CABLExpress Installation Best Practices Guide

Published April 2020

Implementation of these outlined installation best practices will ensure the best environment for proper functioning of your CABLExpress cables. These guidelines help improve operations by minimizing the risk of failure due to inadequate planning, mishandling of fiber cabling, improper testing, and reducing installation time.

> *These guidelines help improve operations by minimizing the risk of failure*

The following guidelines are recommended as best practices pre-, post-, and during installation of CABLExpress Skinny-Trunk® products in accordance with the TIA-942 Data Center Standard and our own experience!

Port Mapping/Assignment

Prior to engineering your cabling design, the CABLExpress architects will request your data center hardware layout design. This map should include the cabinet placements, patch panels, hardware, port-counts, trunking locations and power access connection points. Future plans for change will be discussed, as well as the bandwidth required.

The architects will use this detail and additional information gathered, to build the cabling infrastructure design. The design's intent is to minimize future errors due to snags, awkward cable access, slack, and unprotected connections in trafficked areas. The design's goal is to maximize efficiency using loss budgets productively.

Product Name	Port ID	Column1	Destination Product Name	Des. Port ID	Port Type	Location
Completed						
Completed Other End						
Management Ports – like PDU's not connected						
QTS-MLPS-SW01	Port 7		QTS-N5K-SW01	Port 7	SFP/Fiber	Row2 Rack5/ Row2 Rack4
QTS-MLPS-SW01	Port 8		QTS-N5K-SW01	Port 8	SFP	Row2 Rack5/ Row2 Rack4
QTS-MLPS-SW01	Port 9		QTS-N5K-SW01	Port 9	SFP/Ethernet	Row2 Rack5/ Row2 Rack4
QTS-MLPS-SW01	Port 10		QTS-N5K-SW01	Port 10	SFP	Row2 Rack5/ Row2 Rack4
QTS-4948-R2-4B	Port 1		C7000 USE815A4R8	Card 6 Port 3	Ethernet	Row1 Rack2/Row2 Rack2
QTS-4948-R2-4B	Port 2		C7000 USE815A4R8	Card 6 Port 5	Ethernet	Row1 Rack2/Row2 Rack2
QTS-4948-R2-4B	Port 3		C7000 USE815A4R8	Card 6 Port 2	Ethernet	Row1 Rack2/Row2 Rack2
QTS-4948-R2-4B	Port 4		C7000 USE815A4R8	Card 6 Port 1	Ethernet	Row1 Rack2/Row2 Rack2
QTS-4948-R2-4B	Port 5		C7000 USE815A4R8	Card 6 Port 6	Ethernet	Row1 Rack2/Row2 Rack2
QTS-4948-R2-4B	Port 6		C7000 USE815A4R8	Card 2 Port 1	Ethernet	Row1 Rack2/Row2 Rack2
QTS-4948-R2-4B	Port 26		C7000 USE815A4R8	Card 2 Port 3	Ethernet	Row1 Rack2/Row2 Rack2
QTS-4948-R2-4B	Port 27		C7000 USE815A4R8	Card 2 Port 2	Ethernet	Row1 Rack2/Row2 Rack2
QTS-4948-R2-4B	Port 29		C7000 USE815A4R8	Card 2 Port 4	Ethernet	Row1 Rack2/Row2 Rack2
QTS-4948-R2-4B	Port 30		C7000 USE815A4R8	Card 2 Port 5	Ethernet	Row1 Rack2/Row2 Rack2
QTS-N2K-02	Port 19		C7000 USE045V4CT	Card 1 Port 1	Ethernet	Row1 Rack2/Row2 Rack2
QTS-N2K-02	Port 20		C7000 USE045V4CT	Card 1 Port 2	Ethernet	Row1 Rack2/Row2 Rack2
QTS-N2K-02	Port 27		C7000 USE945V2F7	Card 2 Port 3	Ethernet	Row1 Rack2/Row2 Rack2
QTS-N2K-02	Port 28		C7000 USE945V2F7	Card 2 Port 4	Ethernet	Row1 Rack2/Row2 Rack2

The finalized layout and port counts are critical to an architect's effective design. The layout should include the destinations of the trunk assemblies, referred to as "Trunking Locations."

Confirm the document is up-to-date and reflects any possible last-minute changes that may have occurred under the floor or in overhead conveyances. Be sure to review this map with the other users in your organization such as the Facilities, Network, and Storage teams.

?

Why is this necessary?

Trunks are custom-built and cannot be returned. Mistakes in length of the trunk or connections due to changes could be costly for you.

Preparation

Before you begin:

Take inventory of all components received onsite to match to the bill of materials provided with the design. If installation will be delayed, store your purchased cabling products in their original packaging in a safe area where they will not be damaged or misplaced.

?

Why is this necessary?

Your product warranty generally only covers defects or errors caused during the manufacturing process. In the event product is damaged due to handling at your facilities, you will be responsible for the cost of replacement. In addition, trunks are custom-made and will take some time to make. If your inventory is | short, or product is damaged, you will not be able to get replacements overnight.

Make sure that you have all of the tools and materials you will need to complete your installation, including: Velcro and cable management, scissors to remove twist ties, a garbage bag for the packaging, a fiber cleaner (if needed), and cable labeling (if needed).

Installation

When work is ready to begin:

Remove all product from the cardboard shipping containers before bringing them into your data center.

Why is this necessary?

Fibers from the cardboard packaging can become airborne and damage the hardware inside the data center.

Labeling Scheme

Your label numbering scheme should match the TIA-606-C published standards for all jumpers and patch cords, labeled by:

- Cabinet number
- Rack unit
- Port location
- Or labeling specified in scope

> *Your label numbering scheme should match the TIA-606-C published standards*

Why is this necessary?

Using the standard provides consistency and a format that should be recognizable to installers working in your data center.

For longer lengths, label your trunk cables at both ends with length, origination, and destination information.

Why is this necessary?

You don't want your installer to pull a 200-foot cable through its designed route only to discover the wrong cable or the wrong end was pulled (see more information below in section titled "Don't Pull Too Hard").

Breakout and Stagger Lengths

Breakout lengths are the distance from the furcation point (where the individual cables separate from the consolidated, single sheathing) to the end of the connectors. These breakout lengths can be staggered to plug into specific ports, patch panels, and/or hardware.

CABLExpress has pre-engineered staggers for all common hardware types with the intent of creating a tidy, slack-free installation to minimize accidental pulls and create an aesthetically pleasing result.

It's important to match any staggers to the correct equipment. Use the location layout to match any specific pre-engineered staggers to the applicable equipment into which they are being plugged.

CABLExpress has pre-engineered staggers for all common hardware types
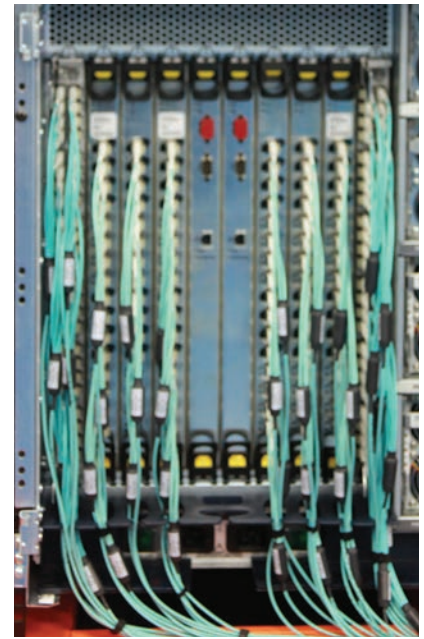
Fiber Optic Service Loops

Service loops are created when additional length is added to a cable for contingencies. If needed, short service loops (three to six feet) are helpful when trunk lengths are cut using estimated lengths. This overage allows the option to move patch panels or enclosures within the cabinet.

The downside to service loops is the potential for too much congestion in the cable pathways. Most pre-terminated systems today do not require additional cable added for service loops. Ultimately, this is best determined through a discussion of specific applications between you and your design architect.

Be sure to manage service loops using Velcro in a circle with at least four mounting points.

Why is this necessary?

This keeps cable tight and prevents unraveling.

If space for service loops is at a minimum, consider running trunks into a figure 8 to better help manage the length.

Why is this necessary?

The coil can get deep quickly and a figure 8 will provide more room.

Whether service loops will be managed on the sides of a cabinet vertically or at a specific rack unit(s) horizontally is determined by the data center operator. Do not mount service loops in conveyance unless specified in the design.

Why is this necessary?

They can interfere with access to the cabled hardware units.

Confirm with the design or Port Map document if trunking is to come from both sides of the cabinet (left and right) or just one side of the cabinet. Reference the Port Map document to determine if a trunk is to span into two separate enclosures.

If the trunk does plug into two separate enclosures, plug the trunk connectors into the specified ports first, then secure the furcation or breakout point.

Why is this necessary?

This will ensure you do not damage the assembly when pulling on the fiber optic "legs."

Cat6 Copper Service Loops

Copper trunking is thicker and stiffer than fiber optic trunking. Copper also can have negative performance results from crosstalk when too many strands are bunched together in a bundle or tight space.

It can be helpful to allow movement of patch panels inside the cabinet with service loops for both fiber and copper, if growth is expected.

It can be helpful to allow movement of patch panels inside the cabinet with service loops for both fiber and copper, if growth is expected. However, copper trunk service loops quickly can become unmanageable in typical server cabinets. If the cabinet is two feet wide and less than four feet deep, plan for minimal service loops, or no service loops at all.

Color Coding

TIA-606-C documents the official standards for cable colors. Beyond these, you can choose specific colors for your data center that define specific factors of your choice. But be consistent.

If possible, post a color code definition diagram near the doors so anyone working in the data center can immediately recognize critical paths.

Furcation Points

When securing fiber trunks to enclosures, racks, or cabinets, only use zip ties on the trunks' furcation points. The furcation point is designed for this, as it has a metal sleeve to protect the fiber. There are only two per trunk, one per side. They are black in color.

For all other applications use ONLY Velcro.
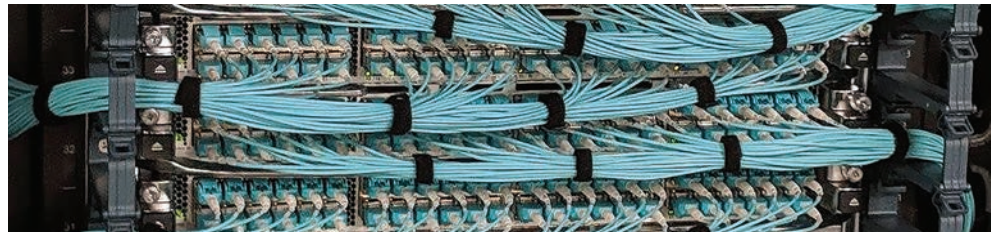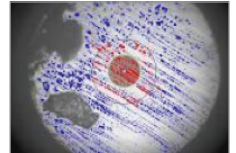
Why is this necessary?

Using zip ties on the fiber optic jacket directly can break the fibers.

Inspect/Clean

The tip of the fiber connector, where the fiber optic glass protrudes, is the most common area for damage to occur. Protective caps should be left on until immediately prior to installation.

Before plugging into a port or patch panel, the installer must inspect the surface of the fiber optic glass end point (ferrule) with a microscope and, if needed, clean the connector with a one-click cleaner. Inspect a second time after cleaning before plugging in.

> *Inspect the surface of the fiber optic glass end point (ferrule) with a microscope and, if needed, clean the connector*

Why is this necessary?

Even though your fiber connector will have a protective cap of some kind on it, any cover can attract dust as it moves through the air to settle on the tip. Condensation can also form in the bag the fiber is packaged in and find its way under the cap. There is also a chance that some human hands have touched it, or a particulate has scratched it. You want to remove the contaminants prior to connecting.

Cable Management

When installing fiber optic jumpers and copper patch cords from the patch panel to active ports within the same cabinet, use a combination of horizontal and vertical cable management to route cables from the left side of the patch panel to left side active ports, and the right side of the patch panel to right side active ports.

Why is this necessary?

Careful cable placement facilitates access to transceivers and ports both in active equipment and patch panels. This allows for the addition of new cables and later removal of them when they are no longer needed. It also allows easier location of a specific cable.

"Patch cords are interconnect cables, which means they should be deployed within racks or cabinets and should not be deployed in ladder racks."

Use cable managers in all new cabling applications. For copper, use horizontal D-ring style cable managers in a 1U or 2U footprint.

For fiber optic cable, use horizontal finger style with front cover cable managers in a 1U or 2U footprint. Consider wide body cabinets (wider than 24 inches) along with vertical cable managers (4", 6" or 12" wide) for core cabinets, main patch cabinets, or cross-connect cabinets.

Why is this necessary?

These cabling interchanges often have much more cabling than a rack or wiring closet, so additional space is needed for clean cable management.

Accessibility considerations are critical when mounting and/or installing cables. Always make sure that access to other major components is not blocked. Also, avoid excessive twisting or stress on pre-terminated cables during installation.

Why is this necessary?

Excessive stress can break and/or damage an assembly, causing it to improperly pass network traffic.

Patch cords are interconnect cables, which means they should be deployed within racks or cabinets and should not be deployed in ladder racks.

Why is this necessary?

This product type is designed to operate optimally within racks and cabinets at short lengths. Patch or jumper cables should not be used as "trunk or backbone" interconnections or deployed under the floor or in ladder racks or basket trays. Using it outside these parameters can lead to damage or pressure on the small fiber jumper cables, which could potentially increase loss or damage the link.

Best practice: Copper and fiber trunk/bulk runs should be separated in either the same tray or run in separate trays.

Why is this necessary?

This reduces the potential for dB link loss in fiber from kinks and pressure build-up.

Don't Bend, Kink, or Pinch Fiber Cables

The fiber optic glass underneath the jacket performs best when running straight. However, real-life applications often require the cables to turn in different directions from source to destination. The bend radius of a fiber cable will dictate the amount of "give" in the fiber to safely install where bending is necessary.

Keep in mind that "pinching" the fiber optic cable also damages the glass, thereby ruining performance. Don't use zip-ties, use Velcro!

> *"Pinching" the fiber optic cable also damages the glass, thereby ruining performance.*

Tip

Look for signs of stress on the cable jacket.

Don't Pull Too Hard

If the cable is too short, don't try to stretch it! Pulling is likely to lead to a break in the fiber optic cable or connector.

Correspondingly, don't use the connectors to pull a long cable through its route. Always have a pull-eye added to a cable longer than 100 feet.

Why is this necessary?

While inconvenient to remove, pull-eyes protect your connections and your warranty. Warranties don't cover mishandling of cabling.

Post-Installation Testing

Transmission performance depends on several characteristics:
- Cable characteristics
- Connecting hardware
- Patch cords
- Cross-connect wiring
- Total number of connections
- Proper care during installation and maintenance

Testing results directly after installation:
- Continuity
- Shorts
- Transposed, reversed or split pairs, grounded conductor

> **Test results should be provided both in soft and hard copy.**

Reporting Test Results

- Test results should be recorded in the memory of a Fluke or comparable test equipment. Test results should be provided both in soft and hard copy.
- Fiber optic links should show the measured attenuation values, as well as the limits against which they have been tested, and the link length in a report or database.
- The testing documentation package should also include the following:
  - o Date(s) of test
  - o Name(s) of test personnel
  - o Identification of field test instrument used, including manufacturer, model, and serial number, and date of most recent calibration of the test instrument

Final Documentation

- An installation partner should provide close-out documentation as defined by the scope of work (SOW) after project completion.
- Any and all changes from the original design drawings in the SOW should be in the document. The installation partner should show modified cable routes of all backbone cables, backbone cable pathways, and cable trunks.
- Test results should be provided, as previously stated.
- A quality assurance checklist with appropriate photos and sign-off should also be provided.