M/T 9175
System Cabling Best Practices Guide

Danger notices

DANGER: To prevent a possible shock from touching two surfaces with different protective ground (earth), use one hand, when possible, to connect or disconnect signal cables. (D001)

DANGER: Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device or the power rating label for electrical specifications. (D002)

DANGER: If the receptacle has a metal shell, do not touch the shell until you have completed the voltage and grounding checks. Improper wiring or grounding could place dangerous voltage on the metal shell. If any of the conditions are not as described, *STOP*. Ensure the improper voltage or impedance conditions are corrected before proceeding. (D003)

DANGER: An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (D004)

DANGER: When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard: If IBM supplied the power cord(s), connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product. Do not open or service any power supply assembly. Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.

-  The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords. For AC power, disconnect all power cords from their AC power source. For racks with a DC power distribution panel (PDP), disconnect the customer's DC power source to the PDP.
- When connecting power to the product ensure all power cables are properly connected. For racks with AC power, connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate. For racks with a DC power distribution panel (PDP), connect the customer's DC power source to the PDP. Ensure that the proper polarity is used when attaching the DC power and DC power return wiring.
- Connect any equipment that will be attached to this product to properly wired outlets.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Do not attempt to switch on power to the machine until all possible unsafe conditions are corrected.
- When performing a machine inspection: Assume that an electrical safety hazard is present. Perform all continuity, grounding, and power checks specified during the subsystem installation procedures to ensure that the machine meets safety requirements. Do not attempt to switch power to the machine until all possible unsafe conditions are corrected. Before you open the device covers, unless instructed otherwise in the installation and configuration procedures: Disconnect the attached AC power cords, turn off the applicable circuit breakers located in the rack power distribution panel (PDP), and disconnect any telecommunications systems, networks, and modems.
- Connect and disconnect cables as described in the following procedures when installing, moving, or opening covers on this product or attached devices.

  To Disconnect: 1) Turn off everything (unless instructed otherwise). 2) For AC power, remove the power cords from the outlets. 3) For racks with a DC power distribution panel (PDP), turn off the circuit breakers located in the PDP and remove the power from the Customer's DC power source. 4) Remove the signal cables from the connectors. 5) Remove all cables from the devices.

  To Connect: 1) Turn off everything (unless instructed otherwise). 2) Attach all cables to the devices. 3) Attach the signal cables to the connectors. 4) For AC power, attach the power cords to the outlets. 5) For racks with a DC power distribution panel (PDP), restore the power from the Customer's DC power source and turn on the circuit breakers located in the PDP. 6) Turn on the devices.

-  Sharp edges, corners and joints may be present in and around the system. Use care when handling equipment to avoid cuts, scrapes and pinching. (D005)

CAUTION: A mismatch in the wiring configuration (delta versus wye) between the IBM product and your facility AC voltage supply can cause significant product damage. Ensure that the PDUs of the product match the supply voltage and wiring configuration of your facility. If the number of wires in the power cord does not match the wiring configuration in your facility, or if the rated voltage on the product does not match the supply voltage in your facility, or if you have any questions about the connection method, do not connect the product to the supply voltage. Contact a certified electrician familiar with your installation, and IBM, for guidance. (C054)

Cabling information inside the rack is provided to customers for reference only. Only IBM Service may plug and route cables within the rack.

Contents

References:

1) Installation and Maintenance Physical Planning (IMPP) Guide
2) Planning for Fiber Optic Links Guide

Chapter 1. Introduction

This cabling best practices document was created to help the reader plan, install and retain cables for the 9175 system mainframe. This document includes information for both internal and external cables to assist in both the initial system installation, system upgrades as well as external connections. In this context, internal cables are those pre-installed and provided within the system while external cables are considered either those cables provided with the system (i.e., power line cord, external communications network attach, etc.) or by the client (i.e., I/O, Coupling, and Storage Network Attach) and that egress from the system. To ensure system reliability and serviceability, it is critical that the system be ordered with the necessary Feature Codes (FC) (reference Table below) and the installation completed following the contents of this document. It serves as a supplement for the Installation Manual for Physical Planning (IMPP). For essential information including, but not limited to, safety notices, specifications, power requirements, and hardware management, refer to the IMPP. For visual help, 9175 Visio ® files are available on-line through IBM Documents.

Chapter 2. Line Cords

The line cords are used to power the system. The only type of internal power sub-system available is the intelligent Power Distribution Unit (iPDU).

IBM offers multiple line cord options to suit varying installation needs. Only the line cords provided with the system may be used. The line cords must not be modified (cut to length, connectors changed, etc). Any request for line cord modifications must be approved by IBM. Note, only connectorized line cord FCs are available starting with 9175. If there is a specific issue regarding this change and a cut-end cord is needed, please contact your IBM Sales representative for assistance.

“IMPORTANT: Line cords should be installed after all internal system cables have been routed and plugged. This ensures that maximum accessibility for routing the other cables.

The line cord is designed to exit straight out of the connector then bend with a given minimum bend radius towards the top or bottom of the frame depending on the desired system frame exiting orientation. Cables can exit through the top of the frame using one of the following feature codes:

- Top Exit Cabling feature with Enclosure **(FC 5823)** or Top Exit Cabling feature without Enclosure **(FC 7803).**
- Cables that leave the frame through the bottom would use Bottom Exit Cabling feature **(FC 7804)**.

For cabling configurations where two line cords are on the same side of a frame, the cables are to be run in parallel underneath the reservoir brackets (see Figure 2)). More specifically, if the cables are top exiting, the bottom PDU line cord should route in front of the top PDU line cord as they are routed upwards. The opposite will hold for bottom exiting cables. The line cords are to be retained to the reservoir bracket using a hook-and-loop fastener (provided in Ship Group).

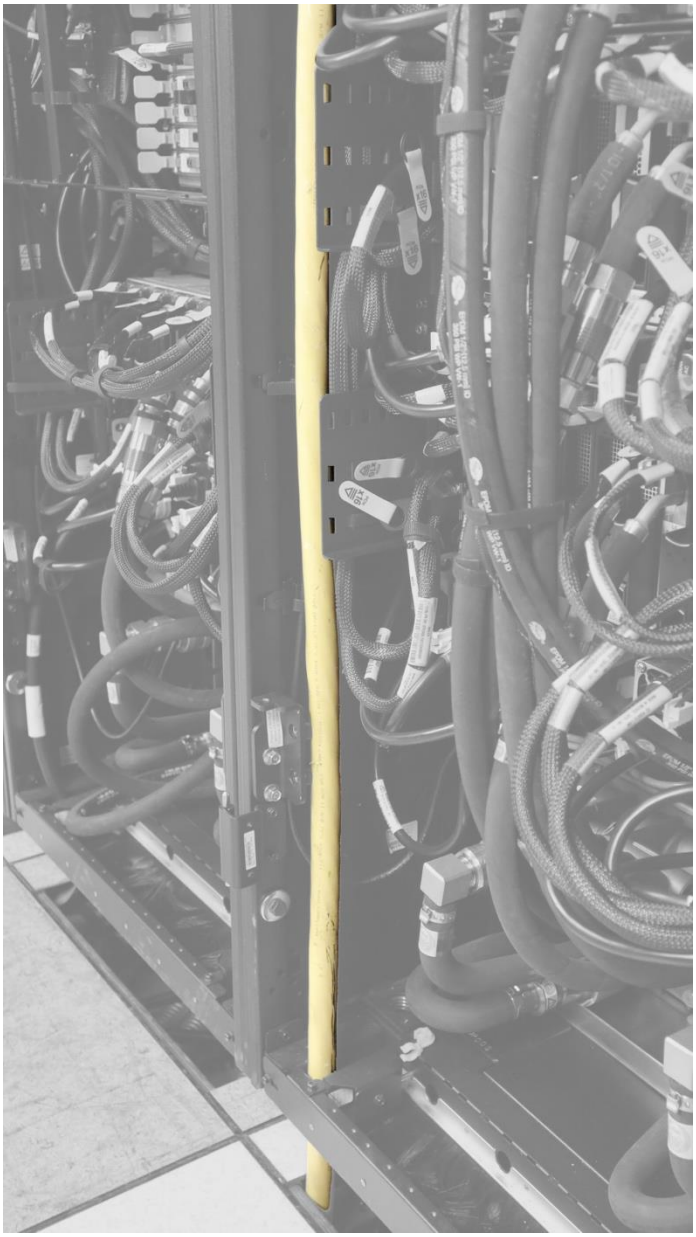

Figure 1: Bottom Exiting Line Cords ***(FC 7804)***

Figure 2: Line Cord routed behind Reservoir Bracket

For top exit system(s) without an enclosure, the space above the system should be clear with sufficient physical space for the line cords to exit the system (ref. Fig. 3). In this case, the line cords would be routed directly out the top corners of the frame then plugged to the data center power supply side connector. Top exit system(s) with an enclosure (**FC 5823**) support both line cord(s) and external system cable(s) exit. The line cords similarly go through the top of the frame, but in this case, are routed within the enclosure using provided cable management features (ref. Fig. 4). All cables exit the enclosure through brush elements.

*Figure 3: Top Exiting Line Cord without an Enclosure (**FC 7803**)*

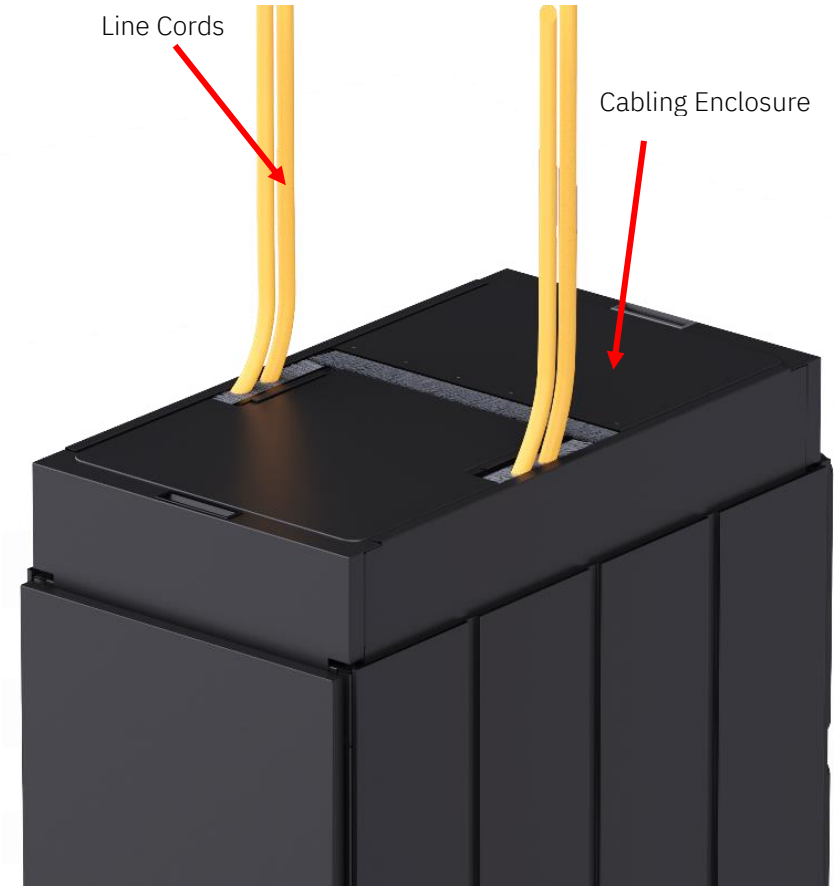

*Figure 4: Line Cords in a Top Exit Cabling Enclosure (**FC 5823**)*

For bottom exit system(s) (FC 7804), the line cord is routed directly to the bottom corners of the system and plugged at customer end. Line cords should be affixed and strain relieved to the tailgate using the provided bracket(s). **Note:** To ensure maneuverability, cable slack must be left to allow for a service loop under the floor.

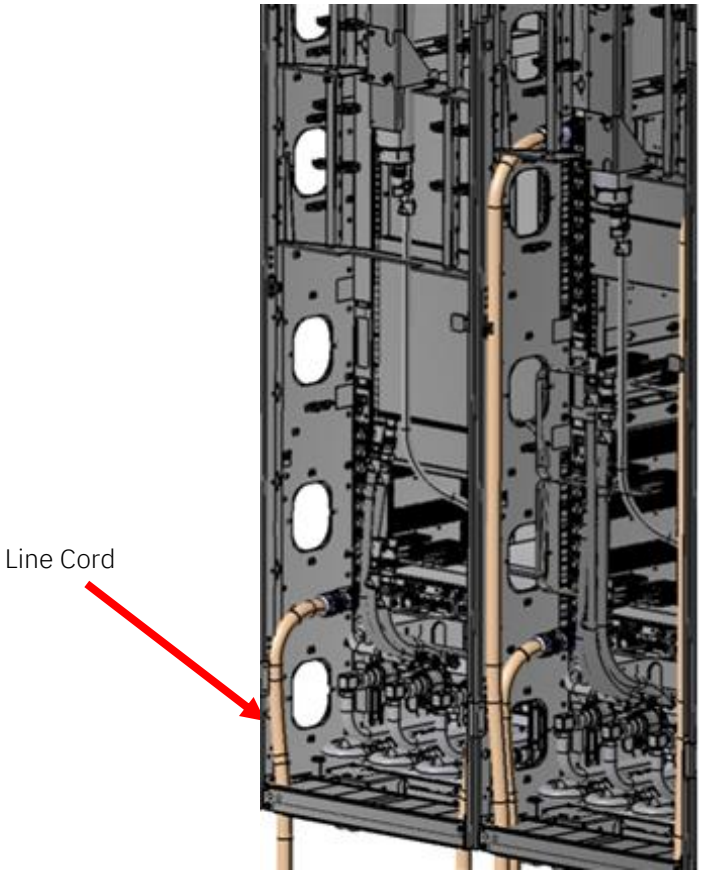

*Figure 5: Bottom Exiting Line Cords (**FC 7804**)*

There is a line cord actuation tool available to assist in plugging line cords. This tool was developed to cam the line cord in for ease of installation, as the area to plug a line cord into an iPDU may be congested. For more information, see the Install Manual. Note: the square key element enables a ¼" drive extension to be used as a tool assist.

Figure 6: iPDU Cable Actuation Tool

Line cords that are routed directly behind the A-Frame's rear door latch plate may interfere with the operation of the door latch. To prevent this, the line cord should be strapped to the A20 CPC bracket or the A15 CPC bracket, whichever is the highest bracket available, as shown in Figure 7.

Figure 7: Use hook and loop to retain line and cord and keep away from latch

If neither of the above strap locations are available (i.e. the A-Frame has only 1 CPC Drawer), use any available hook-and-loop tie-down point on the frame's side wall to retain the line cord away from the door latch plate.

Chapter 3. Cable Retention and Strain Relief

CPC Bracket

These brackets are used to manage and strain-relieve Peripheral Component Interconnect express+ (PCIe+) I/O cables that attach to the Central Processor Complex (CPC) drawer. The function and routing of this cable is discussed later in this document. These brackets hold the cables by using hook-and-loop straps.

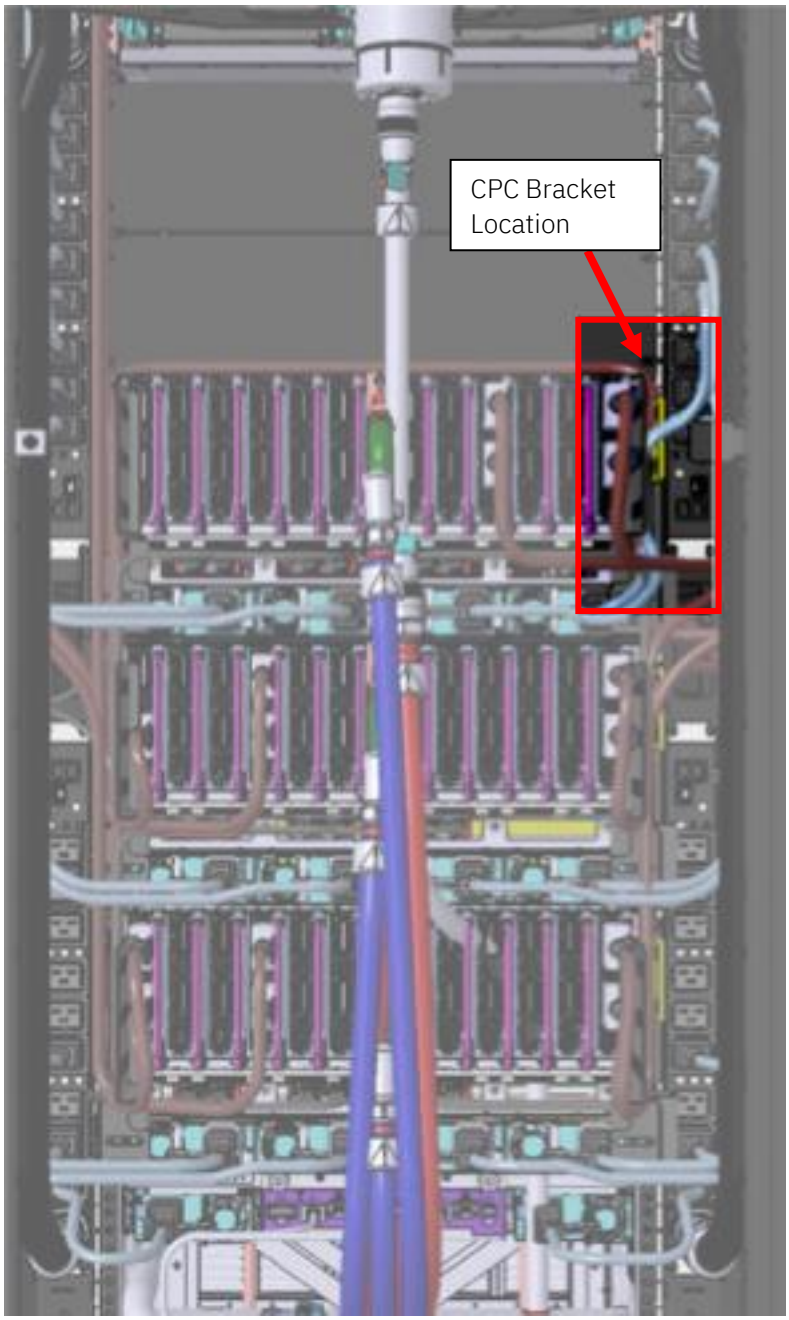

Figure 8: 3D Rendering of CPC Bracket Location

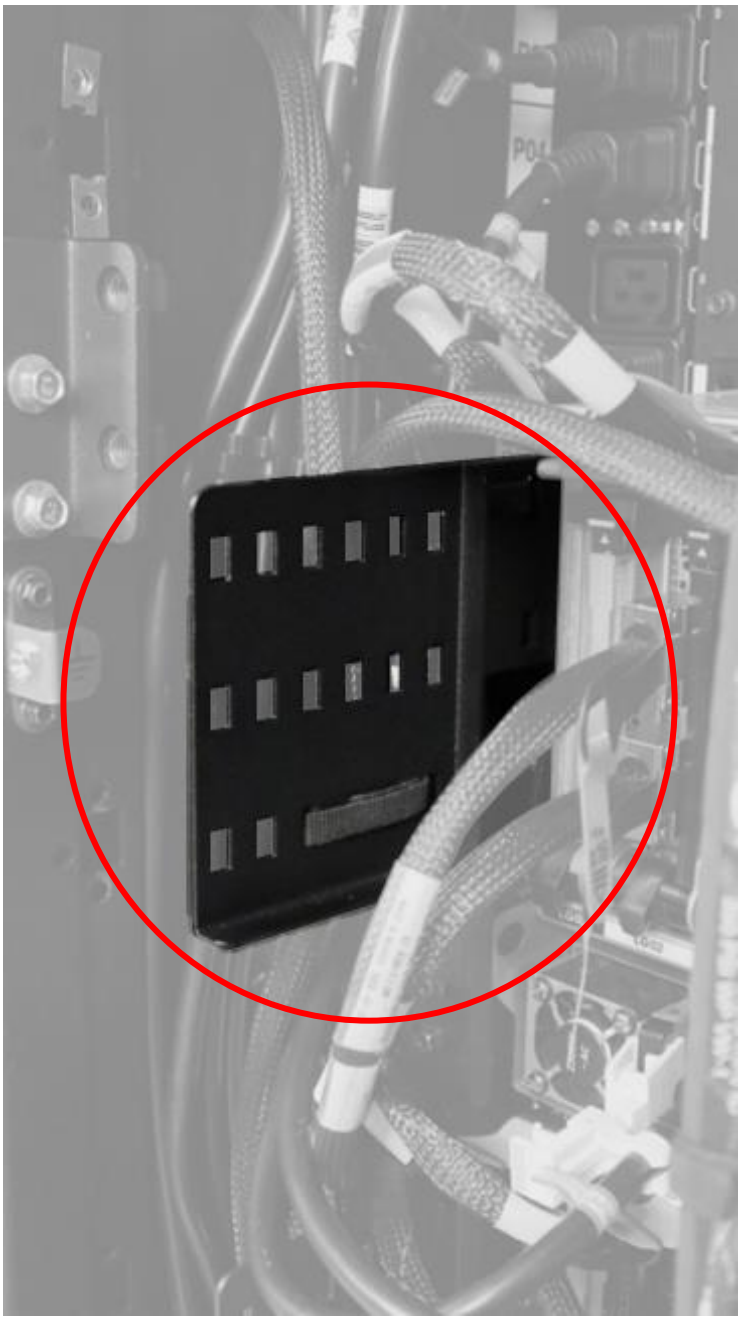

Figure 9: CPC Bracket

SMP Plastic Channel

The intention of this plastic channel is to retain the Symmetric Multi-Processing (SMP) cables and protect them as the machine is being serviced. When the SMP cables are being routed between frames A and B, they are to go through hole #3 (see Figure 25 for hole number designations). Figure 10 depicts the SMP plastic channel. It allows the cables to be neatly routed behind the CPC drawer bracket.

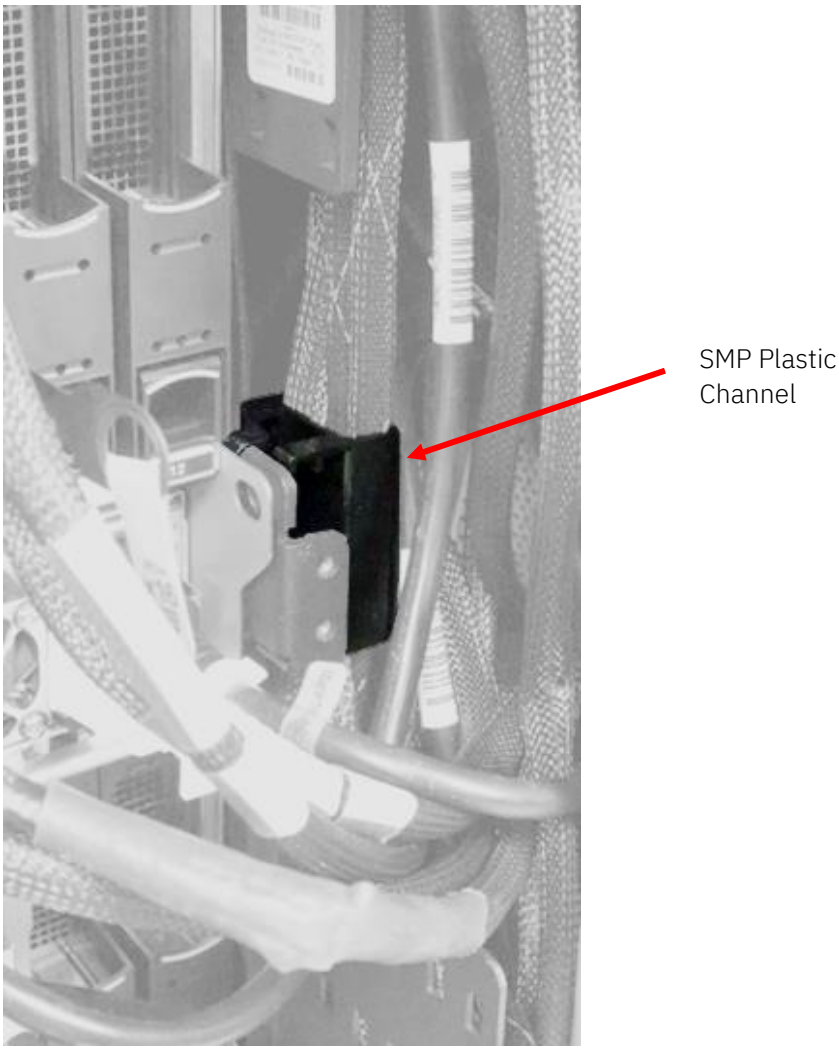

Figure 10: SMP10 Plastic Channel (CPC bracket not shown for clarity)

Clips

There are seven (7) types of cable retention clips:

- Spine/mini-spine Hardware Clip for Customer Fiber only (reference Figure 11)
- Frame Side Clip for Power Jumpers (reference Figure 12)
- Frame Side Clip for PCIe+ (CDFP) Cables (reference Figure 13)
- Frame Edge Clip for Ethernet Cables (reference Figure 14)
- Hook-and-loop Fastener Clip for Power Jumpers and Ethernets (reference Figure 15 and 16).
- Small Power Supply 2-Piece Clip for Power Jumper Plug Retention (reference Figure 17 and 18)
- Large Power Supply 2-Piece Clip for Power Jumper Plug Retention (Figure 19)

Spine Clip

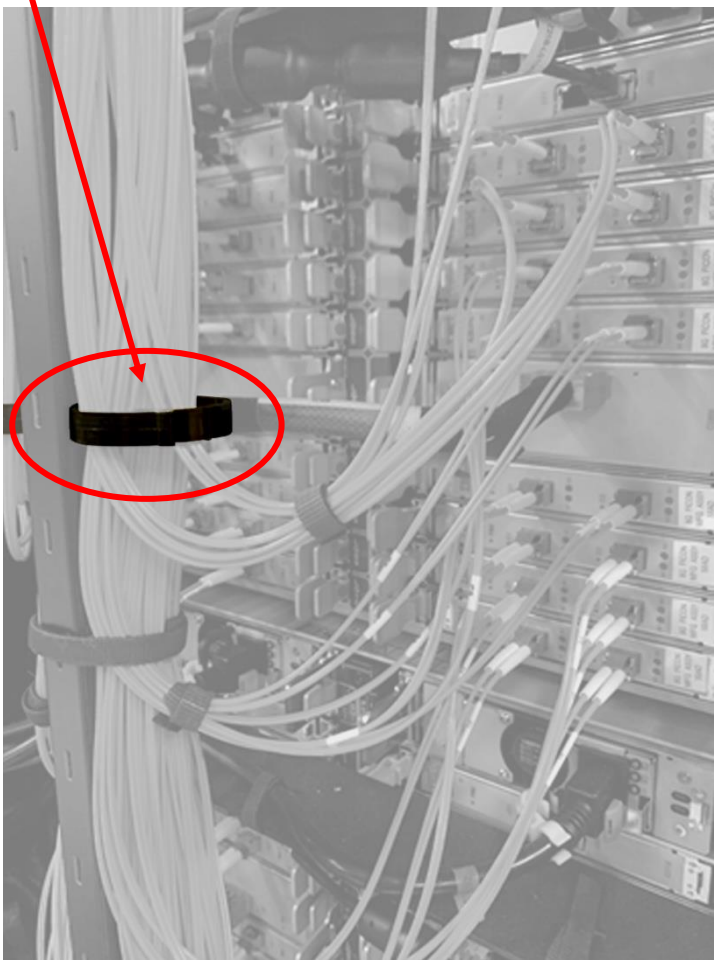

Figure 11: Spine Clips

Frame Side Clip for Power Jumpers

Figure 12: Frame Side Clip: Power Jumpers

Frame Side Clip for PCIe+ Cables

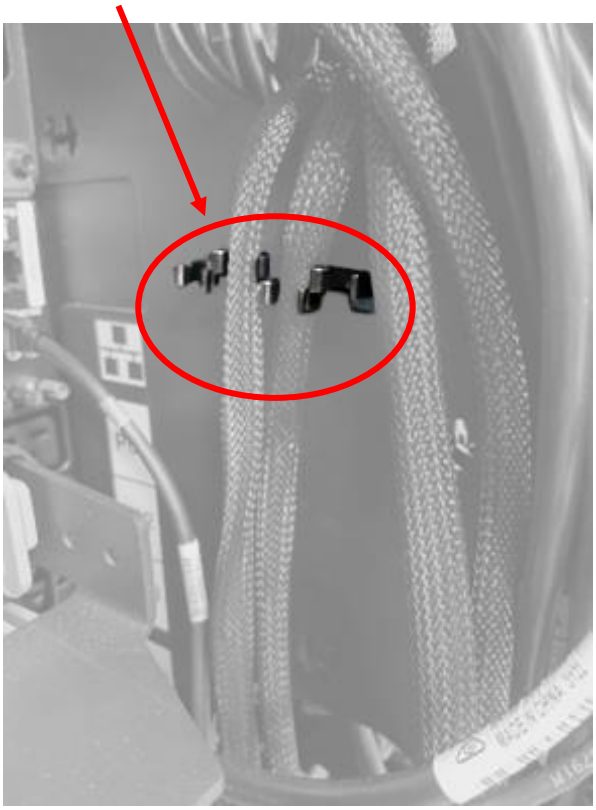

Figure 13: Frame Side Clip: PCIe+ Cables

Frame Edge Clip for Ethernet cables

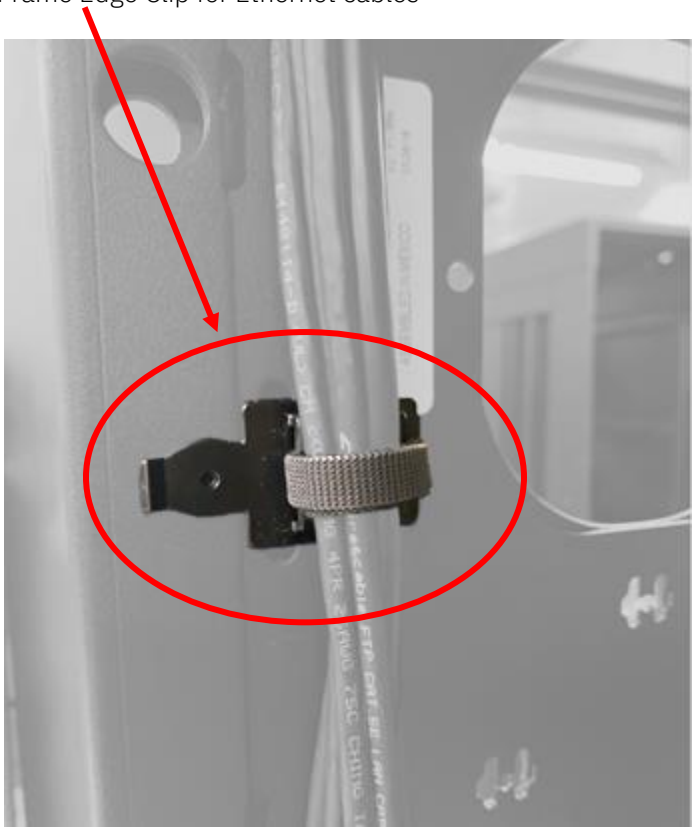

Figure 14: Frame Edge Clip

Hook-and-loop fasteners are used to properly route and retain cables, while maintaining bend radii and providing strain relief. Figure 15 shows an example of the application of a hook-and-loop fastener clip.

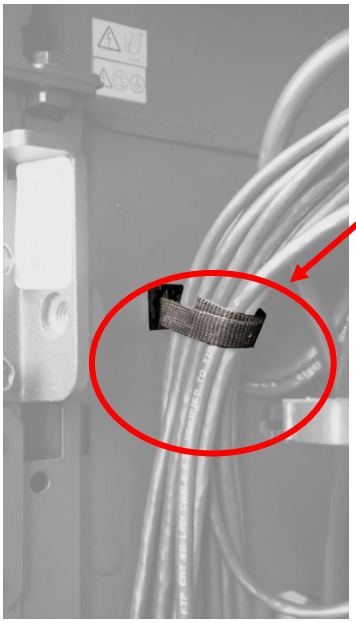

Figure 15: Hook-and-Loop Fastener

Figure 16: Hook-and-Loop Fastener Clip

During system service, plugged power jumpers are at risk of being accidentally snagged or bumped, which could result in system interruption. Retention Clip assemblies are factory-installed to address this risk by retaining jumpers in their plugged state.

These two-piece Clip assemblies are adjustable on a slide "zip-track" to accommodate a range of cable plug over-mold sizes. The Trigger part of the assembly enables this adjustment, and this part is universal throughout the Z system. The Grip part of the assembly affixes onto the PSU or frame bracket, and this part has two variations:

1. Large Grip – used on CPC Drawer PSU's and Radiator PSU's. These ship fully installed in the system.
2. Small Grip – used on I/O Drawer PSU's, SE PSU's, and Ethernet Switches. These ship fully installed in the system for Ethernet Switches, and they ship partially installed for I/O Drawer PSU's and SE PSU's since these PSU's are undocked for shipping.

Before system start-up at install, all Retention Clips should be checked to verify they are fully in place with the Trigger part snug against the jumper plug over-mold. After service, any disturbed Retention Clip must be restored to its retaining state.

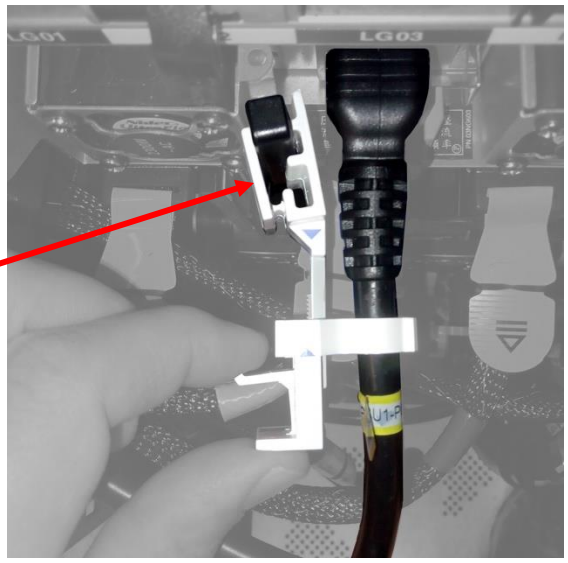

Figure 17: Large PSU Clip being adjusted

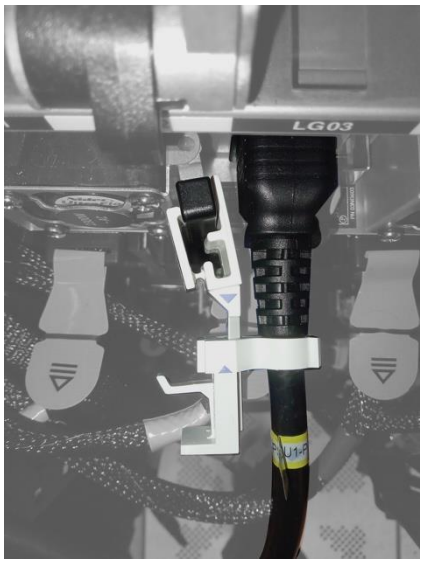

Figure 18: Large PSU Clip fully installed

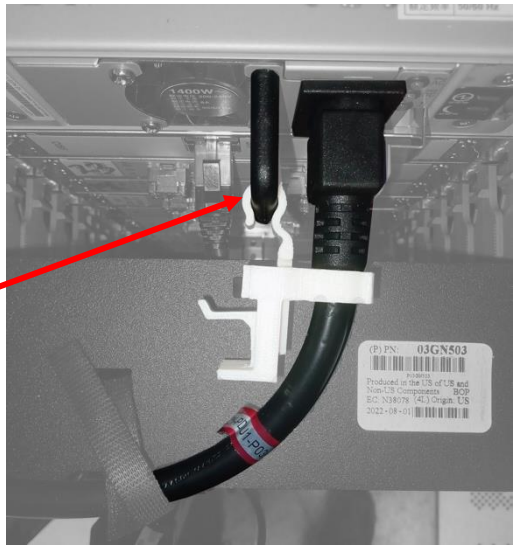

Figure 19: Small PSU Clip fully installed

Figure 20: Large and Small Grips

Center Spine

The Center Spine is used to route external customer-provided cables vertically in the Z- and C- frames. For 9175, the spine and clips are preinstalled. The clips may be relocated if needed. When the Bottom Exit FQC Bracket feature code (**FC 5827**) is selected, there are optional FICON cable length management hoops that can be installed on the spine.

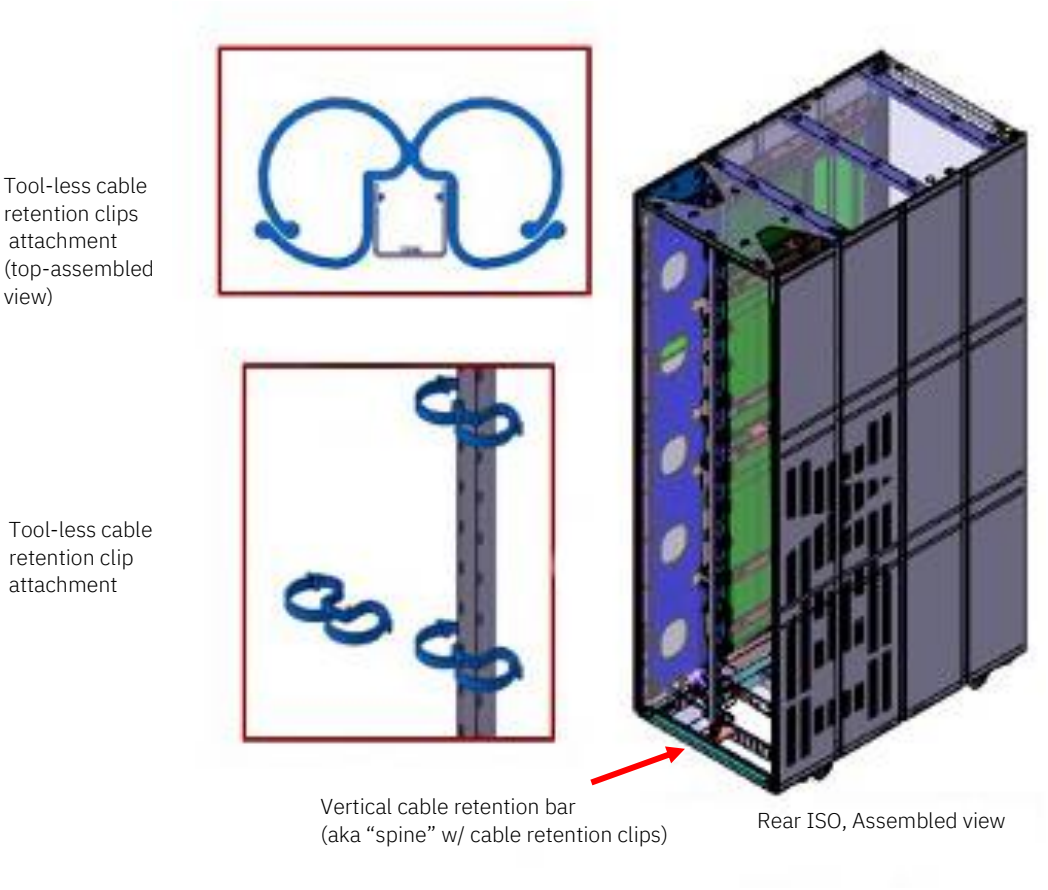

Figure 21: Center spine and clips

Cable Management Brackets & 2U Filler Plate

The 2U filler plate return flange is used when a cable crosses a frame and a cable management bracket is absent from that specific location. Cables going across the frame should be routed along a cable management bracket or the 2U filler plate's return flange for support. This bracket is designed to secure the power cords and Ethernet cables exclusively, providing necessary clearance for servicing units both above and below these cables, thereby enhancing serviceability. There is a cable management bracket associated with each PCIe+ I/O drawer.

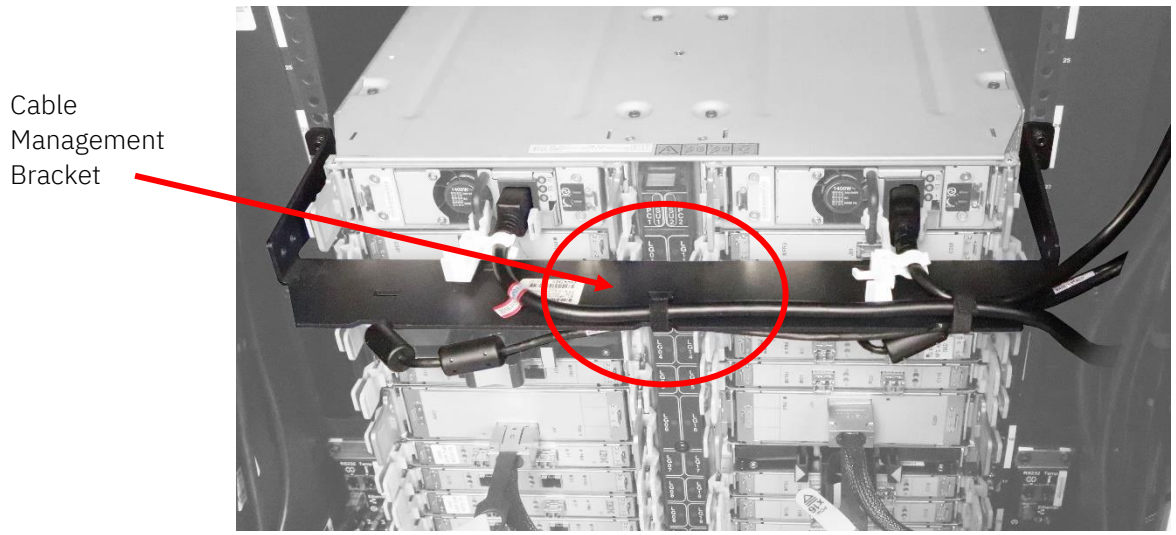

Figure 22: PCIe Drawer Cable Management Bracket

When I/O cage #3 is present in the A-frame and there is a Z-frame, a cable management bracket is required to route the cables across the A-frame (see Figure 23). It is important to secure these cables to the bracket to allow for unimpeded service access to all cassettes in the I/O cage.

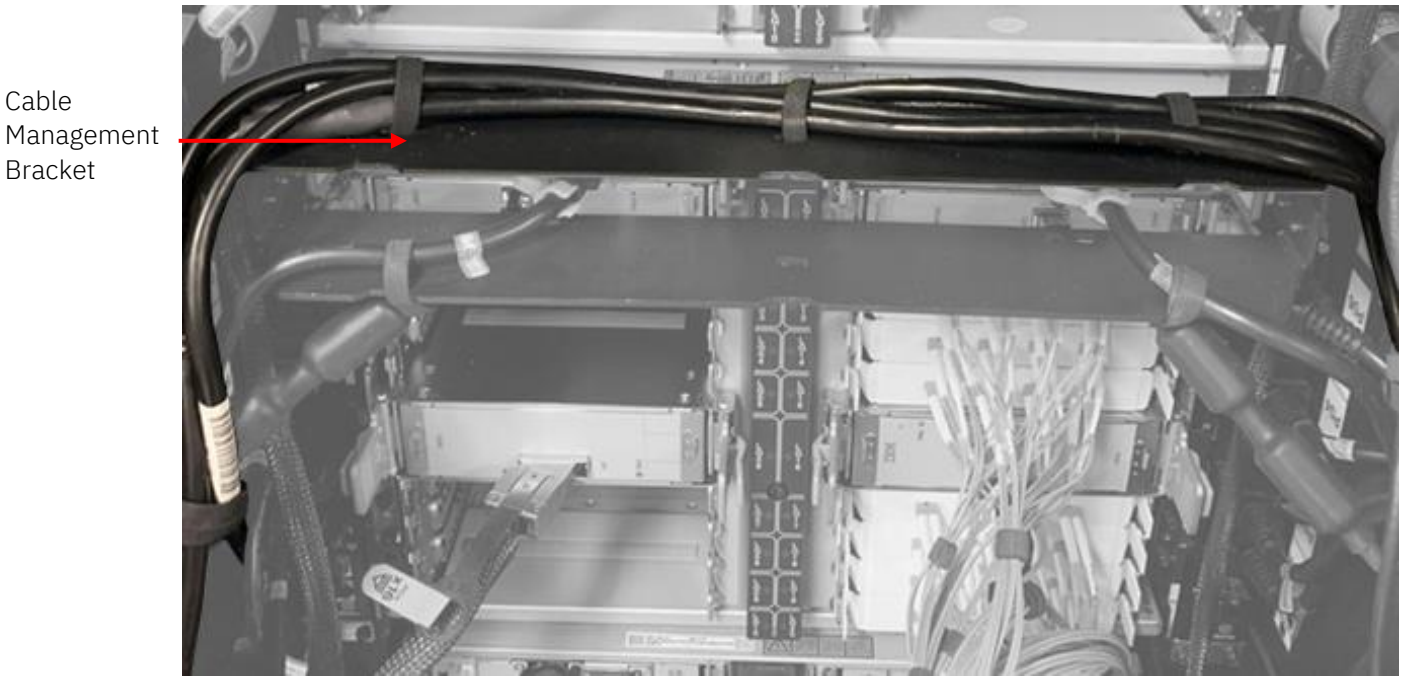

Figure 23: Cable Management Bracket

Also, at I/O cage #3 there may be left and right vertical cable management brackets (See Fig 24). These relieve cable congestion from the upper PDUs when four (4) PDUs are present. Power jumpers are routed on the inward side of each bracket as shown.

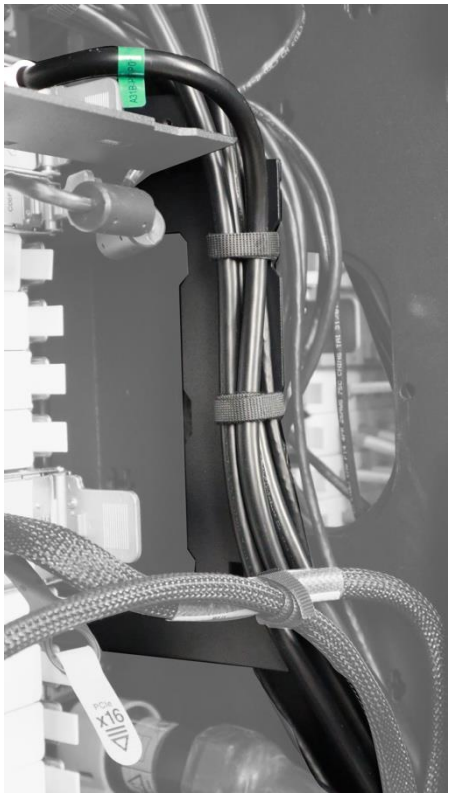

Figure 24: Vertical Cable Management Bracket

Chapter 4. Internal System Cables

To ensure compliance with safety and other regulatory requirements, multi-frame systems must always be bolted together with rack-to-rack connection hardware. For multi-frame system configurations, signal and power cables are routed within and between frames. The interframe cables are coiled and bagged to one (1) side of the frame for shipping. After the frames are bolted together during installation, these cables will need to be routed through designated frame holes (see Figure 25). These frame hole callouts are also referenced in the Installation Manual.

On the cable's free end, there is a striped- or solid-colored location flag label designating where the cable should be plugged. The color on the label serves as a visual aid to distinguish entities from each other. The solid-colored flag indicates the primary source, and the striped-colored flag indicates the secondary source. Installation personnel shall use the provided printed label data to ensure correct cable plugging locations are used.

The following subsections of this chapter are listed in the prioritized installation order:

1) Ethernet Network Cables
2) Power Jumpers
3) SMP Cables
4) PCIe+ I/O Cables

Note: Line cords shall be installed after all internal system cables have been installed, routed and strain-relieved.

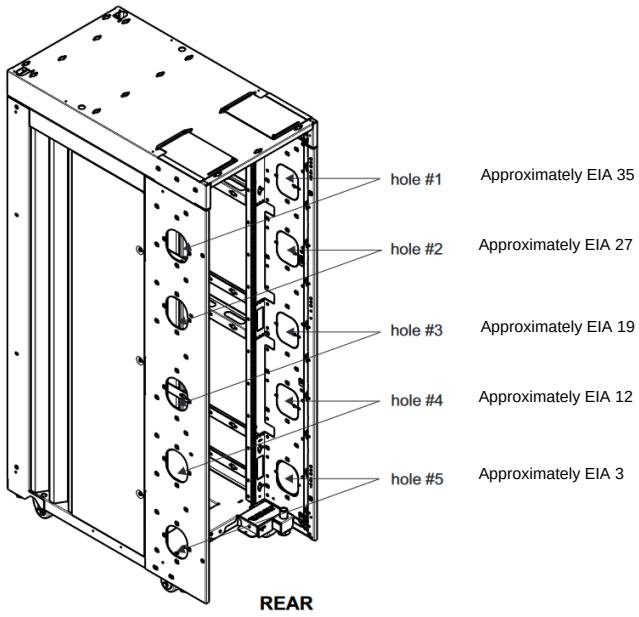

Figure 25: Rear View of Frame with Hole Numbers and Locations

Ethernet Network Cables

Internal system Ethernet network cables interconnect the system's internal service processor network. External Ethernet cables will be discussed later in this document. The routing schemes for these cables are provided in Figures 26-30 for various system configurations.

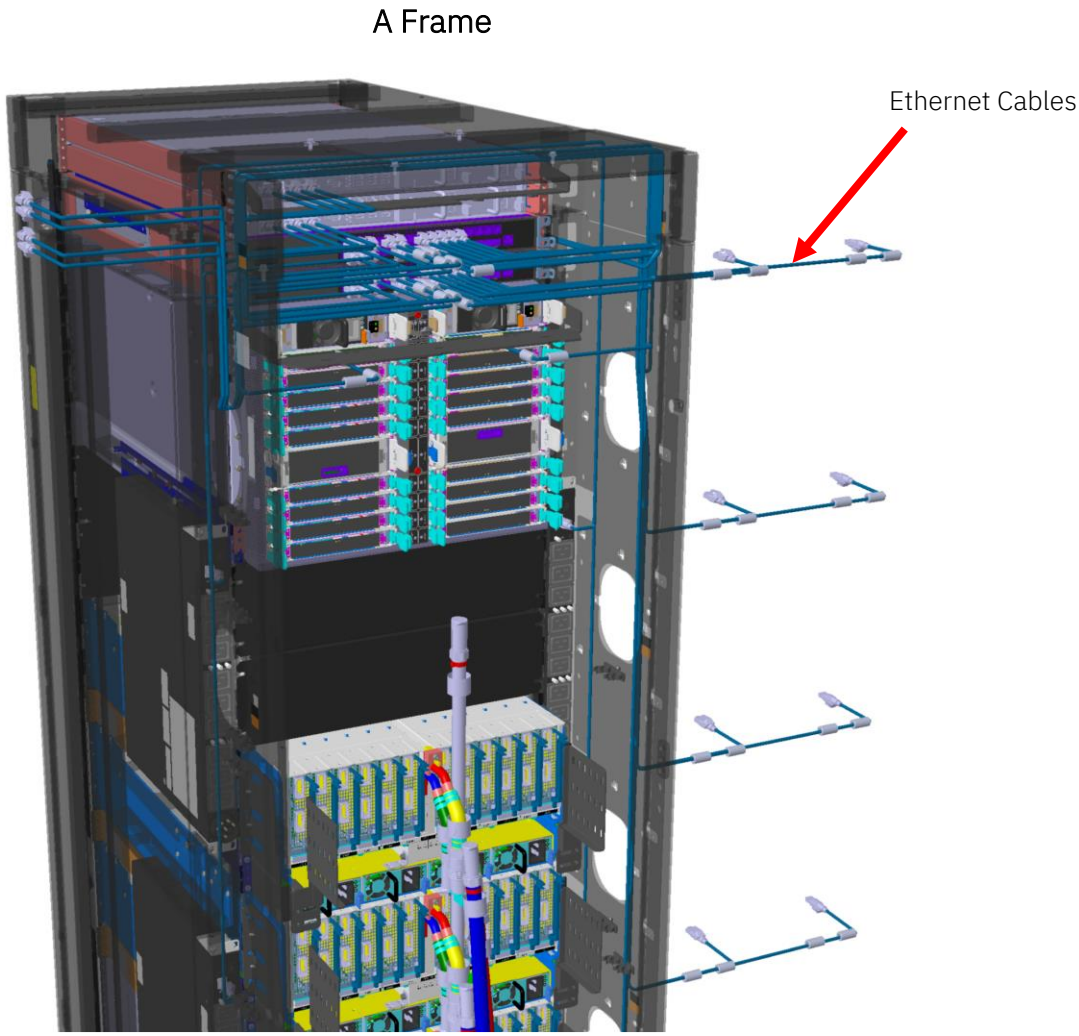

Figure 26: 3D Rendering of Ethernet Cables routed within semi-transparent Frame. The adjacent frames and reservoir are not shown for clarity.

Figure 27: Z to A Frame Ethernet Cabling through hole #1

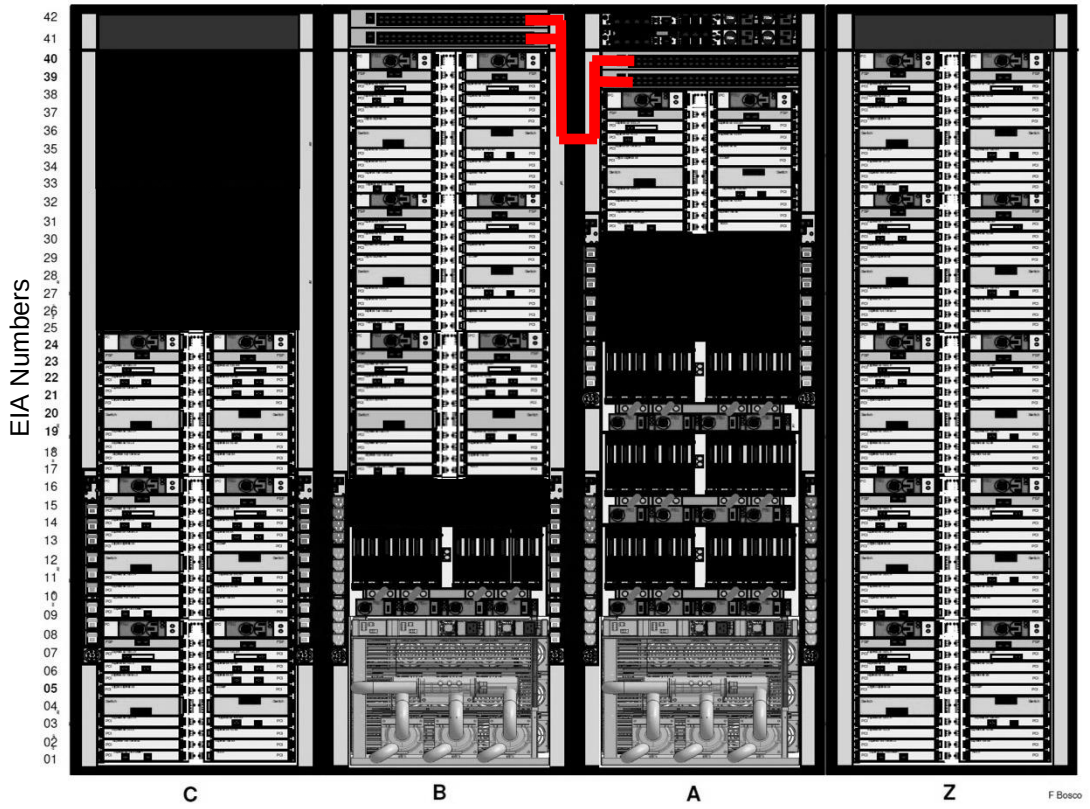

Figure 28: B to A Frame Ethernet Cabling through hole #1

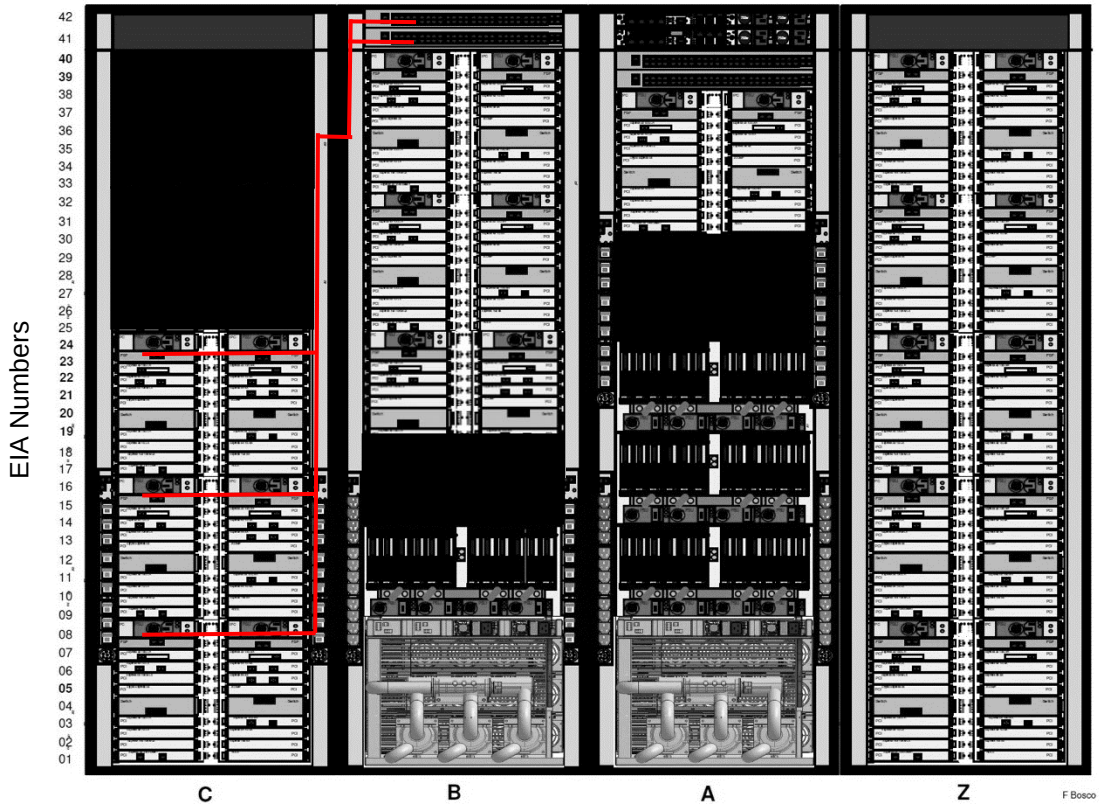

Figure 29: C to B Frame Ethernet Cabling through hole #1

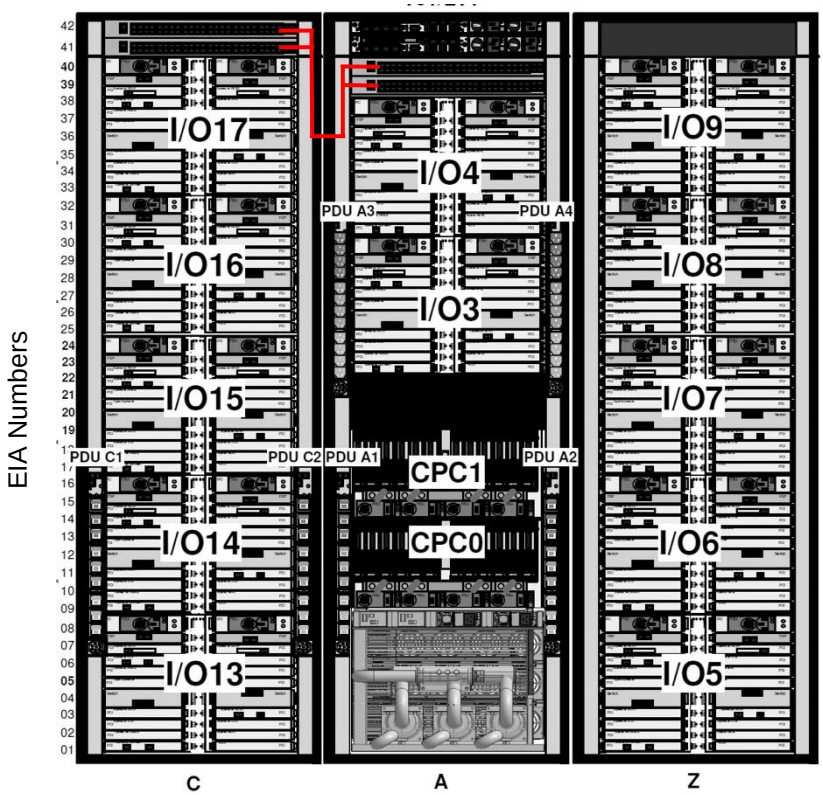

Figure 30: C (without B) to A Frame Ethernet Cabling through hole #1

Power Jumpers

Power jumpers are internal system cables used to connect the power supply units to the system's power distribution system (i.e., iPDU). Note, these cords are all point-to-point connections. The routing schemes are provided for these cables in Figures 31-32 for the maximum configured systems.

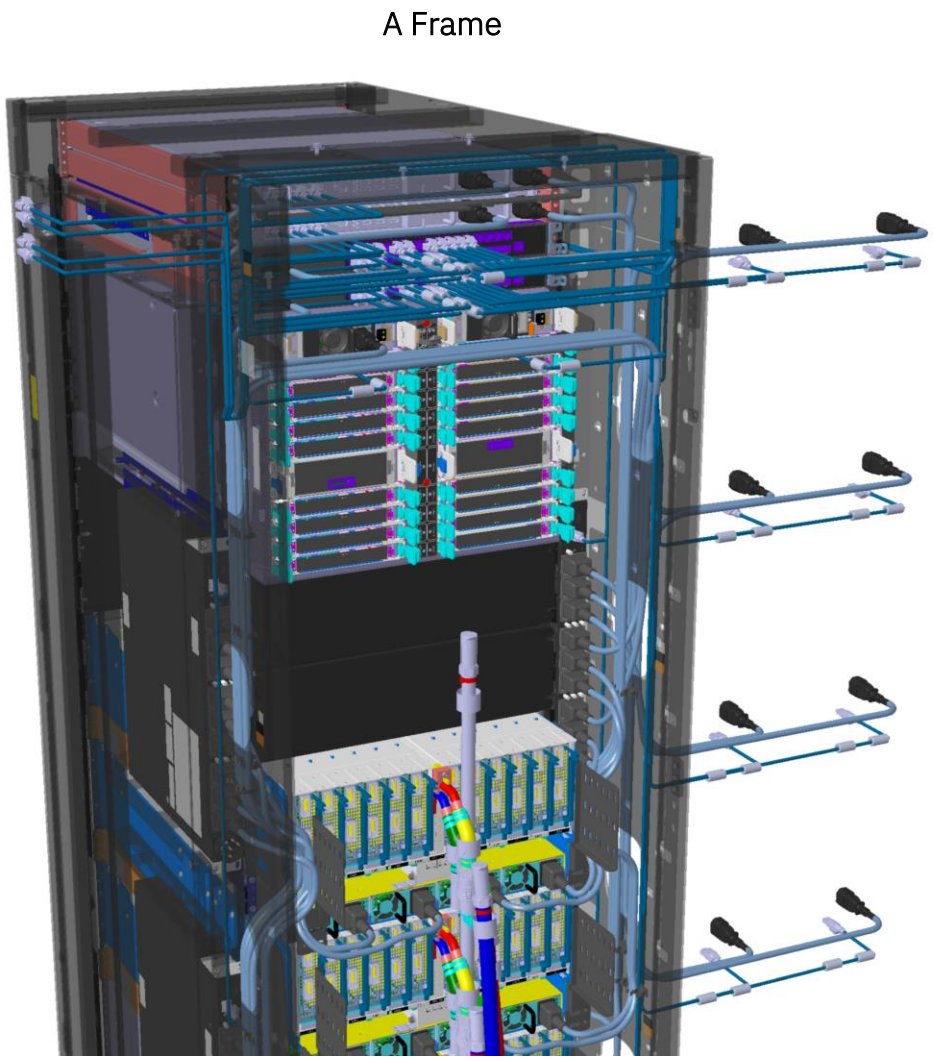

Figure 31: 3D Rendering of Power Jumpers routed within semi-transparent Frame. The adjacent frames and reservoir are not shown for clarity.

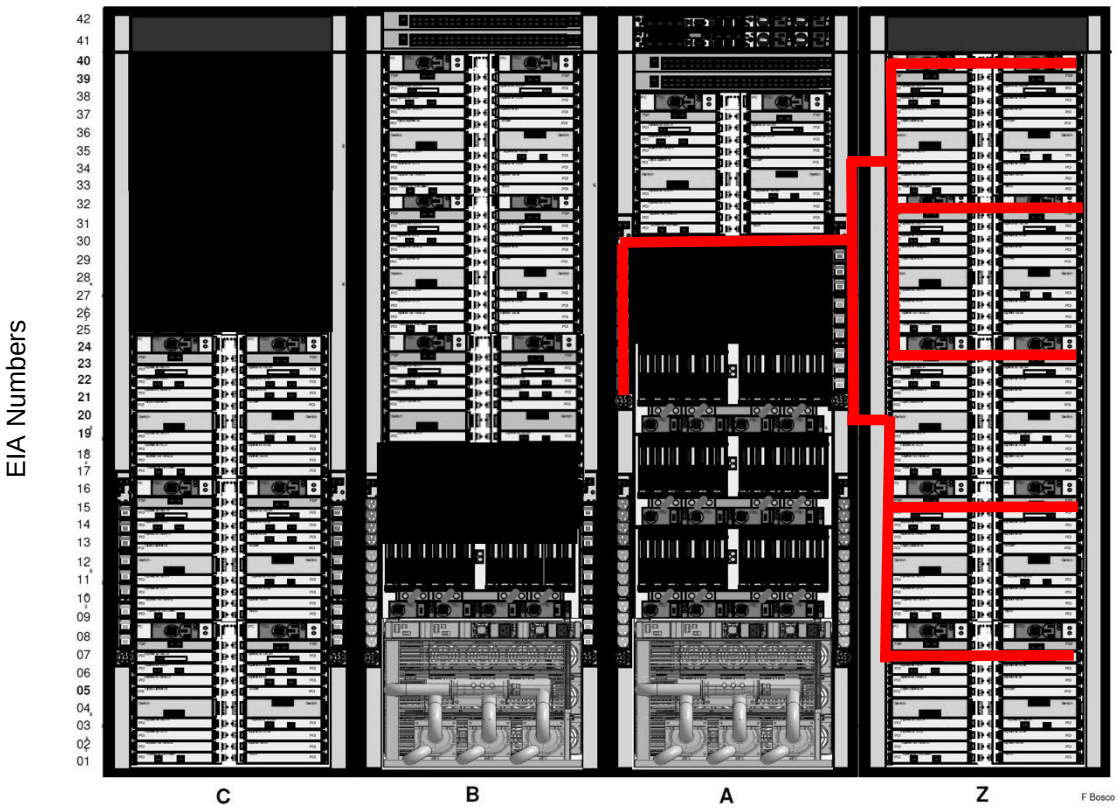

Figure 32: Z- to A- Frame Power Jumper Cabling through holes #1 and #3
Bottom 2 I/O Drawers hole #3
Top 3 I/O Drawers hole #1

SMP Cables

The SMP cables enable the processor network by interconnecting the system's CPC drawers to each other.

Figures 33-35 depict the maximum configuration for the SMP cables and how they must be routed. The cable count depends on the number of configured CPC drawers, but the cable routing paths always remain the same. The SMP cables are to be routed directly left or right from the CPC drawer's SMP ports such that they don't interfere with servicing the CPC IO adapters as shown in Figure 35.

Note: For iPDU service actions, the hook-and-loop fastener that attaches the SMP cable to the CPC bracket will need to be removed to release the cable so they can be moved out of the way during servicing. Do not unplug the cable but rather gently move them aside to make clearance for service activities.

Figure 33: SMP Cabling through hole #3

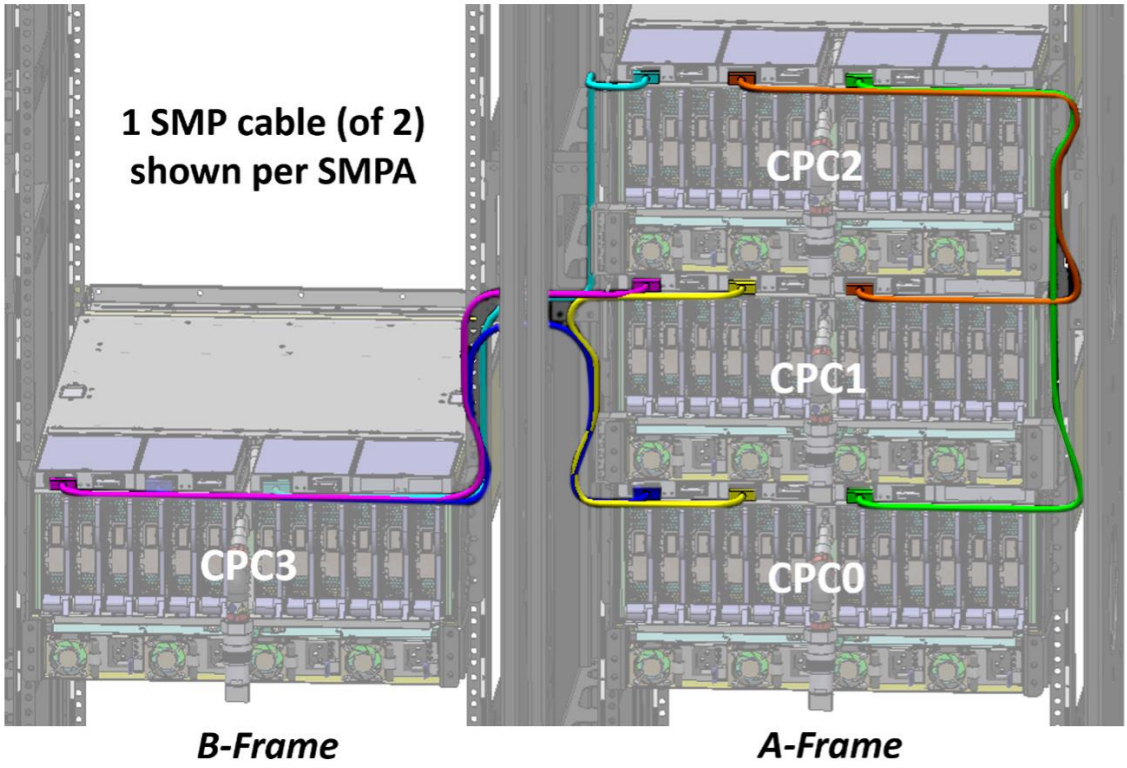

Figure 34: SMP Cabling for CPC Drawers

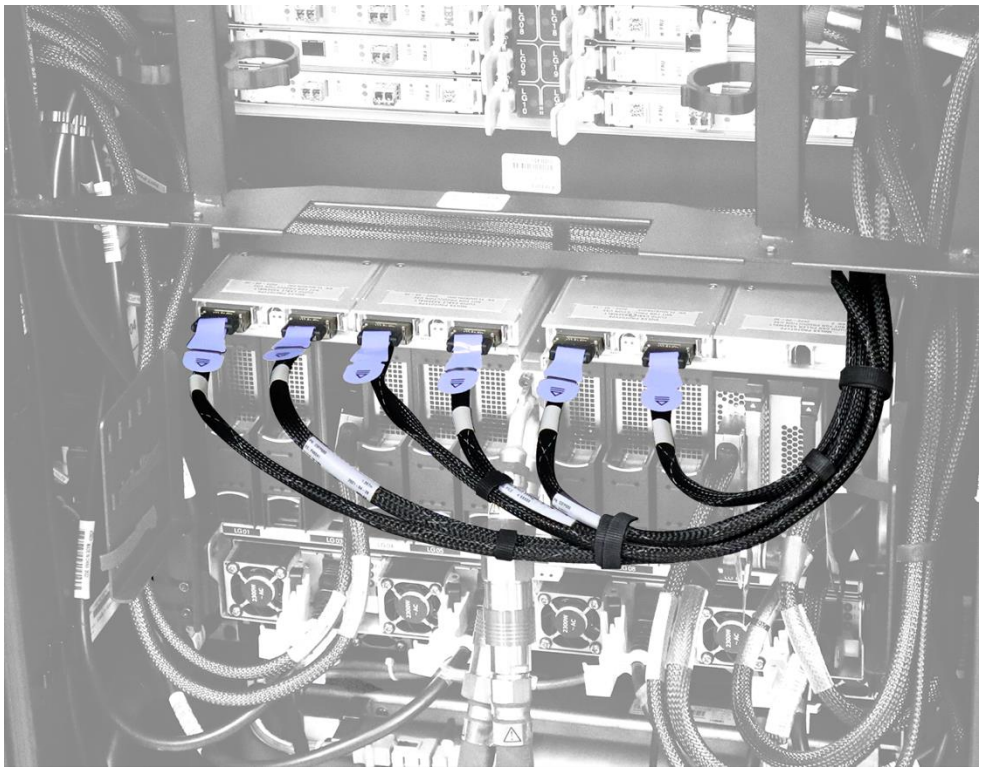

Figure 35: Required SMP Cable Routing

PCIe+ I/O Cable

PCIe+ I/O cables connect the System's CPC drawers to the PCIe+ I/O drawers. The recommended routing of these cables within a frame or to an adjacent frame(s) is provided in Figure 36. For frame-to-frame routing, these cables must pass through hole number 3 (ref. Figures 25 and 36).

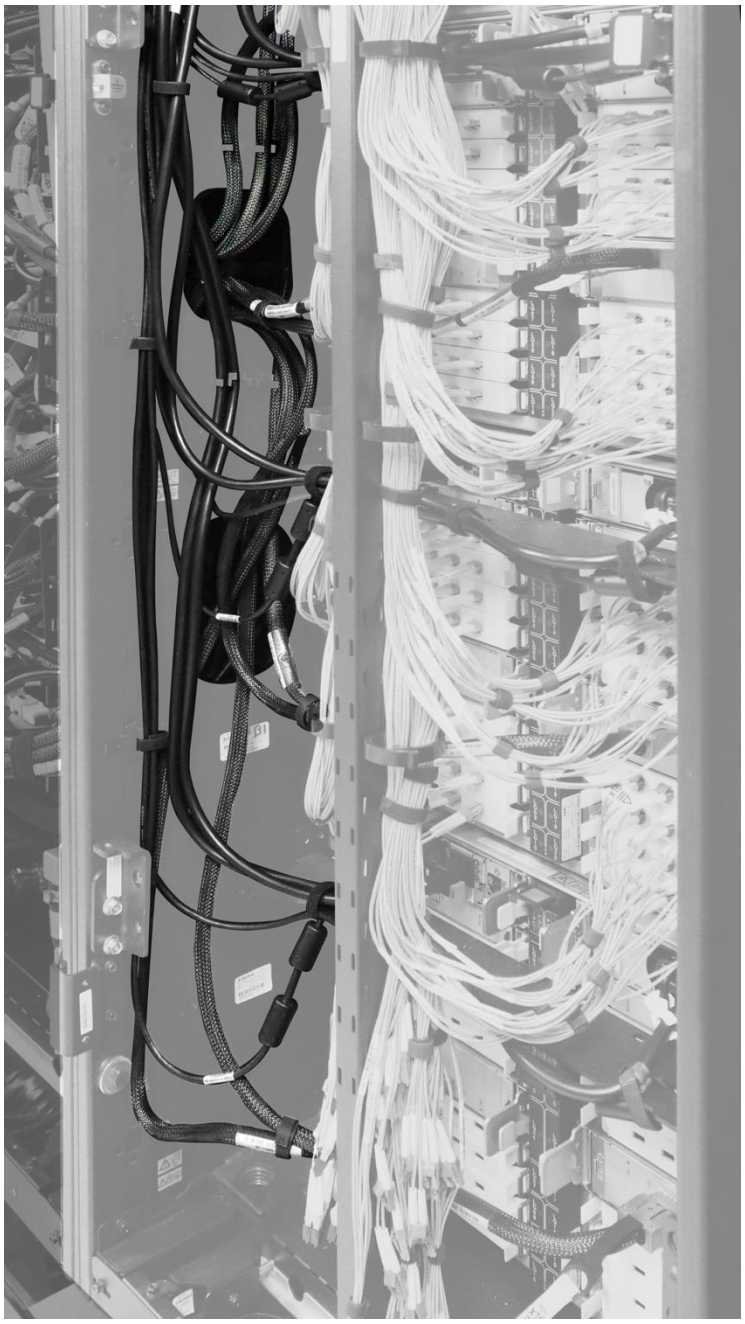

Figure 36: PCIe+ I/O cables *Routed Through Hole #3*

In certain system configurations, there may be PCIe+ cables that need to be routed from the B-Frame's CPC Drawer (CPC3, B10), through the A-Frame to plug to I/O Drawers in the Z-Frame. These cable lengths are designed to reach over top of the A-Frame's uppermost CPC Drawer (CPC2, A20) and should be strapped to that CPC Drawer's cable management brackets using hook-and-loop fasteners as shown in Figure 37. This ensures proper cable strain relief and minimal obstruction to support FRU serviceability.

Figure 37: PCIe+ I/O cables *Routed Across A-Frame*

Chapter 5. External System Cables

External cables can enter/egress a system through the top and/or bottom exit frame locations according to the options provided in the Table below. External cables may include Optical I/O or Coupling, Ethernet, and Line Cords. Fiber Quick Connect (FQC) options are available for FICON I/O optical cabling.

Customer Environment	Bottom Exit Cabling	Top Exit Cabling	FCs to be Ordered	Comments
Raised Floor	Yes	No	7804 only	Ships with Bottom Exit Tailgate & supports Bottom FQC FC 5827
Raised Floor	Yes	Yes, no Top Exit Enclosure	7803 & 7804	Ships with Bottom Exit Tailgate & supports Bottom FQC FC 5827
Raised Floor	Yes	Yes, with Top Exit Enclosure	7804 & 5823	Ships with Bottom Exit Tailgate & supports FQC FCs 5824, 5826 & 5827
Raised Floor	No	Yes, no Top Exit Enclosure	7803	Ships with Bottom Seal Plate and does not support FQC FCs
Raised Floor	No	Yes, with Top Exit Enclosure	5823 & 7803	Ships with Bottom Seal Pate and only supports FQC FC 5824 & 5826
Non-Raised Floor	No (not supported)	Yes, no Top Exit Enclosure	7998* & 7803	Ships with Bottom Seal Plate and does not support FQC FCs
Non-Raised Floor	No (not supported)	Yes, with Top Exit Enclosure	7998* & 5823	Ships with Bottom Seal Plate and & supports FQC FCs 5824 & 5826

**FC 7998: Non-Raised Floor Support (flag)*

Table 1: 9175 Cabling Feature Codes Combinations

FICON & FCP Cables

Fiber optic cables that attach to PCIe+ I/O cards can exit through the top or the bottom of the frame. FICON, FCP, OSA Express, and Coupling connection types are included in this grouping. For further details on the connection type options, refer to the IMPP, Chapter 8: I/O Cabling and Connectivity and Fiber Optic Cabling Guide.

The following important notes should be understood when installing fiber optic cables:

1) Follow recommended cleaning and installation procedures for all fiber optic cable products for optimal performance (see Fiber Optic Cabling Guide).
2) If using FQC, make sure the coupler type matches the correct cable plug type. There are two polarity options:
   - key up-key up **(FC 5826)** Top Exit only
   - key up-key down **(FC 5824)** Top Exit, **(FC 5827)** Bottom Exit
3) The Top Exit Enclosure (TEE) (**FC 5823**) is not required to route fiber optic cables through the top of the machine.

The spine is factory installed in Z- and C-frames. It is used for cable management and strain relief. These cables will route parallel to the central channel for both top and bottom exiting systems (ref Figure 38).

If the TEE FQC **(FC 5824 or 5826)** is used, the FQC brackets should be populated from the outside inward (Fig 39). If the Bottom Exit FQC (**FC 5827**) is selected, the FQC brackets are factory installed (ref Figure 44).

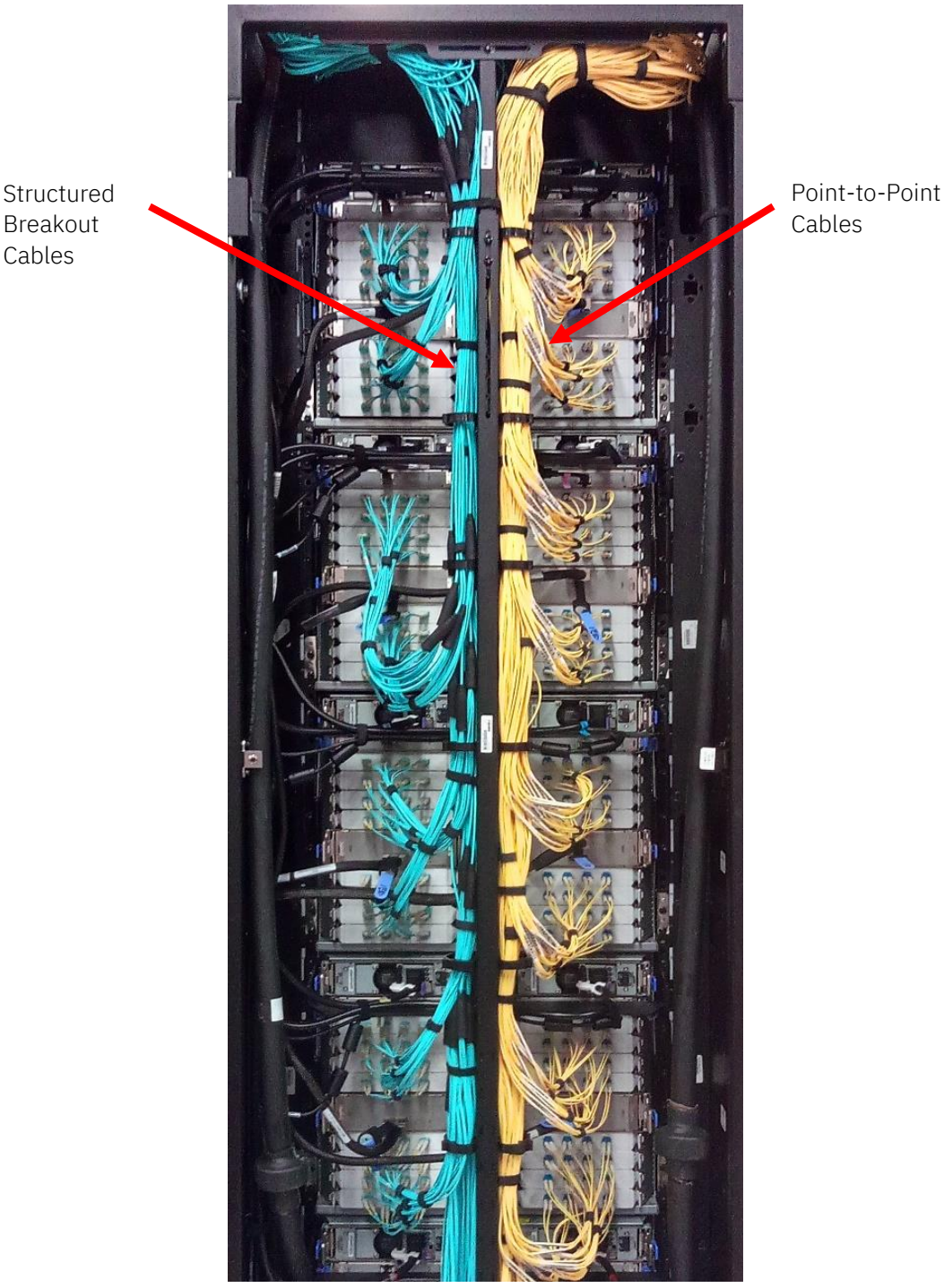

Figure 38: Fiber Optic Cables in Spine
(Structured Breakout Cables on Left, Point-to-Point Cables on Right)

The TEE is an optional feature (FC 5823) to support:

- Top exit of power cables to be mounted along the side walls, two on each side
- Top exit of fiber optic cables routed through the brushes and into the frame routed securely away from power cables
- Management of cable slack
- Ease of integration with hot / cold aisle airflow containment system
- Restricted TEE access when frame covers are locked

Additional optional FQC bracket features (FC 5824 and 5826) support:

- Structured cabling with built in strain relief
- FQC workstation at the back edge of the TEE, enabling unimpeded access to either side of the FQC brackets while cabling

When using the TEE (FC 5823) cable routing and length may be managed with provided cable spools and hook-and-loop strain relief. For Bottom Exit FQC configurations, vertical cable spools are provided. Use of these spools is optional, but when used, are mounted to the central spine.

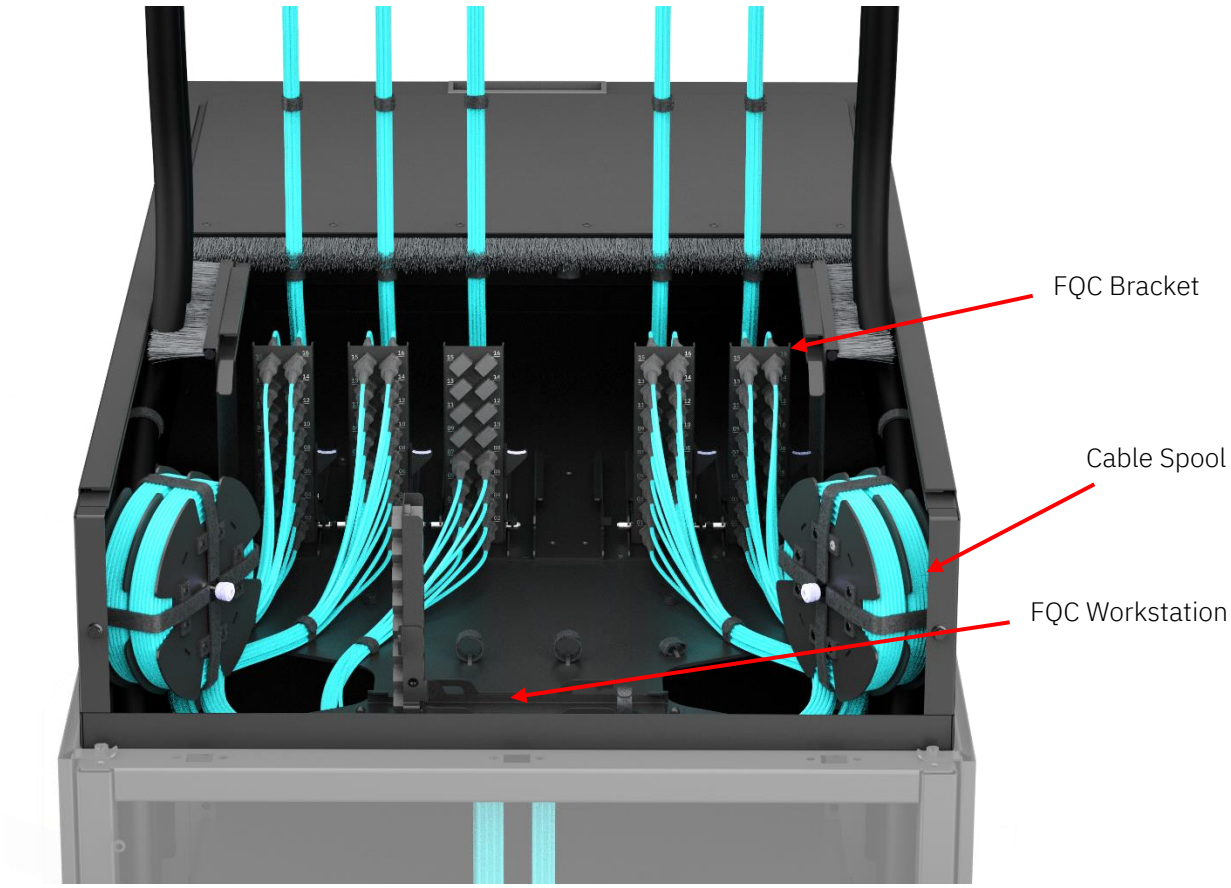

Figure 39: Fiber optic cables in Top Exit Cabling Enclosure (FC 5823)

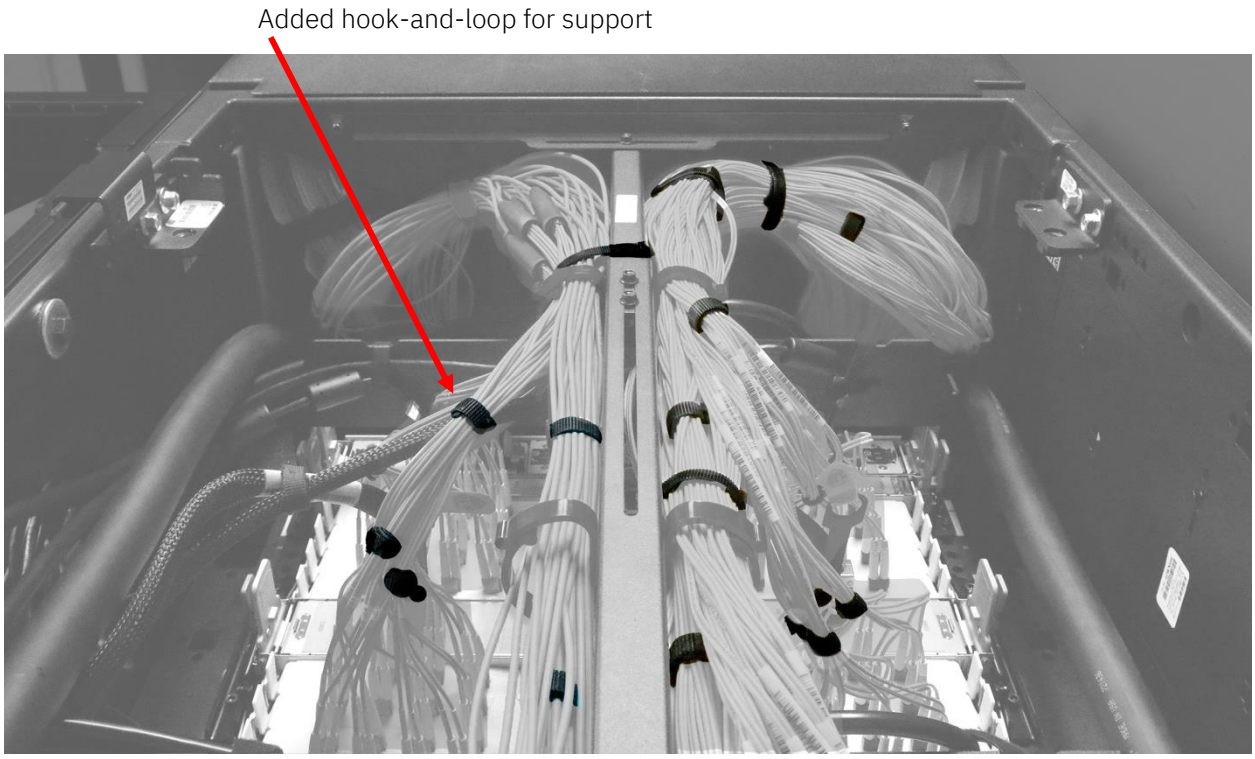

Figure 40: Fiber optic cables strapped to center spine

Figure 41: Fiber optic cables in Top Exit Cabling Enclosure including optional Cable Spools

The Bottom Exit Tailgate is required for any bottom exit cabling **(FC 7804)**. It supports line cords, Ethernet cabling, and both point-to-point and Structured fiber optic cabling.

Strain relief clamps are used to secure any cables that pass through the tailgate. There are two types:

- Line Cord Strain Relief Clamps integrated with tailgate (ref Figure 42)
- Optional Strain Relief Foam Clamps for point-to-point I/O, Coupling, and/or Ethernet cabling (ref Figure 43)

Figure 42: Strain Relief Line Cord Clamp for bottom exiting

Figure 43: Strain Relief Clamp

Additional optional FQC brackets **(FC 5827)** are also available (Fig 44).

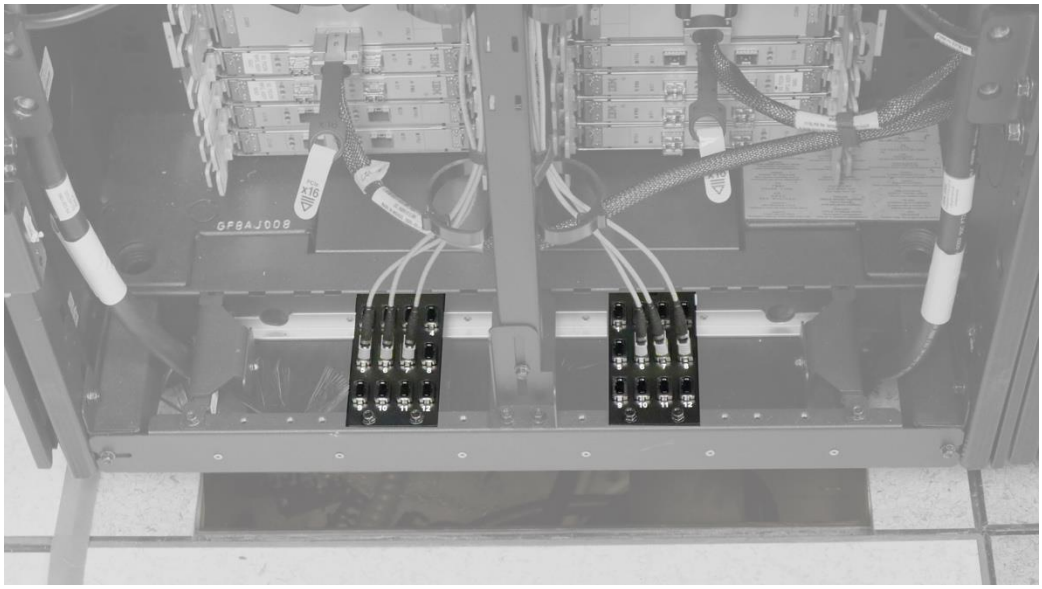

*Figure 44: FQC on Tailgate (**FCs 7804 and 5827**)*

Optional cabling spools are provided to organize and retain excess fiber optic cabling in the Z- and C- Frames when both the bottom exit (FC 7804) and FQC brackets (*FC 5827*) are ordered. To ensure adequate cable service loop, it is recommended that the spool be placed in its service position prior to wrapping any excess cable length around it. Once completed, the spool is to be moved to the final installed position on either side of the spine (reference Figures 45 & 46).

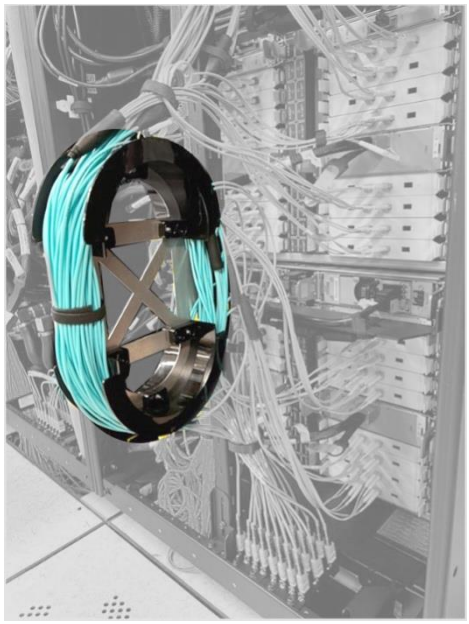

Figure 45: FICON Cabling Spools in its Service Position

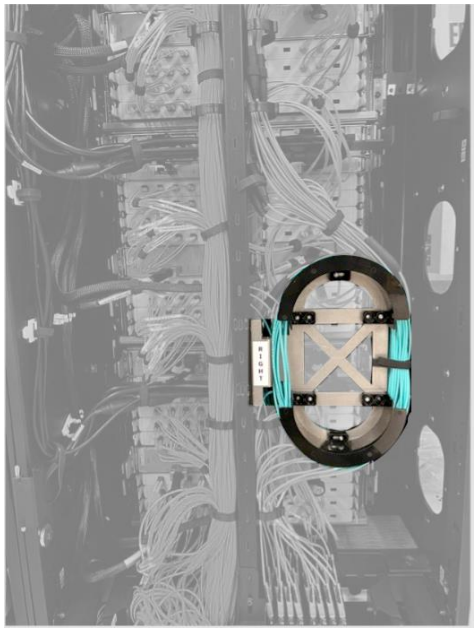

Figure 46: FICON Cabling Spool in its Regular Position

In the A- and B- Frames, excess Structured fiber optic cabling can be spooled on left and/or right of the lower portion of the frame using the factory installed filler plates. The cable should be spooled on the filler plate outside of the frame (Fig 47), before being installed in the frame.

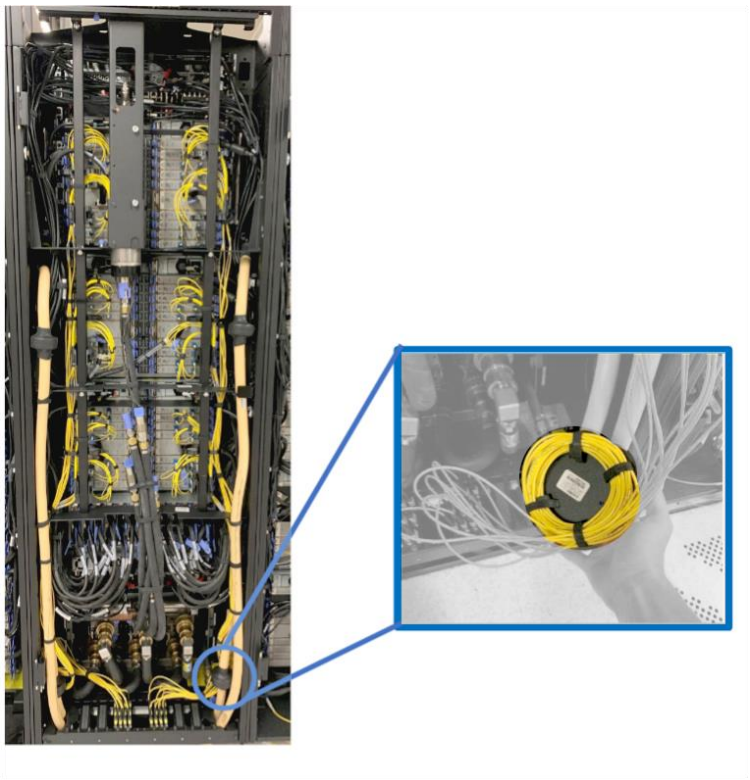

Figure 47: Fiber Optic Cable Filler Plate

Mini-spines are factory installed in the A- and B-Frames for routing of fiber optic cables. Where the mini-spines end, the fiber cables must be routed and secured along the side walls of the frame with hook-and-loop fasteners, ensuring they are appropriately tucked and strain relieved behind the reservoir bracket and the line cords (ref Figure 48 and 49). The fiber optic cables (i.e., FICON, OSA and/ or Coupling) are to be routed through the outer loops (Ref. Figures 50 and 51).

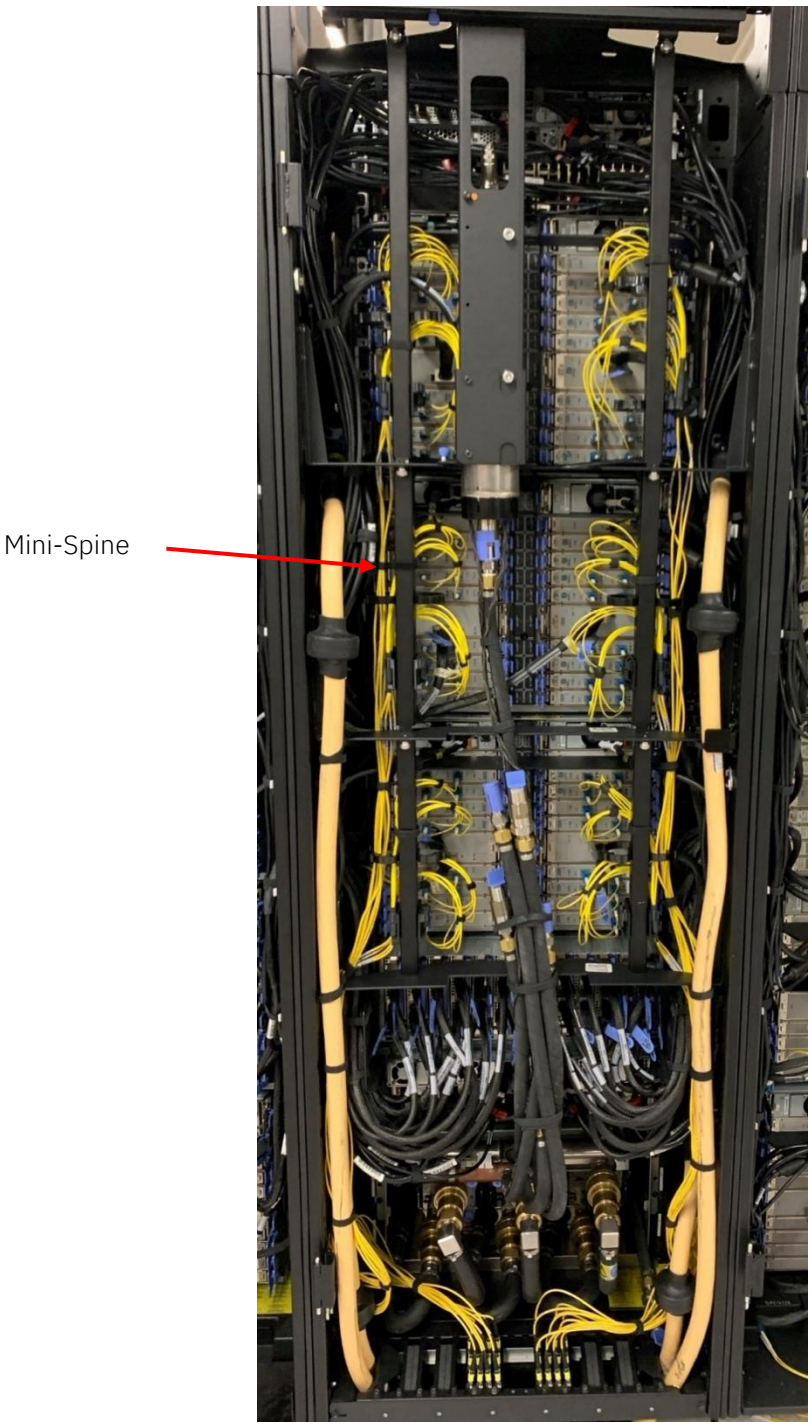

Figure 48: Mini-spine Fiber Optic Cable Routing

Figure 49: Example, Fiber Optic Cable Routing

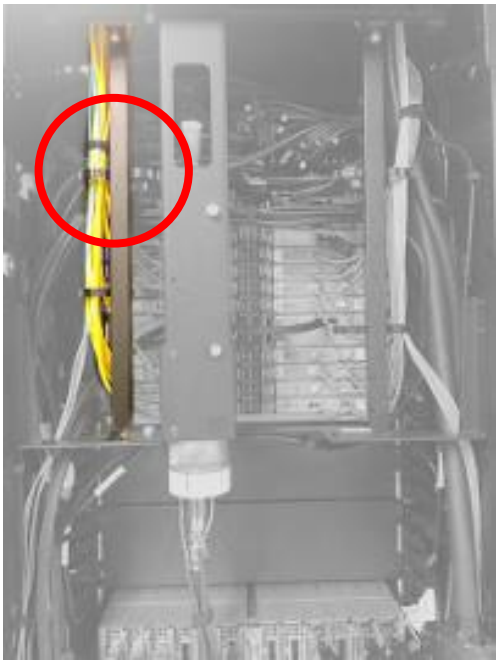

Figure 50: Coupling Cabling in Mini-Spine with Hook-and-Loop Fasteners

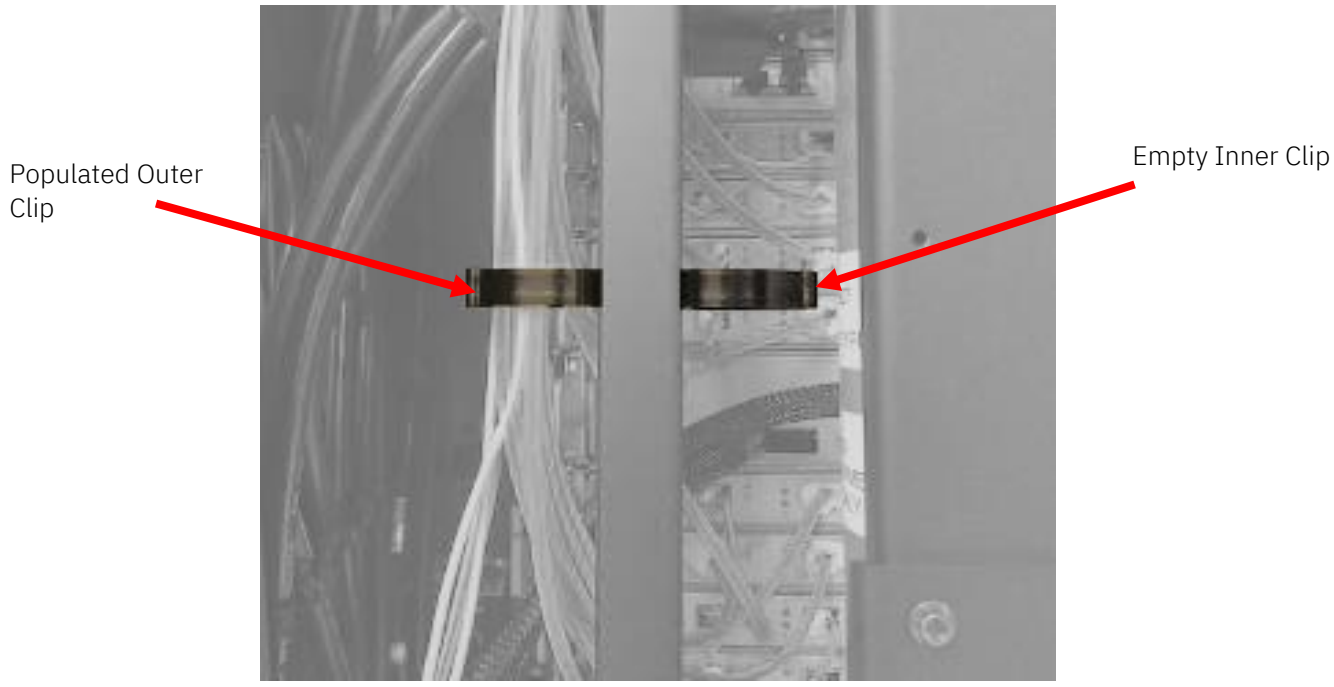

Figure 51: Example, Populated and Empty Spine Cable Clips

NOTE: Short Range Coupling cables originating from the CPC drawer(s) shall be routed first to the nearest side wall of the frame and then transition to the mini-spine clip (ref Figure 52).

Figure 52: CPC Short Range Coupling Cables Routed to sides of frame

To ensure the system and its cabling performs reliably, the correct termination, and proper routing and strain relief (i.e., via the provided clamps, brackets, filler plates and fasteners) of all cables shall be verified as part of final system check-out and/or following any system upgrade or service actions.

OSA Network Cables

Open Systems Adapter-Express (OSA-Express) features enable connectivity to industry-standard local area networks (LANs). These cables may be either fiber optic or copper (carry-forward FC only), and are routed through the center spine or mini-spine. In the mini-spine, the cables shall be routed through the outer clips (ref. Figure 53). Configuration information is found in the IMPP, and reference information may also be found in the “Planning for Fiber Optic Links” document.

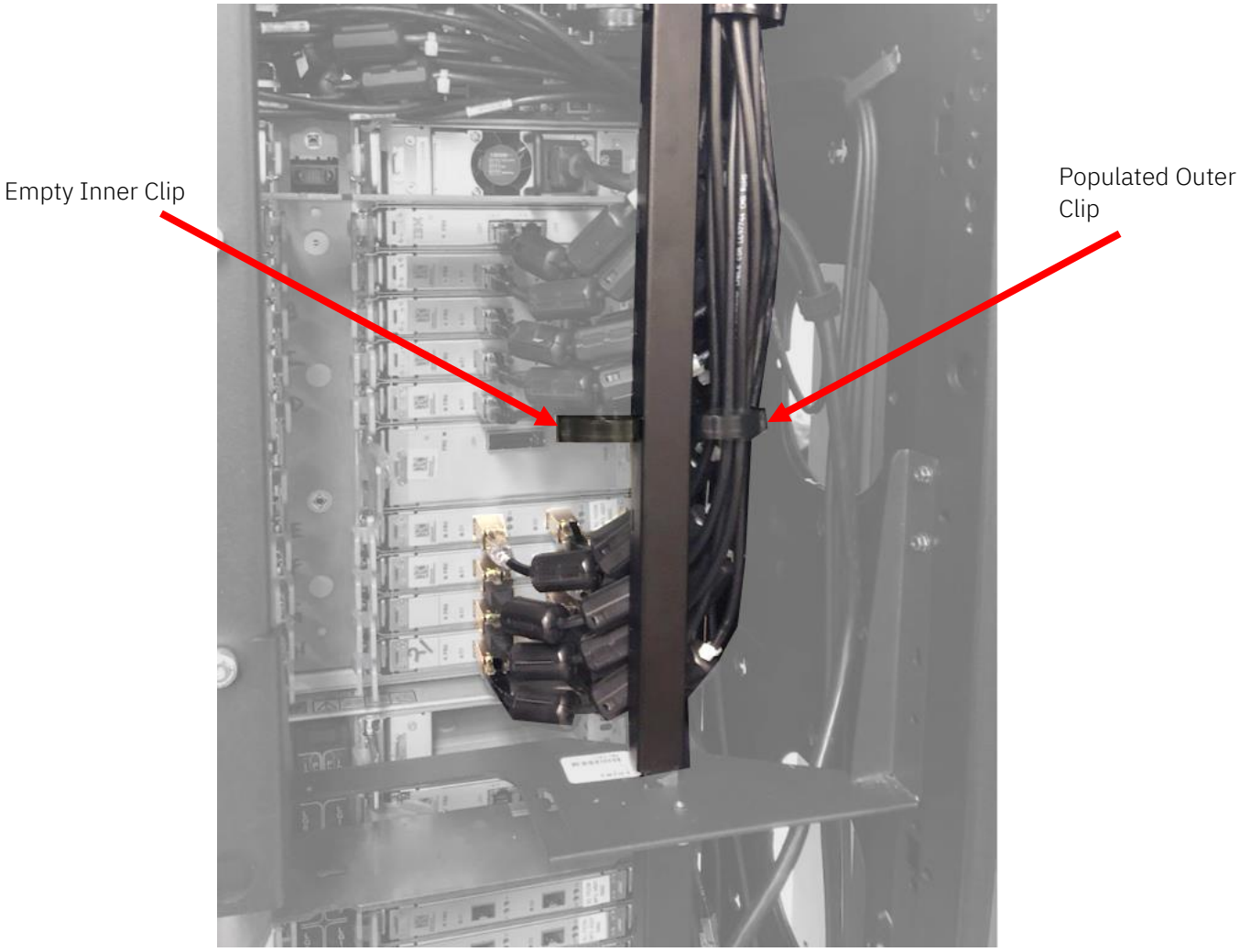

Figure 53: OSA Cables in Mini-Spine

External Ethernet (HMC)

If a Hardware Management Console (HMC) is ordered, the customer must supply the necessary Ethernet cables to connect the remote HMC to the IBM Z system's Support Element (SE). These cables are routed either through the top or bottom of the system depending on the frame configuration. If entering through the top, the cables shall enter through the D-holes at the front of the frame (red line in Fig 54) or through the large cutouts at the rear of the frame (blue line in Fig 54).

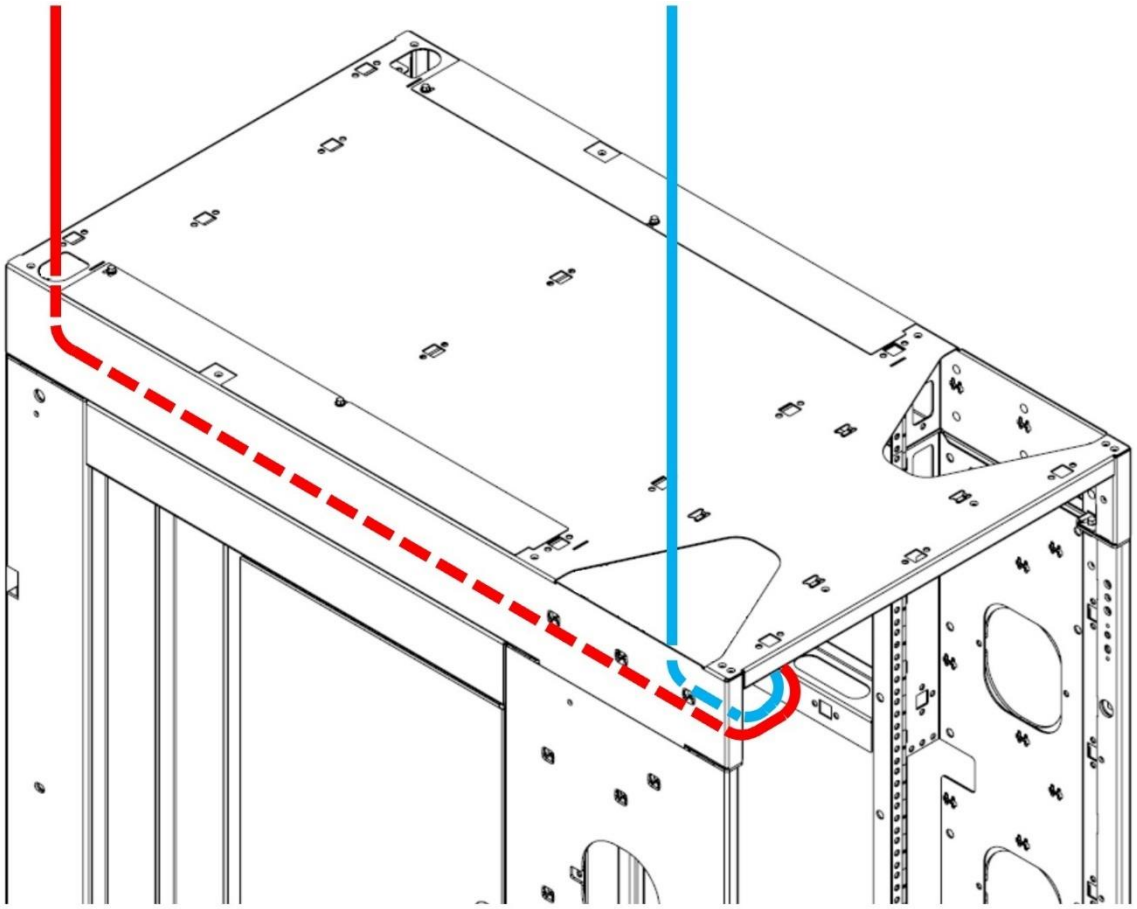

Figure 54: External Ethernet Cable Routing

System Time Synchronization

A Server Time Protocol (STP) Coordinated Timing Network (CTN) has the capability of connecting to its timing source via a Network Time Protocol (NTP) or a Precision Time Protocol (PTP) time server that has a pulse per second (PPS) output signal. The NTP or PTP timing network is connected to the oscillator card(s) in the CPC drawer(s) assuming the client network operates in a firmware partition within the CPC drawer. The PPS output of the time server is connected using a coaxial cable to the front of the CPC drawer located within the "A" frame (reference Figures 55 and 56). When installing the PPS cable, caution must be followed as detailed in the Install Manual.

The PPS cable shall use a 90-degree BNC connector (included in Ship Group) that has a bare grounded outer barrel. The warning provided below shall be followed when plugging or unplugging the BNC cable (also, reference procedure provided in the System's Installation Manual).

DANGER: To prevent a possible shock from touching two surfaces with different protective ground (earth), use one hand, when possible, to connect or disconnect signal cables. (D001)

The PPS cable should be retained to the oscillator card latches using hook-and-loop fasteners. The routing of these cables shall be along the same path as the preinstalled BMC ethernet cables under the plastic cable organizers in front of the frame (ref. Figure 57 and 58). These cables are to be routed through the "D-holes" (see Figure 58) at the top of the frame.

Cables routed on the left side of the frame shall only plug to the left oscillator card. Cables routed on the right side of the frame shall only plug to the right oscillator card (ref Figure 57 and 59).

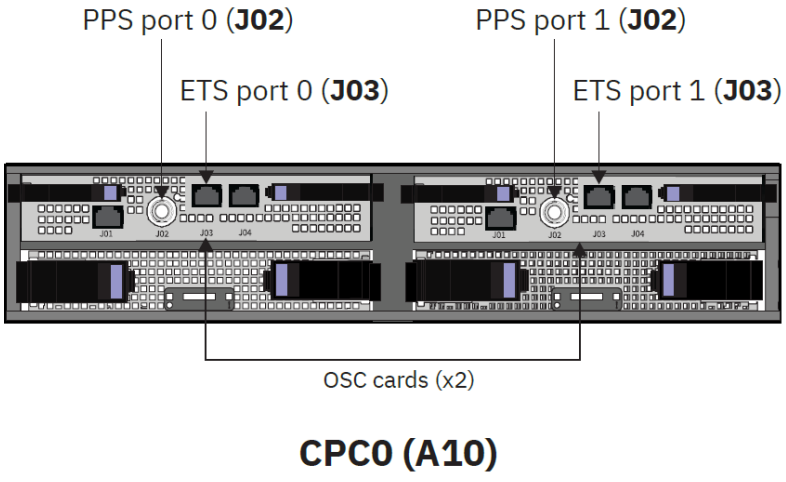

Figure 55: PPS Ports for One (1) "A" Frame CPC drawer

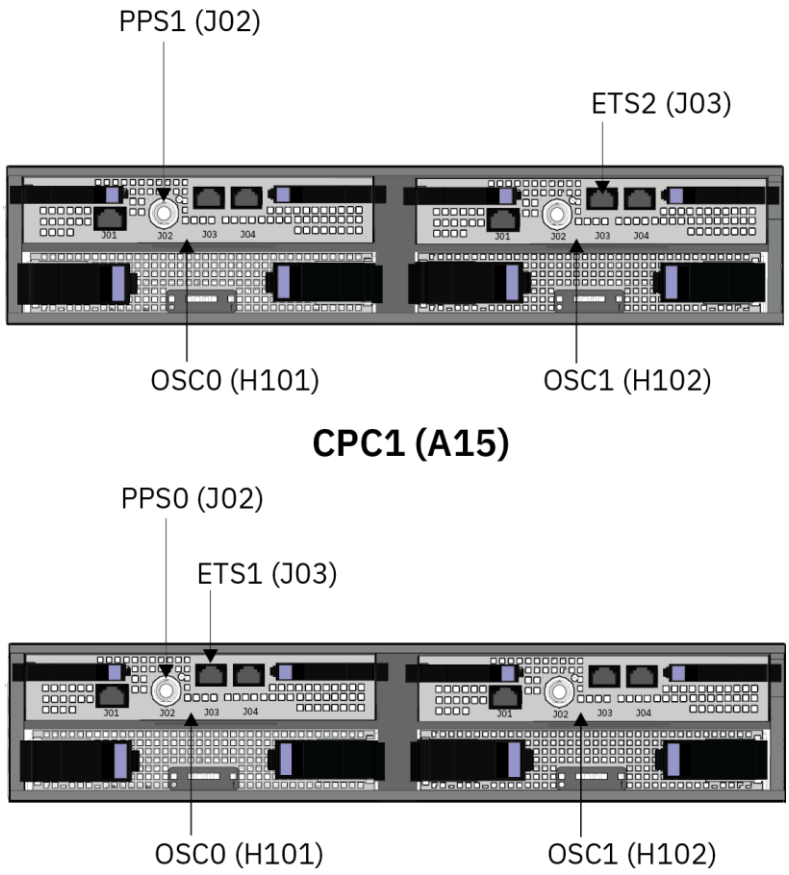

Figure 56: PPS Ports for Two (2) or more "A" Frame CPC drawers (please update with PTP locations)

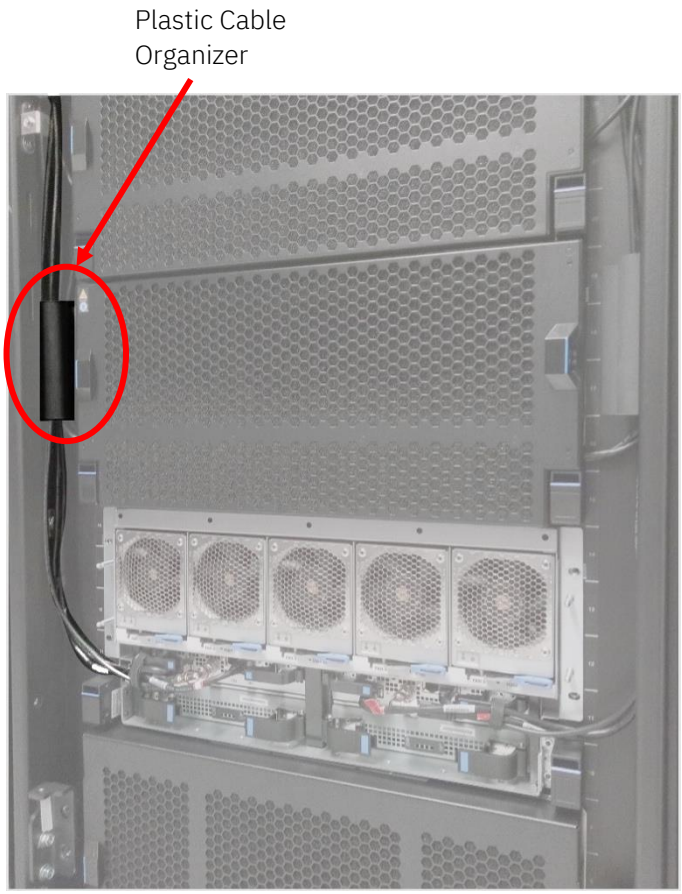

Figure 57: Front of CPC Drawer (“A” frame)

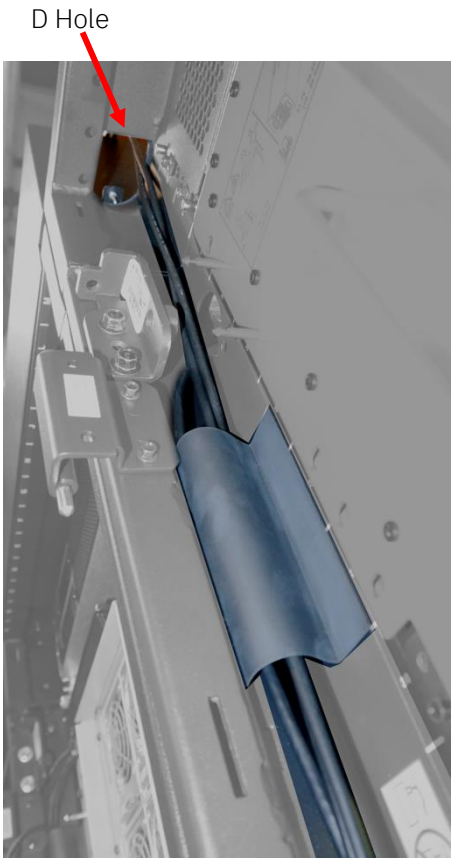

Figure 58: D Hole

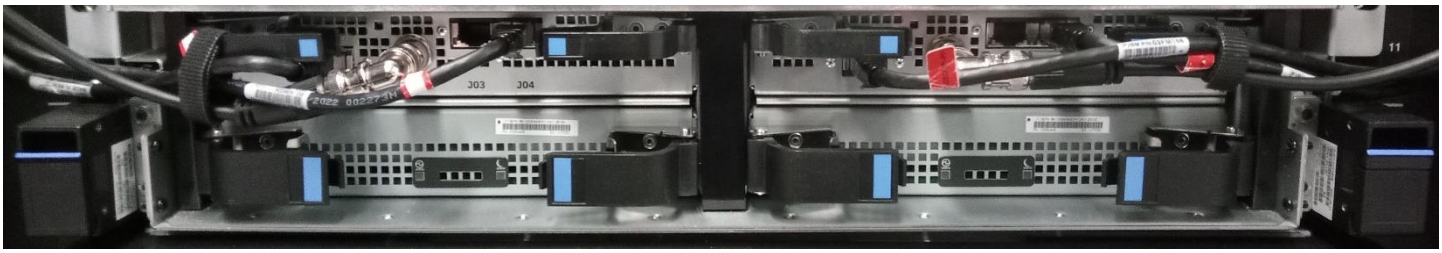

Figure 59: Front of CPC Drawer (“A” frame)

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Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

European Community Compliance Statement

This product is in conformity with the protection requirements of EU Council Directive 2014/30/EU on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55032. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

European Community contact:
IBM Deutschland GmbH
Technical Regulations, Department M372
IBM-Allee 1, 71139 Ehningen, Germany
Tele: +49 (0) 800 225 5423 or +49 (0) 180 331 3233
email: halloibm@de.ibm.com

Warning: This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

VCCI Statement - Japan

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

The following is a summary of the Japanese VCCI statement above:

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Japan JIS C 61000-3-2 Compliance

（一社）電子情報技術産業協会 高調波電流抑制対策実施要領に基づく定格入力電力値： Knowledge Centerの各製品の仕様ページ参照

For products less than or equal to 20 A per phase, the following statement applies:

高調波電流規格 JIS C 61000-3-2 適合品

For products greater than 20 A, single-phase, the following statements apply:

高調波電流規格　JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。
回路分類：６（単相、ＰＦＣ回路付）
換算係数：０

For products greater than 20 A per phase, three-phase, the following statements apply:

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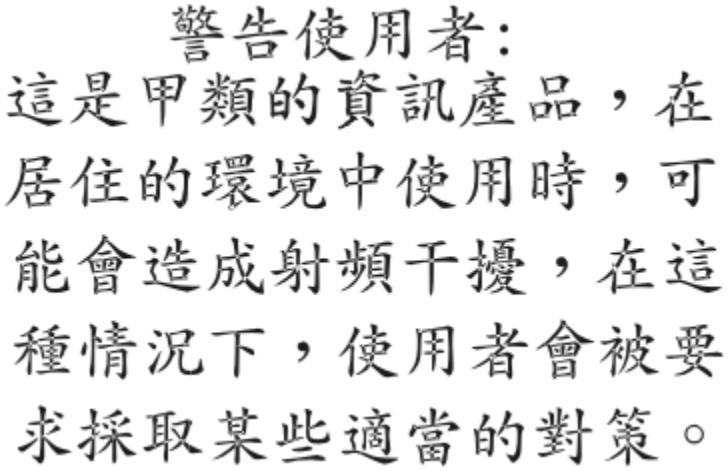

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