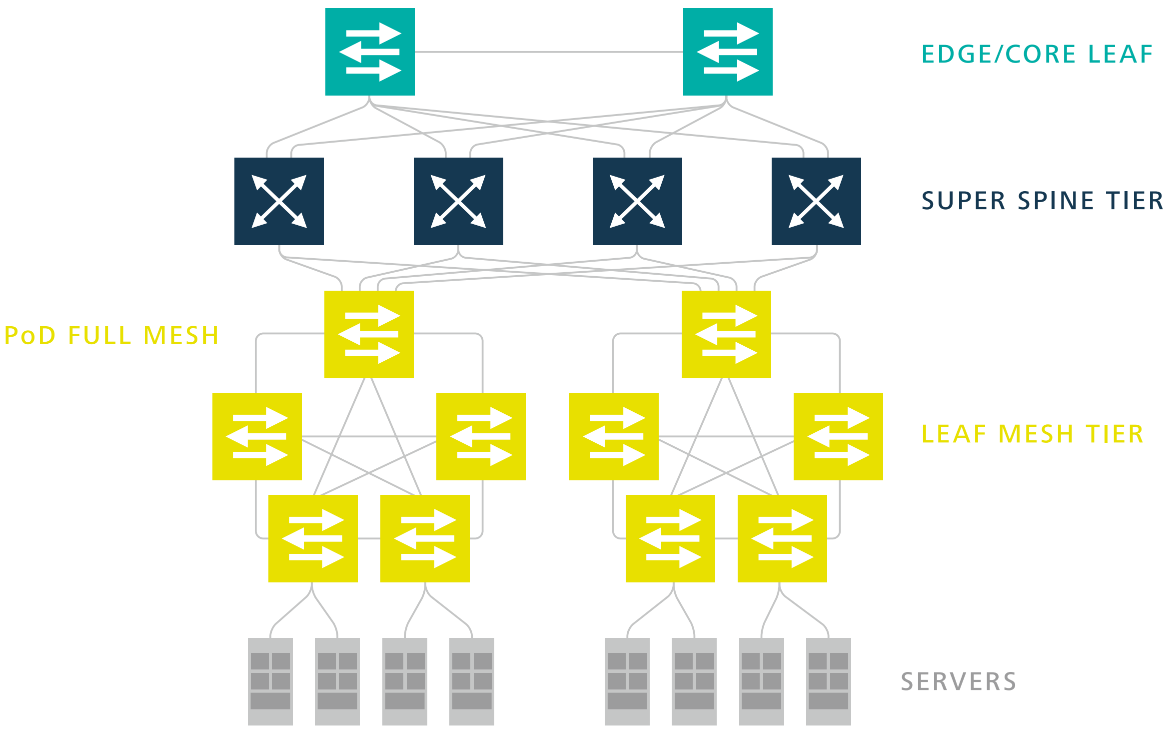
High fault tolerance and improved network resiliency, multiple pathways provide numerous alternate routes if a link or switch fails. Load balancing, traffic can be distributed across multiple paths, improving overall network performance and reliability.

Improves east-west traffic speed. Simplified maintenance, individual components can be taken offline for maintenance without significantly impacting the overall network operation.

Data Centre Architecture

PoD - Point of Delivery

The PoD (Point of Delivery) model, also known as the 'PoD-based model', is a modular approach to data centre design. It involves creating self-contained units (PoDs) that contain all necessary components for a specific portion of the data centre's operations.



Architecture Overview

PoD STRUCTURE

Function: Each PoD is a modular unit that includes compute, storage, networking, and power resources. PoDs are designed to be self-sufficient and can operate independently or in conjunction with other PoDs.

Characteristics: Modular and scalable, PoDs can be easily added, removed, or upgraded as needed. Each PoD is designed to meet specific workload requirements.

Implementation: Uses a combination of copper and fibre optic cabling within each PoD. Networking equipment within a PoD is often organised in a ToR (Top of Rack) or EoR (End of Row) configuration, depending on the specific design.

Key Benefits

Scalability

New PoD's can be added to expand capacity without disrupting existing infrastructure.

Flexibility

Each PoD can be tailored to specific needs, allowing for a mix of different configurations and technologies within the same data centre.

Isolation

Issues within one PoD can be isolated and managed without affecting other PoD's, enhancing reliability and fault tolerance.

Data Centre Connection

Inter-Connect

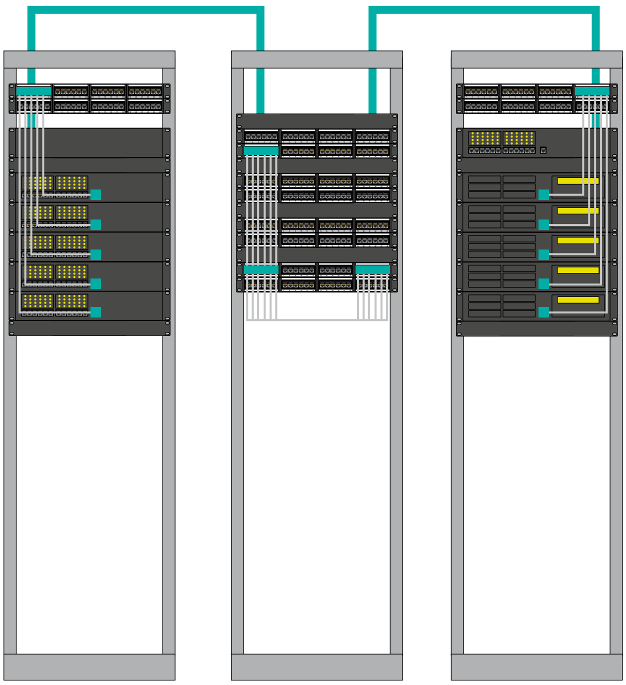
Inter-Connect refers to the connections between different data centres or between different sections within a large data centre.

This method enables the integration of various network segments and facilitates data exchange over larger distances.

Cross-Connect

Cross-Connect refers to the physical and logical interconnection of different network elements within a data centre, typically facilitated through a meet-me room (MMR) or a patch panel.

This method is used to link various network carriers, service providers, and customers within the data centre.



Using the Cabling Guide

Selecting the right optical fibre cabling components to create your overall solution can be complex.

Our cabling guide will give you a number of RapidNet ULTRA cabling solution examples based upon typical migration scenarios.

Use the following steps to help guide your cabling selection;

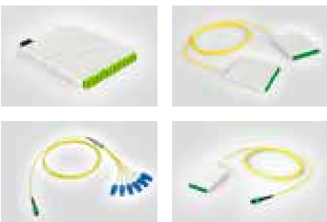
1 What optical transceivers?

Understand which optical transceivers are being used in your connectivity application.

Are you running parallel, duplex or parallel to duplex optics? This will affect your base fibre choice. The application will also determine your connectivity and cabling configurations.

2 What housing?

Choose the relevant 19" Panel Housings to support your density needs and RapidNet ULTRA Cassette format.



3 What components?

Build your RapidNet ULTRA fibre solution by selecting system components. The wide range of configurations mean HellermannTyton can support your unique network demands.

RAPIDNET®

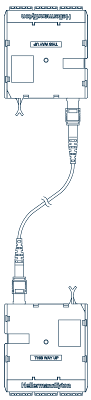
ULTRA

RapidNet ULTRA - Driving your Data Centre

HellermannTyton pioneered the factory terminated and tested cassette based 'plug and play' solution almost three decades ago. Even in today's market, HellermannTyton are unique and renowned for manufacturing a variety of configurations including direct terminated cassette solutions to support today and tomorrow's growing range of applications.

RapidNet ULTRA can deliver network sustainability, flexibility, enhanced loss budget, superior cost efficient solutions for your data centre.

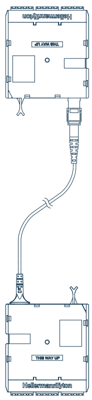
Cassette to Trunk to Cassette



Cassettes with rear MTP connections using separate MTP Trunk cables are the industry's defacto configuration.

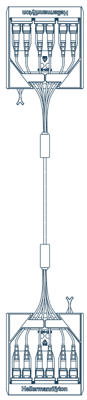
Naturally great for installations with difficult pathways and high re-use benefit but carry a higher insertion loss and are more expensive to produce.

Cassette to Tethered Cassette



Tethered cassettes were pioneered by HellermannTyton and are on the increase in use thanks to Base-8 fibre systems where the MTP tether can be directly connected to QSFP and offer an LC breakout within the cassette.

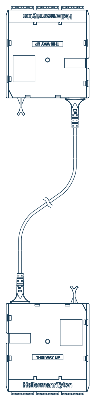
AMC Cassette to Trunk to AMC Cassette



Adaptor Mounted Cassettes (AMC) are used in conjunction with fanout cables weather LC or MTP.

They offer a highly flexible, reduced loss and cost effective approach to network deployment.

Cassette to Cassette



Cassette to cassette configurations are factory terminated links offering the best insertion loss performance and are the most cost effective solution to deploy.

Ideal for more permanent network installation.

MOST — Cabling Flexibility Compromise — LEAST

Most flexible option to accommodate future network migration and upgrades.

System components remain individual allowing them to be re-used, changed or re-installed in-line with future changes.

This configuration retains usage flexibility for example the ability to reuse the tether cassette as a direct QSFP breakout assembly.

Very flexible solution with the use of fanout back bone cables which can be easily re-deployed in future moves, adds and changes.

Least flexible option for potential future upgrades in comparison to other configurations.

Due to the direct termination of connectors this configuration is suited to more permanent installations.

LEAST — Link Cost Efficiency — MOST

The industry standard option forms the base of our cost comparison.
Based on 12F OM4 LC DX cassette with rear MTP (x2) and MTP 12F OM4 B2ca Trunk 30m (x1).

18% More cost effective.

Based on 12F OM4 LC-MTP B2ca Tethered Cassette 30m (x1) and 12F OM4 LC DX cassette with rear MTP (x1).

30% More cost effective.

Based on 12F OM4 LC AMC(x2) and 12F OM4 LC DX B2ca Fanout cable 30m (x1).

46% More cost effective.

Based on 12F OM4 LC- Cassette to LC Cassette B2ca 30m (x1).

HIGHEST — Link Insertion Loss (Db) — LOWEST

Without Patchcords: 1.9dB
With Patchcords: 2.9dB

Without Patchcords: 1.2dB
With Patchcords: 2.2dB

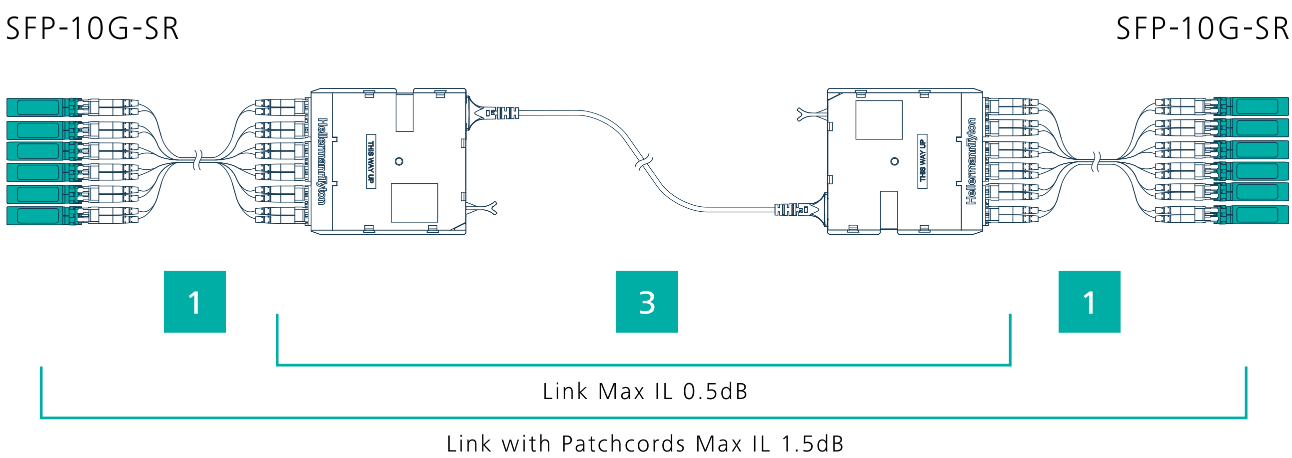
LC Fanout with AMC
Without Patchcords: 0.5dB
With Patchcords: 1.5dB

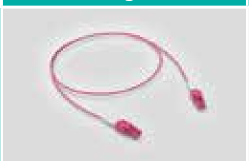
MTP Fanout with AMC
Without Patchcords: 0.7dB
With Patchcords: 2.1dB

Without Patchcords: 0.5dB
With Patchcords: 1.5dB

Cabling Diagrams

10G Multimode Option 1 **10GBase-SR**



	Product Image	Part Code	Description
1		FUABM4LCLCM001M	LC - LC Uniboot Duplex Patchcord A/B Crossover OM4 Magenta LSZH 1m
2		RNU1U12WH	1U 19” Panel Housing for ULTRA12 Cassettes - White
3		RNU12-C-12M4LCLCM010M	ULTRA12 LC Cassette - LC Cassette, Polarity C, 12F OM4 Magenta LSZH B2ca 10m

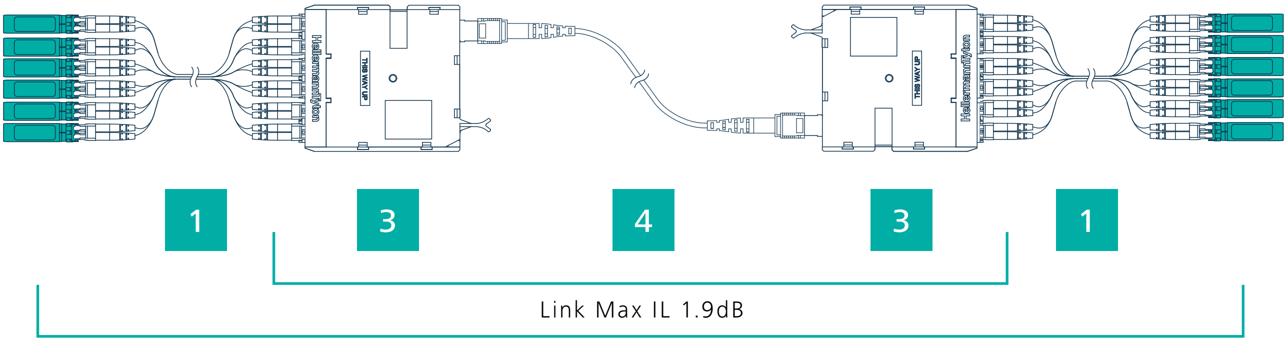
Images for illustration purposes only. Other configurations available.

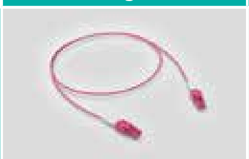
10G Multimode Option 2

10GBase-SR

SFP-10G-SR

SFP-10G-SR



	Product Image	Part Code	Description
1		FUABM4LCLCM001M	LC - LC Uniboot Duplex Patchcord A/B Crossover OM4 Magenta LSZH 1m
2		RNU1U12WH	1U 19” Panel Housing for ULTRA12 Cassettes - White
3		RNU12-A-12M4LC1M	ULTRA12 LC Cassette - 1x Rear MTP, Polarity A, 12F OM4
4		FLC12M4-NFNFM-10.0M	MTP Pro Trunk Cable - Polarity C - 12F OM4 LSZH B2ca Magenta 10m

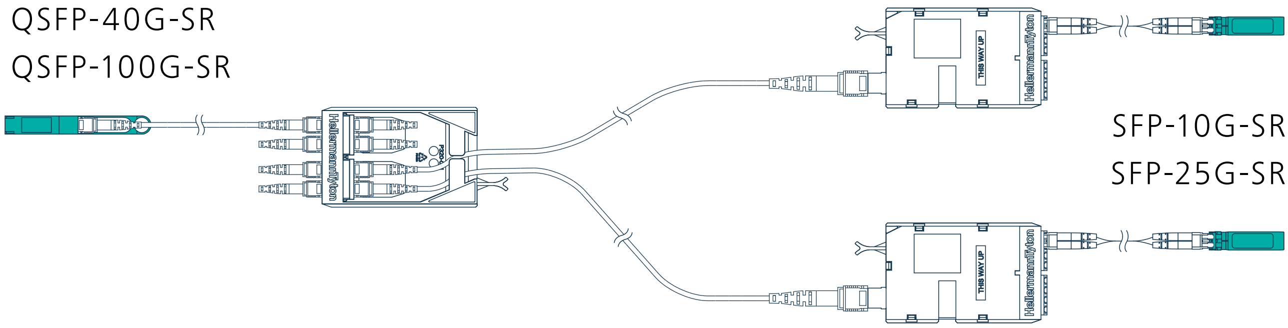
Images for illustration purposes only. Other configurations available.

Cabling Diagrams

40G Multimode Option 1 — **40GBase-SR to 4x 10GBase-SR**

100G Multimode Option 1 — **100GBase-SR to 4x 25GBase-SR**

QSFP-40G-SR
QSFP-100G-SR



SFP-10G-SR
SFP-25G-SR

1 2 3 4 5

Link Max IL 1.3dB

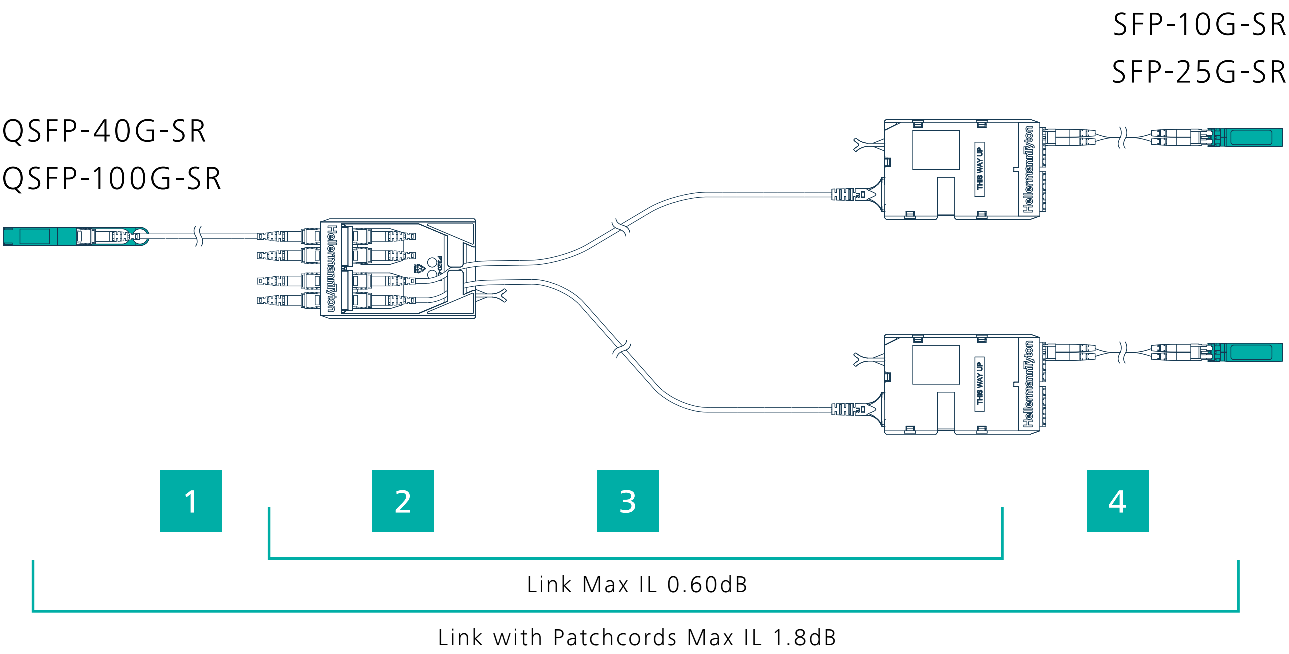
Link with Patchcords Max IL 2.5dB

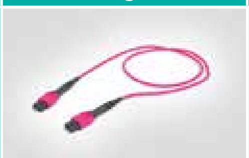
	Product Image	Part Code	Description
1		FLS08M4-NFNFM-01.0M	MTP Pro Trunk Cable - Polarity A - 8F OM4 LSZH B2ca Magenta 1m
2		RNUAMC8-M1M	ULTRA8 AMC (Adaptor Mounting Cassette) - 4x MTP KU/KD Magenta Adaptors
3		FLW08M4-NFNFM-10.0M	MTP Pro Trunk Cable - Polarity B - 8F OM4 LSZH B2ca Magenta 10m
4		RNU8-Q-08M4LC1M	ULTRA8 LC Cassette - 1x Rear MTP, QSFP, 8F OM4
5		FUABM4LCLCM001M	LC - LC Uniboot Duplex Patchcord A/B Crossover OM4 Magenta LSZH 1m
6		RNU1U8WH	1U 19” Panel Housing for ULTRA8 Cassettes - White

Images for illustration purposes only. Other configurations available.

40G Multimode Option 2 — **40GBase-SR to 4x 10GBase-SR**

100G Multimode Option 2 — **100GBase-SR to 4x 25GBase-SR**



	Product Image	Part Code	Description
1		FLS08M4-NFNFM-01.0M	MTP Pro Trunk Cable - Polarity A - 8F OM4 LSZH B2ca Magenta 1m
2		RNUAMC8-M1M	ULTRA8 AMC (Adaptor Mounting Cassette) - 4x MTP KU/KD Magenta Adaptors
3		RNU8-Q-08M4LCNFM010M	ULTRA8 Tethered Cassette, LC – MTP Pro, 8F QSFP OM4 B2ca LSZH Magenta 10m
4		FUABM4LCLCM001M	LC - LC Uniboot Duplex Patchcord A/B Crossover OM4 Magenta LSZH 1m
5		RNU1U8WH	1U 19” Panel Housing for ULTRA8 Cassettes - White

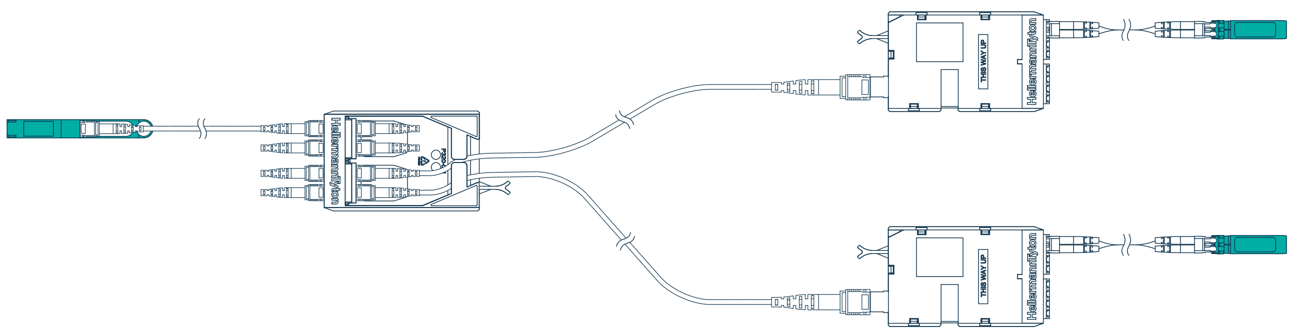
Images for illustration purposes only. Other configurations available.

Cabling Diagrams

200G Multimode Option 1 **200GBase-SR4 to 4x 50GBase-SR**

QSFP56-200G-SR

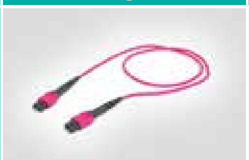
SFP56-50G-SR



1 2 3 4 5

Link Max IL 1.3dB

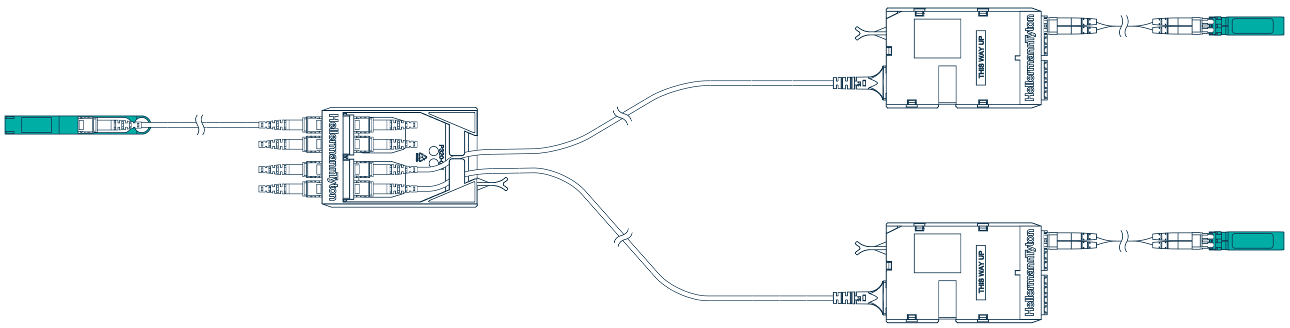
Link with Patchcords Max IL 2.5dB

	Product Image	Part Code	Description
1		FLS08M4-NFNFM-01.0M	MTP Pro Trunk Cable - Polarity A - 8F OM4 LSZH B2ca Magenta 1m
2		RNUAMC8-M1M	ULTRA8 AMC (Adaptor Mounting Cassette) - 4x MTP KU/KD Magenta Adaptors
3		FLW08M4-NFNFM-10.0M	MTP Pro Trunk Cable - Polarity B - 8F OM4 LSZH B2ca Magenta 10m
4		RNU8-Q-08M4LC1M	ULTRA8 LC Cassette - 1x Rear MTP, QSFP, 8F OM4
5		FUABM4LCLCM001M	LC - LC Uniboot Duplex Patchcord A/B Crossover OM4 Magenta LSZH 1m
6		RNU1U8WH	1U 19” Panel Housing for ULTRA8 Cassettes - White

Images for illustration purposes only. Other configurations available.

200G Multimode Option 2 **200GBase-SR4 to 4x 50GBase-SR**

QSFP56-200G-SR SFP56-50G-SR



1 2 3 4

Link Max IL 1.3dB

Link with Patchcords Max IL 2.5dB

	Product Image	Part Code	Description
1		FLS08M4-NFNFM-01.0M	MTP Pro Trunk Cable - Polarity A - 8F OM4 LSZH B2ca Magenta 1m
2		RNUAMC8-M1M	ULTRA8 AMC (Adaptor Mounting Cassette) - 4x MTP KU/KD Magenta Adaptors
3		RNU8-Q-08M4LCNFM010M	ULTRA8 Tethered Cassette, LC – MTP Pro, 8F QSFP OM4 B2ca LSZH Magenta 10m
4		FUABM4LCLCM001M	LC - LC Uniboot Duplex Patchcord A/B Crossover OM4 Magenta LSZH 1m
5		RNU1U8WH	1U 19” Panel Housing for ULTRA8 Cassettes - White

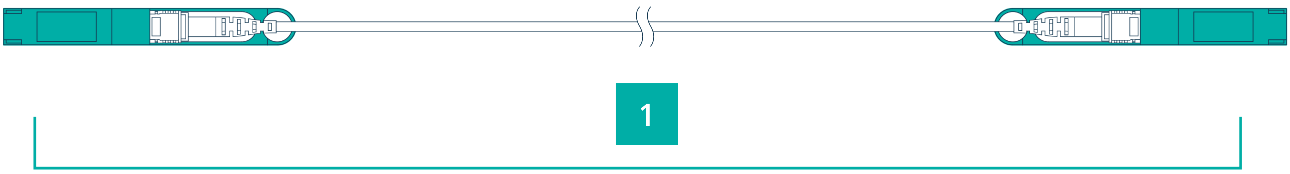
Images for illustration purposes only. Other configurations available.

Cabling Diagrams

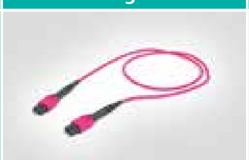
100G/200G/400G Multimode Option 1

100GBase-SR4, 200GBase-SR4.2, 400GBase-SR16

QSFP28-100G-SR4	QSFP28-100G-SR4
QSFP56-200G-SR4	QSFP56-200G-SR4
QSFPDD-400G-SR4.2	QSFPDD-400G-SR4.2
QSFPDD-400G-SR16	QSFPDD-400G-SR16



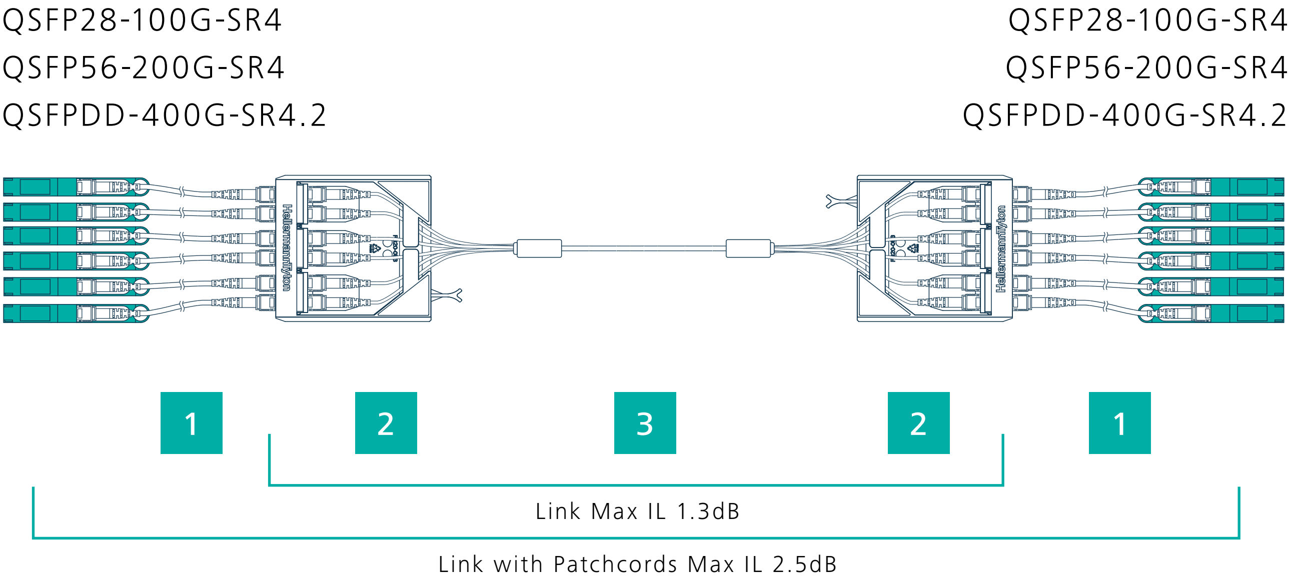
Link Max IL 0.70dB

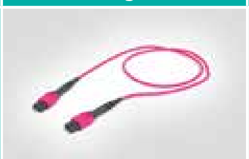
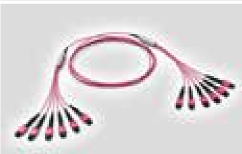
	Product Image	Part Code	Description
1		FLW08M4-NFNFM-10.0M	MTP Pro Trunk Cable - Polarity B - 8F OM4 LSZH B2ca Magenta 10m

Images for illustration purposes only. Other configurations available.

100G/200G/400G Multimode Option 2

100GBase-SR4, 200GBase-SR4, 400GBase-SR4.2



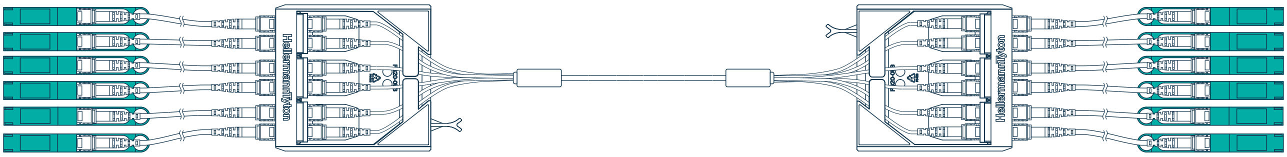
	Product Image	Part Code	Description
1		FLW08M4-NFNFXM-02.0M	MTP Pro Trunk Cable - Polarity B - 8F OM4 LSZH B2ca Magenta 2m
2		RNUAMC12-M1M	ULTRA12 AMC (Adaptor Mounting Cassette) - 6x MTP KU/KD Magenta Adaptors
3		FLW48M4-NFNF6M-02.0M	MTP Pro Hydra Trunk Cable - 48F OM4 LSZH B2ca - 6x MTP - 6x MTP - 2m
4		RNU1U12WH	1U 19" Panel Housing for ULTRA12 Cassettes - White

Images for illustration purposes only. Other configurations available.

Cabling Diagrams

400G Multimode Option 1 **400GBase-SR16**

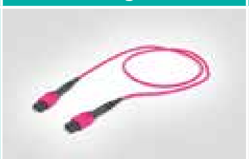
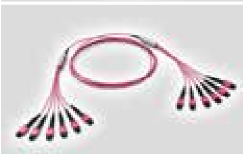
QSFP28-100G-SR4 QSFP56-200G-SR4 QSFPDD-400G-SR4.2	QSFP28-100G-SR4 QSFP56-200G-SR4 QSFPDD-400G-SR4.2



1 2 3 2 1

Link Max IL 1.3dB

Link with Patchcords Max IL 2.5dB

	Product Image	Part Code	Description
1		FLW16M4-NFNFXM-02.0M	MTP Pro Trunk Cable - Polarity B - 16F OM4 LSZH B2ca Magenta 2m
2		RNUAMC12-M2M	ULTRA12 AMC (Adaptor Mounting Cassette) - 6x MTP KU/KD Magenta Adaptors
3		FLW96M4-NFNF6M-02.0M	MTP Pro Hydra Trunk Cable - 96F OM4 LSZH B2ca - 6x MTP - 6x MTP - 2m
4		RNU1U12WH	1U 19” Panel Housing for ULTRA12 Cassettes - White

Images for illustration purposes only. Other configurations available.

ULTRA12 & ULTRA8

RapidNet ULTRA Cassettes

LC, CS, SN, MTP

RapidNet ULTRA cassettes are designed to efficiently transition MTP backbone assemblies into front presentation small form factor (SFF) or very small form factor (VSFF) connectivity. Cassettes are factory terminated and tested offering best in class ultra low loss connectivity (ULL) for rapid deployment of ULTRA8 or ULTRA12 fibre systems.

The compact design allows for ultra high density installations to be realised, maximising critical connectivity real estate. RapidNet ULTRA cassettes are available in two footprints ULTRA8 which has been optimised for 8 fibre deployments and ULTRA12 which services 12 fibre deployments and forms the basis for the rest of the RapidNet ULTRA Solution.

Cassette assemblies are made with 250um Corning® SMF-28® fibres for Singlemode and ClearCurve® fibres for Multimode.

Features and Benefits:

- Rear MTP elite connectivity
- Factory terminated & tested
- Best in class ultra low loss connectivity
- Effortless plug & play system
- Supports OS2 G657-A1, OM4 & OM5 Fibre specifications
- UL94 V0 Compliant
- Singlemode made with Corning® SMF-28® Fibres
- Multimode made with Corning® ClearCurve® Fibres

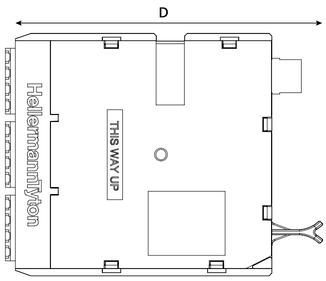
ULTRA12 Cassette

RapidNet ULTRA12 SN (front view).

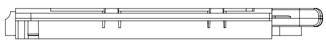
RapidNet ULTRA12 SN (rear view).

Dimensions (mm)	L	W	H
	120	94	12
Capacity	LC	CS	SN
Per Cassette	12f	18f	24f
Per U	144f	216f	288f

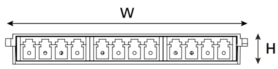
Technical Diagrams



RapidNet ULTRA12 LC (top view).



RapidNet ULTRA12 LC (side view).



RapidNet ULTRA12 LC (front view).

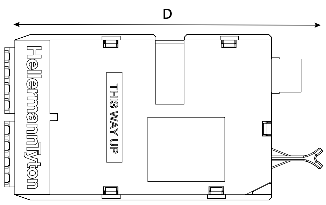
ULTRA8 Cassette

RapidNet ULTRA8 LC (front view).

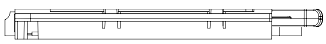
RapidNet ULTRA8 LC (rear view).

Dimensions (mm)	L	W	H
	120	64.5	12
Capacity	LC	CS	SN
Per Cassette	8f	12f	16f
Per U	144f	216f	288f

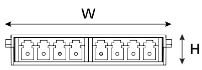
Technical Diagrams



RapidNet ULTRA8 LC (top view).



RapidNet ULTRA8 LC (side view).



RapidNet ULTRA8 LC (front view).

RapidNet ULTRA Tethered Cassette

RapidNet ULTRA tethered cassettes are a factory terminated and tested cassette to MTP cabled assembly. The micro fibre cable is terminated directly from a single MTP connector to the front connectors. This offers an effective way to reduce the number of connections in your fibre deployment and improve system loss.

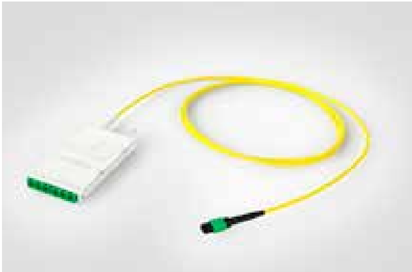
Tail ends can be connected to another RapidNet ULTRA Cassette or directly into QSFP interfaces.

Cassette assemblies are made with 250um Corning® SMF-28® fibres for Singlemode and ClearCurve® fibres for Multimode.

Features and Benefits:

- Available in ULTRA8 and ULTRA12 cassette footprints
- Supports OS2 G657-A1, OM4 & OM5
- Supports LC, CS, SN front presentation connectivity
- Tail end available in MTP Elite or Pro (pinned/unpinned)
- Bare end tail for on-site splicing available
- Single or double jacket micro fibre cable
- Made to order bespoke lengths
- Singlemode made with Corning® SMF-28® Fibres
- Multimode made with Corning® ClearCurve® Fibres

RapidNet ULTRA12 Tethered LC Cassette (front view).



RapidNet ULTRA12 Tethered CS Cassette to MTP (rear view).

RapidNet ULTRA Cassette to Cassette Assembly

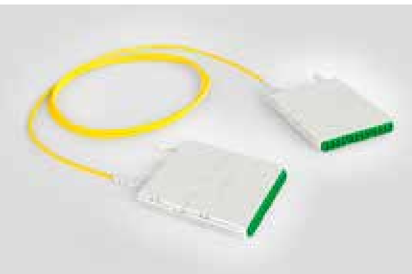
RapidNet ULTRA cassette to cassette assemblies are the cornerstone of HellermannTyton's RapidNet system. They have been the leading configuration throughout the RapidNet life cycle. RapidNet ULTRA offers this popular format which benefits the user by reducing the number of components required for installation, making this configuration one of the fastest 'plug & play' solutions available in the market.

The cable is directly factory terminated in both cassettes therefore reducing the number of connections and improving fibre loss.

Cassette assemblies are made with 250um Corning® SMF-28® fibres for Singlemode and ClearCurve® fibres for Multimode.

Features and Benefits:

- Available in ULTRA8 and ULTRA12 cassette footprints
- Reduced insertion loss performance
- Supports OS2 G657-A1, OM4 & OM5
- Supports LC, CS, SN front presentation connectivity
- Rapid deployment, plug & play high density fibre solution
- Single or double jacket micro fibre cable
- Made to order bespoke length
- Singlemode made with Corning® SMF-28® Fibres
- Multimode made with Corning® ClearCurve® Fibres



RapidNet ULTRA12 LC Cassette to LC Cassette Assembly (front view).

RapidNet ULTRA12 LC Cassette to LC Cassette Assembly (rear view).

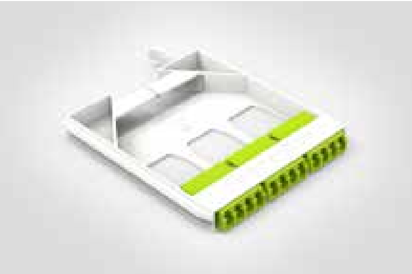
ULTRA12 & ULTRA8

RapidNet ULTRA AMC

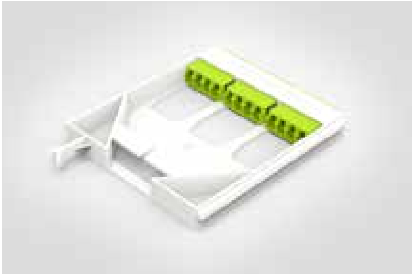
RapidNet ULTRA Adaptor Mounting Cassettes (AMC) are factory loaded with specified adaptors including LC, SN, CS and MTP. The AMC facilitates mating between assembly connectors including MTP trunk and harness cables, small form factor and very small form factor, fanout, harness and jumper cables.

Features and Benefits:

- Available in ULTRA12 and ULTRA8 cassette footprints
- Supports singlemode UPC / APC and multimode UPC Adaptors
- Can be pre-loaded with LC, CS, SN or MTP connectivity
- LC offers 144f per 1U — MTP 16f offers 1152f Per 1U
- Ideal for managing patching fields and fan-out cables



RapidNet ULTRA12 AMC (front view).



RapidNet ULTRA12 AMC (rear view).

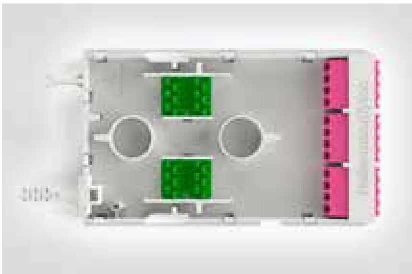
RapidNet ULTRA Splice Cassette

RapidNet ULTRA splice cassettes are available in the ULTRA12 format only.
Splice cassettes offer a convenient and flexible solution for on-site splicing of high density fibre systems and are ideal for maintenance and repair scenarios. Each cassette is preloaded with 12 pigtails and corresponding adaptors.

Features and Benefits:

- Available in ULTRA12 cassette footprint only
- Supports OS2 G657-A1, OM4 & OM5
- Supports LC, CS, SN front presentation connectivity
- Pre-loaded pigtails and adaptors
- Convenient and flexible option for low volume MACs
- Best in class ultra low loss connectivity

RapidNet ULTRA12 Splice Cassette (front view).



RapidNet ULTRA12 Splice Cassette (top view - open).

RapidNet ULTRA MTP Shuffle Cassette

RapidNet ULTRA MTP shuffle cassettes are designed to support the growing implementation of Mesh or Spine & Leaf network architectures in today's advanced data centre.

The shuffle cassette is produced with 4x MTP at the front and rear using 12f MTP elite connectors.

Available for both singlemode or multimode applications.

Features and Benefits:

- Available in ULTRA12 cassette footprint only
- Supports OS2 G657-A1, OM4 & OM5
- Pre-loaded with 4x MTP rear & 4x MTP front
- Supports 12f MTP for today's data centre network architecture

RapidNet ULTRA MTP Shuffle Cassette (front view).

RapidNet ULTRA MTP Shuffle Cassette (rear view).

RapidNet ULTRA Cassette Housing

RapidNet ULTRA Cassette housings are industry standard 19” mountable hardware for housing both RapidNet ULTRA8 and ULTRA12 cassettes.

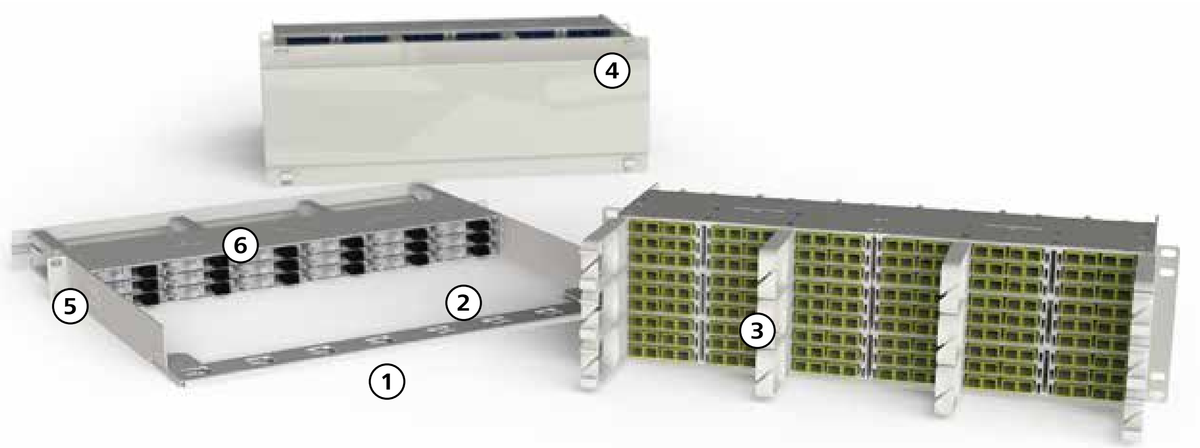
Available in 1U, 2U, 3U & 4U heights Housings come standard with integrated rear cable management support, adjustable side mounting brackets, integrated front patchcord management rings and removable swing down patching field cover. A port identification labelling matrix is pre-installed on the inside of the cover.

The housings come pre-assembled with mounting kit, ready to install straight into the rack. Painted with RAL9003 Signal white to increase light reflectance which helps to improve in rack visibility alongside supporting reduced energy costs from lighting.

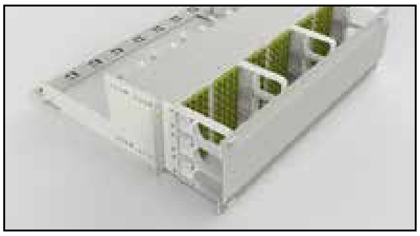
Features and Benefits:

- High fibre density: LC 144f, CS 216f, SN 288f per U
- Rear loading cassettes
- Integrated rear cable management
- Integrated front patchcord management rings
- Adjustable mounting brackets
- Patching field swing down cover
- Identification label matrix
- 19” Mounting profile
- Signal White RAL9003
- Fast, one person installation

Housing Size		1U	2U	3U	4U
Cassette Capacity	ULTRA8	18	36	54	72
	ULTRA12	12	24	36	48
No. of Rows		3	6	9	12
Fibre Capacity (LC)		144f	288f	432f	576f
Fibre Capacity (CS)		216f	432f	648f	864f
Fibre Capacity (SN)		288f	576f	864f	1152f



1 **Easy one person installation**



3 **Integrated front management rings**

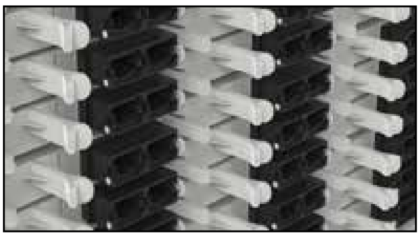
5 **Adjustable mounting profiles**

2 **Integral cable management**

Supports incoming cables and fanout manifolds

4 **Removable drop down patching field cover + port ID matrix**

6 **Rear plug & play cassette entry**



ULTRA12 & ULTRA8

RapidNet ULTRA Multi-Fibre Assemblies

RapidNet ULTRA multi-fibre assemblies are designed, manufactured and tested to the highest quality to support critical data centre infrastructure and sensitive high bandwidth multi-fibre systems. The fibre assemblies all benefit from best in class ultra-low loss connectivity. Assemblies are produced using 3.0mm round cable for multi-fibre cables or 2.0mm cable for the fan-out legs helping reduce overall cable volume in containment and maintain good air flow within the rack or cabinet. Multi-Fibre Assemblies can be made bespoke to your requirement, giving you choice and flexibility in your network design. Fibre assemblies are available in a variety of fibre counts and specifications to support OS2, OM4 and OM5 facilitating requirements from 10G to 400G and beyond.

Our mult-fibre assemblies are produced using 250um Corning® SMF-28® fibres for Singlemode and ClearCurve® fibres for Multimode.

MTP Trunk Cables

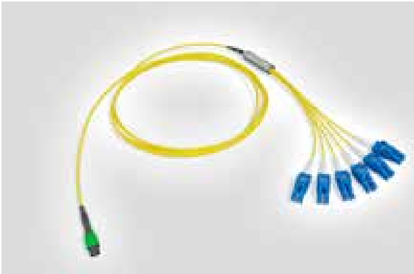
MTP trunk cables support backbone requirements and cross-connection patching within a data centre network. Available as standard with female (non-pinned) MTP Elite Connectors and benefiting from 3.0mm multi-fibre micro cables for optimised airflow and cable volume reduction.

RapidNet ULTRA MTP Trunk Cable.

MTP Harness Links

MTP harness links are designed to offer a breakout from multi-fibre MTP connectivity to LC connectivity or very small form factor connectors such as CS or SN. Harness links are designed to enable interconnection between active equipment and patching interfaces or create a cross-connect point between passive patching fields.

Available in singlemode and multimode, harness links benefit from LC uni-boot connectors and female (non-pinned) MTP Elite connectors.

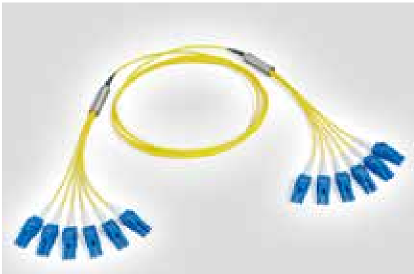


RapidNet ULTRA MTP Harness Link.

Multi-Fibre Assemblies

Multi-fibre assemblies are produced with a variety of cable and connector combinations. Options include LC, MTP, CS and SN connectors.

Available with either single and double jackets supporting singlemode and multimode specifications with fibre counts from 8 to 144. Multi-Fibre Assemblies offer an effective way to rapidly deploy patching where higher density is required while reducing installation time and risk of error.



RapidNet ULTRA Multi-Fibre Assembly.

Fibre Jumpers

Fibre jumpers are produced with field reverse-polarity Uni-boot LC connectors. The 2-fibre 1.85mm diameter single round cable design adds to the overall reduction of space taken up by patching cables and supports the increasing requirement for high-density installations.

Jumpers are available in both multimode and singlemode fibre, with specifications carrying a superior macro-bending performance with minimal bend-induced attenuation loss which tolerates a minimum bend-radius of 10 mm, reducing signal decay and system downtime

Other connectivity options include CS and SN connectors with both UPC and APC polishes available for singlemode applications.

RapidNet ULTRA Fibre Jumper.

RapidNet ULTRA from HellermannTyton

Designed with our 30years of industry knowledge and experience

HellermannTyton is an established leader in the design, development and manufacture of innovative network infrastructure solutions for both internal and external copper and fibre networks.

At HellermannTyton we pride ourselves on being a leading solutions provider, offering quality end to end network systems, industry and technical expertise and first-class customer service and support.

Our extensive LAN product range covers Cat6A and Cat6 solutions as well as fibre connectivity and a comprehensive range of accessories. To strengthen our range further, all of our copper and fibre solutions are available in our world leading RapidNet pre-terminated format.

Market and Industry Knowledge
Selecting HellermannTyton for your network infrastructure gives you peace of mind, knowing that the system can be installed easily, will perform well first time, and will continue to operate at the highest levels throughout its life.

In the unlikely event that there are any difficulties, you have the reassurance of the UK technical support and a warranty that is backed by the larger HellermannTyton Group with a long history in the industry. Ultimately, the choice of HellermannTyton significantly reduces the risk of your project.

Benefits of HellermannTyton

- Quality of the products, designs and materials
- Credibility of our 25-year system warranty
- Over 30 year of industry knowledge
- UK design capability
- Environmentally responsible
- Established UK manufacturer

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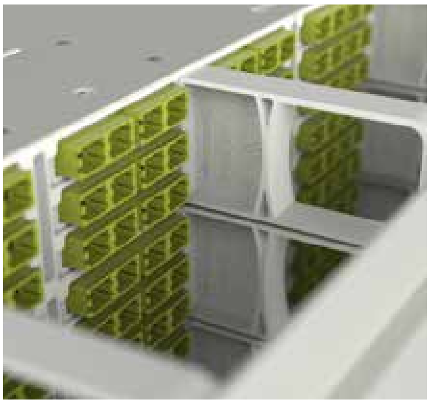
Keep up to date with all our new product releases and news.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